

**RENOVATE 2ND – 5TH
FLOOR AT
KING-SHAW HALL
SUCF No. 181008**

Project Manual & Specifications

January 31, 2025

Owner

**Cornell University
Ithaca, New York 14853**

Architect

**Mitchell Giurgola Architects LLP
630 Ninth Avenue, Suite 711
New York, New York 10036**

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New York State Department of Labor – Prevailing Wage Rates

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INSTRUCTIONS TO BIDDERS

Project: Renovate 2nd – 5th Floor at King-Shaw Hall
Owner: The State University of New York, by
Cornell University for and on behalf of the
College of Industrial and Labor Relations (ILR)
Ithaca, New York 14853.
Architect: Mitchell Giurgola Architects LLP
630 Ninth Avenue, Suite 711
New York, New York 10036

1. PROPOSAL FORMS

a. Proposals shall be made only on the forms provided and all blank and underlined spaces in the forms shall be fully filled in, in ink or typed; amount shall be fully stated both in writing and in figures. Proposals shall be signed by Principals or Officers duly authorized to execute such documents on behalf of their respective firms or organizations, and the Certificate included in the Bid Form shall be completed accordingly. Bidder's legal name must be fully stated. Completed form shall be without interlineations, alterations, or erasures unless initialed and dated by the signer.

2. RECAPITULATION OR PROPOSAL

a. Proposals shall not contain any recapitulation of the work to be done. No oral, telegraphic or telephonic proposals or modifications will be considered.

3. METHOD OF SUBMISSION

a. Proposals shall be prepared and enclosed in a sealed envelope. **The Contractor shall submit one original signed Bid Forms.** Envelope shall be addressed to:

Brenda Frank, Manager
Facilities Contracts
121 Humphreys Service Building
Cornell University
Ithaca, New York 14853

Proposal for: Renovate 2nd – 5th Floor at King-Shaw Hall

Submitted by: _____
(Bidder)

b. Proposals shall be delivered to the Owner at the address listed above not later than **2:00PM on May 6, 2025.**

4. BID OPENING

a. Proposals will be opened and read aloud publicly by the Owner in Room 133 Humphreys Service Building, Cornell University Campus, Ithaca, New York and via Zoom at <https://cornell.zoom.us/j/94936340387?pwd=HxiCfOH1QLVGkuvaRiTJRSdhwISbIB.1&from=addon>, at the hour and date listed in 3b. The Owner reserves the right to postpone the date and time of opening of proposals at any time prior to the date and time announced in this Instruction to Bidders or amendments thereto.

5. BIDDING DOCUMENTS

a. The Bidding Documents will consist of the following:

- (1) Instructions to Bidders.
- (2) Bid Form.
- (3) General Conditions of the Contract and Division 1 - "General Requirements".
- (4) Drawings and Specifications.
- (5) Addenda and/or bulletins issued prior to date of opening of Proposals.

6. DRAWINGS AND SPECIFICATIONS FURNISHED

a. Contract Documents may be obtained from Facilities Contracts website (<https://fcs.cornell.edu/projects-out-to-bid>). For assistance call 607-255-5343.

b. Sets will be available at \$49.00 per set without refund. No partial sets will be issued. The Contract Documents remain the property of the Owner. Fees are waived for certified Minority and Women Owned and Service Disabled Veteran Owned Businesses. Certification status will be verified in the New York State Contract System.

7. START OF WORK

a. Work shall begin upon Owner's written authorization to proceed and shall be completed within four hundred sixty (460) calendar days from the contract approval date provided in the authorization to proceed.

b. The construction schedule is critical. The Contract shall include for adequate manpower and equipment in his Bid to ensure that no slippage of the schedule will occur.

8. BONDS

a. Performance and Payment Bonds. The successful Bidder shall furnish the Owner with "Performance" and "Labor and Material Payment Bonds", each in the amount of 100% of the Contract Price. The cost of such bonds shall be included in the Bidders Proposal. Each of these Bonds are to be in a form with such sureties as the Owner may approve.

b. Bid Security. Each Bidder will be required to furnish a Bid Security in the amount of 10% of the Bid Amount. Bid Securities may be in the form of a Bid Bond or Certified Check. Such Bid Security shall guarantee that the Bidder will execute the Contract if it is awarded to him in conformity with his Proposal. Such Proposal Guarantee Bond shall include a statement that the Insurer shall, at the option of the Bidder, be willing to provide to the Bidder the Contract Bonds as described in 8a above.

9. AWARD OF CONTRACT

a. It is the intent of the Owner to enter into a Contract with one General Contractor for the entire project. All labor and services and materials and supplies, etc. are to be furnished in accordance with the Contract.

b. Award of the Contract shall be made to the bidder submitting the lowest responsive and responsible bid who, in the opinion of the Owner, is qualified to perform the work. The Owner shall determine the lowest bid by adding to or deducting from the Base Bid of the bidders additive or deductive alternates, if any, the Owner elects to accept after the opening of the Bids. Alternates will be accepted in the order they are set forth in the Bid Form. The unit prices set forth in the Bid for additions to or deductions from the work shall not be considered in determining the lowest bid.

c. The Owner reserves the right to reject any or all Proposals, and to waive any informalities in Bidding.

d. All Proposals shall remain in force and effect for a period of not less than ninety (90) calendar days following the bid opening date.

e. Contract award shall be subject to approval of Cornell University's Contractors Qualification Statement.

10. EXAMINATION OF SITE AND CONTRACT DOCUMENTS

a. Each Bidder shall visit the Site of the proposed work, fully acquaint and familiarize himself with the conditions as they exist and the character of the operations to be carried on under the proposed Contract, and make such investigation as he may see fit so that he shall fully understand the facilities, physical conditions and restrictions attending the work under the Contract.

b. Each Bidder shall also thoroughly examine and become familiar with the Drawings, Specifications and associated Bid Documents.

c. By submitting a Proposal, the Bidder covenants and affirms that he has carefully examined the Drawings, Specifications, associated Bid Documents, the Addenda and Bulletins, if any, and the Site, that he relies on no representation by the Owner, and that from his own investigation he has satisfied himself as to the nature and location of the work, the general and local conditions, and all matters which may in any way affect the work or its performance, and that as a result of such examination and investigation, he fully understands the conditions of bidding and that he will not make any claim for, and waives any right to damage because of misinterpretation or misunderstanding of the Bid Documents and the conditions of bidding.

11. DISCREPANCIES

a. Should a Bidder find discrepancies in or omissions from the Drawings, Specifications and associated Bid Documents, or should he be in doubt as to their meaning, he shall at once notify the Architect, who will send written instructions to all bidders. Neither the Owner nor the Architect will be responsible for oral instructions. Every request for such interpretation should be in writing, addressed to the Architect. Inquiries received seven (7) or more days prior to date fixed for opening of Bids will be given consideration.

12. PRE-BID CONFERENCE

a. A pre-bid conference has been scheduled for 10:00AM, April 15, 2025, in Room 133 of Humphreys Service Building or via Zoom at:

<https://cornell.zoom.us/j/94279817607?pwd=l2xEZjeIQE3mK7QyeZFr2m2Ix59oba.1&from=adon>

A pre-bid walkthrough will follow and will meet at King-Shaw Hall, 140 Garden Avenue in Ithaca, New York.

The Pre-Bid Conference is designed to assist Bidders in understanding the Contract Documents, the opportunity to pose clarifying questions or make inquiries regarding Contract Documents. Results will be published in an Addendum.

b. NOTE: All Contractors/Subcontractors attending the walkthrough are REQUIRED to sign a Release if using Cornell equipment. You are also required to have appropriate PPE including, but not limited to, all current OSHA regulations and at a minimum the use of eye protection foot protection, hand protection, head protection, hearing protection and fall protection. Additionally, the Borrower shall provide their own five-point safety harness where required.

13. ASSUMPTION OF RISK

Consultants/Subconsultants are expected to bring to jobsite all applicable personal safety devices required or needed to view the Scope of Work. Use of Cornell equipment or tools, with or without permission, involves inherent risk of injury to User(s). Any use of Cornell equipment is conditioned upon the assumption of all risks attendant to the use of any tools or equipment – including personal injury, death or permanent disability – arising from the Use of Cornell equipment or tools. These risks also include but are not limited to: accidents, collisions, falling, as well as unforeseen risks resulting in injuries to User and/or bystanders. Participation in a walk-through or similar activity constitutes acceptance of risk assumption.

14. TRADE SUBCONTRACTORS, MATERIAL SUPPLIERS

a. Each portion of the work shall be performed by an organization equipped and experienced to do work in that particular field, and no portion of the work shall be reserved by the Bidder to himself unless he is so equipped and experienced. Subcontracts shall be awarded only to parties satisfactory to the Owner and the Architect. Each subcontractor and materials supplier shall be approved individually.

b. In the spaces provided in the Bid Form, the Bidder will list all portions of the work they propose to perform directly with their own forces.

c. A list of names from which the Bidder proposes to select subcontractors, materials suppliers, and/or manufacturers for the principal trades or subdivisions of the work should be entered for each Section, Subdivision, or Supplier listed in the Bid Form.

d. In the Bid Form, there has been listed the principal trades or subdivisions of the work for which such a listing is required, together with the provisions which govern the listing, selection, and approval of principal subcontractors.

15. ALTERNATE PROPOSALS

a. Certain Alternate Proposals may be requested. They will be listed in the Bid Form and all Bidders are required to bid on all Alternates without exception, in the spaces provided.

b. Alternate Proposals shall include all overhead, profit, and other expenses in connection therewith.

c. Alternate Proposals, if accepted, will be accepted in the order in which they are set forth in the Bid Form.

16. UNIT PRICES

a. Certain Unit Prices may be requested. They will be listed in the Bid Form and all Bidders are required to bid on all Unit Prices without exception, in the spaces provided.

b. Unit Prices shall include all overhead, profit, and other expenses in connection therewith.

17. SCHEDULE OF VALUES

a. A partial "Schedule of Values" for certain trades and/or subdivisions of the work is required as part of the Bidder's Proposal in the Bid Form.

b. The successful Bidder shall submit a complete "Schedule of Values" showing the amounts allocated to the various trades, suppliers, subcontractors, installers and General Contractor's work, aggregating the total sum of the Contract. If requested by the Owner or Architect, the complete "Schedule of Values" shall be submitted prior to award of Contract.

18. ADDENDA AND BULLETINS

a. Addenda and/or bulletins issued during the bidding period shall be acknowledged in the space provided in the Bid Form.

19. SUBSTITUTIONS

a. Proposals shall conform to the requirements of the Bid Documents.

b. The Bidder may offer substitutions for any item of material or equipment, element of work, or method of construction set forth in the Bid Documents, with the exception of Form of Contract, General Conditions and General Requirements - Division 1, by listing the proposed substitutions and the amounts to be deducted from the Base Bid corresponding to each such proposed substitution in the spaces provided in the Bid Form. However, the Bidder is cautioned to make his base proposal on the materials and items specified by name or other particular reference.

20. SUB-SURFACE CONDITIONS

a. Boring information, water levels, indications of sub-surface conditions and similar information given on the Drawings or in the Specifications are furnished only for the convenience of the Bidders. The Owner, Architect and Consulting Engineer make no representation regarding the character and extent of the soil data or other sub-surface conditions to be encountered during the work and no guarantee as to the accuracy or validity of interpretation of such data or conditions is made or intended.

b. Each Bidder shall, by careful examination, inform himself as to the nature and location of the work, the conformation of the ground, subsoil and ground water conditions, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions and all other matters which can in any way affect the work under this Contract. The Bidder may, at his option, conduct tests at his expense, including borings, by prior notification to the Owner. Each Bidder shall make his own deductions of sub-surface conditions which may affect methods or cost of construction of the work hereunder and he agrees that, if awarded the construction contract, he will make no claim for damages or other compensation, except such as are provided for in the Contract Documents, should he encounter conditions during the progress of the work different from those as calculated and/or anticipated by him.

21. SALES AND USE TAX EXEMPTION

a. The Owner a non-profit educational institution, is exempt from payment of certain Sales and Use Taxes.

22. FEDERAL EXCISE TAX

a. The Owner a non-profit educational institution, is exempt from payment of certain Federal Excise Taxes.

23. TAX EXEMPT STATUS

a. Bidders shall inform all prospective subcontractors and suppliers from whom they expect to obtain proposals or quotations of the tax-exempt status of the Owner as set forth above and request that they reflect anticipated tax credits in their proposals or quotations.

24. EXEMPTION CERTIFICATES

a. At the Contractor's request, following the award of a Contract, Contractor exempt purchase certificates will be furnished by the Owner to the Contractor with respect to such tax-exempt articles or transactions as may be applicable under the Contract.

25. REQUIRED SUBMISSIONS

a. Provide with Bid Proposal:

- (1) Acknowledgement of Addenda and/or Bulletins issued prior to bid opening
- (2) Certificate as to Corporate Bidder
- (3) List of Proposed Subcontractors
- (4) Schedule of Values
- (5) Alternate Proposals and Unit Prices
- (6) Completion of Milestone Schedule
- (7) Bid Security

- b. **Within three (3) business days after bid opening (see attached forms):**
- (1) MWBE and SDVOB Utilization Plan Form
 - (2) EEO Policy Statement
 - (3) Six-Month Workforce Projection
 - (4) Vendor Responsibility Questionnaire
 - (5) Procurement Lobbying Act SFL J&K Forms
 - (6) Omnibus Procurement Act Forms I and II (if bid is over One Million Dollars)
 - (7) Offerer's Certification Regarding Sexual Harassment Prevention Policies Pursuant to the State Finance Law §139-I
 - (8) NY Human Rights Law Executive Order 177 Certification
- c. Execution of Contract:
- (1) Insurance Certificate
 - (2) Performance Bond
 - (3) Labor and Material Payment Bond
 - (4) Schedule of Work
 - (5) Federal Tax Identification Number

END OF SECTION

RENOVATE 2ND – 5TH FLOOR AT KING-SHAW HALL

Cornell University, Ithaca, New York

BID FORM

Submitted by: _____ Date _____

To: Brenda Frank, Manager
Facilities Contracts
121 Humphreys Service Building
Cornell University
Ithaca, New York 14853

Gentlemen:

The undersigned, _____
(Name of Bidder)

a _____
(Type of Firm, State of Incorporation, if applicable)

of _____
(Address)

having carefully examined the Instructions to Bidders, the "Conditions of the Contract" (General, Division 1 - "General Requirements"), and the Drawings, Specifications and associated Bid Documents dated January 31, 2025, as prepared by Mitchell Giurgola Architects LLP, 630 Ninth Avenue, Suite 711, New York, New York 10036, as well as the premises and conditions affecting the work, proposes to furnish all material, equipment, labor, plant, machinery, tools, supplies, services, applicable taxes and specified insurance necessary to perform the entire work, as set forth in, and in accordance with the said documents for the following considerations:

1. BASE BID

a. All work complete, for the sum of

_____ (\$ _____)
for MATERIALS, SUPPLIES, LABOR, and
SERVICES AND ALL OTHER COSTS.

2. ALTERNATE PROPOSAL

a. The undersigned, if awarded the Contract, proposes to perform work in addition to or in place of the scope of the work shown and specified herein as associated with the Base Bid in accordance with the following Alternate Proposals, which amounts are to be added or deducted to the amount of the Base Bid as indicated for the Alternates specified in Division 1 of the Specifications.

b. If the Bidder desires to indicate that the acceptance of any Alternate or Alternates will result neither in an addition to nor a deduction from the value of the work, he shall enter the phrase "No Change" in response to such Alternate or Alternates.

c. It is understood that the Owner will accept or reject Alternate Proposals in conjunction with the award of a construction contract and that Alternates will be accepted in the order provided below.

Alternate No.	Description	ADD	DEDUCT
ONE	Amount to restore the cupola.	\$ _____	\$ _____
TWO	Provide a 2 HR glass wall and door assembly on both Stair A and B on levels 3 and 4.	\$ _____	\$ _____

3. MINORITY AND WOMEN’S BUSINESS ENTERPRISES (M/WBEs)

a. The undersigned shall, if awarded the Contract, endeavor to include both Minority and Women Owned Business Enterprises participation and to demonstrate a “good faith effort” with respect to these requirements. Goals shall be as follows:

- A goal of 4.47% for Minority-Owned Business Enterprise (MBE) participation shall be applied as follows: a maximum of one-third (1/3) of the goal may be applied to purchases of materials, supplies, and equipment from MBEs.
- A goal of 2.75% for Women-Owned Business Enterprise (WBE) participation shall be applied as follows: a maximum of one-third (1/3) of the goal may be applied to purchases of materials, supplies, and equipment from WBEs.
- A goal of 6.00% for Service Disabled Veteran Owned Businesses (“SDVOB”) participation shall be applied as follows: a maximum of one-third (1/3) of the goal may be applied to purchases of materials, supplies, and equipment from SDVOBs.

4. START OF WORK AND TIME FOR COMPLETION

a. Work at the site shall not start prior to receipt of the Owner's written Notice to Proceed and be completed within four hundred sixty (460) calendar days from that date.

b. The construction schedule is critical. The Contract shall include for adequate manpower and equipment in his Bid to ensure that no slippage of the schedule will occur.

5. LIST OF PROPOSED PRINCIPAL SUBCONTRACTORS

a. The undersigned agrees, if awarded the Contract, to employ subcontractors from the following list for the Sections or Subdivisions of work stated below subject to the following provisions:

(1) Prior to the award of the Contract, the Owner and Architect reserve the right to review the list of "Proposed Principal Subcontractors", and to delete from it the name or names of any to whom they may have a reasonable objection. The Contractor may make the final selection of principal subcontractors at his option from the resulting list after the award of the Contract.

b. Bidder shall list the names of at least one subcontractor for each Section or Subdivision of the work listed below and shall limit the listing for each such Section or Subdivision to THREE (3) names.

c. If Bidder does not propose to employ a Subcontractor for any Section or Subdivision of the work listed below, he shall enter the name of his firm for each such Section or Subdivision.

DEMOLITION

_____	_____
_____	_____

CONCRETE

_____	_____
_____	_____

METALS

_____	_____
_____	_____

CARPENTRY

_____	_____
_____	_____

THERMAL & MOISTURE PROTECTION

OPENINGS

FINISHES

FIRE SUPPRESSION

ELECTRICAL

PLUMBING

HVAC

COMMUNICATIONS

SECURITY SYSTEMS

6. PRINCIPAL SUBDIVISIONS OR ELEMENTS OF THE WORK TO BE PERFORMED BY GENERAL CONTRACTOR'S FORCES

a. If awarded a Contract, we will perform the following portions of the Work with forces directly employed by the undersigned:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

b. If awarded a Contract, the Contractor's main **Project Manager** will be:

(include resume with bid)

The Owner reserves the right to reject the names of any to whom they have a reasonable objection.

c. If awarded a Contract, the Contractor's main **Superintendent** will be:

(include resume with bid)

The Owner reserves the right to reject the names of any to whom they have a reasonable objection.

7. TIME PROGRESS SCHEDULE

a. The undersigned agrees, if awarded the Contract, to furnish a "Time Progress Schedule" showing the starting and completion dates for all principal trades and subdivisions of the Work, together with such additional information related thereto as may reasonably be required.

8. BONDS

a. Performance and Payment Bonds. The undersigned agrees, if awarded the Contract to execute and deliver to the Owner "Performance" and "Labor and Material Payment Bonds" in such form as acceptable to the Owner and in an amount equal to 100% of the Contract Sum. Such bonds will be furnished by

(Name of Surety)

b. Bonding Rate for Change Orders. _____%

c. Bid Bond. A Bid Bond in the amount of \$ _____ (10% of Bid Amount) is attached to this Bid.

9. SCHEDULE OF VALUES

a. The undersigned agrees, prior to the award of a construction contract and upon the request of the Architect or Owner, to submit a complete, itemized and detailed "Schedule of Values" including Alternates elected, if any, showing the amount allocated to the various trades and subdivisions of the work, aggregating the total Contract Sum.

b. To facilitate the evaluation of Bids, the undersigned has included in each part of his Bid the following values for the trades and/or subdivisions of the work as listed below. Values for work included under Alternate Proposals are excluded. Values relative to General Contractor's costs for General Conditions are excluded.

Spec Section	Trades and/or Subdivision	Value Included in Base Bid
Division 01	General Requirements	
Division 02	Existing Conditions	
Division 03	Concrete	
Division 04	Metals	
Division 06	Wood, Plastics, and Composites	
Division 07	Thermal and Moisture Protection	
Division 08	Openings	
Division 09	Finishes	
Division 10	Specialties	
Division 11	Equipment	
Division 12	Furnishings	
Division 21	Fire Suppression	
Division 22	Plumbing	
Division 23	Heating, Ventilation, and Air Conditioning	
Division 26	Electrical	
Division 27	Communications	
Division 28	Electronic Safety and Security	
	Field Order Allowance No. 1	\$ 250,000
	Allowance No. 2	\$ 10,000
	Total Bid	\$ _____

11. ACCEPTANCE

a. The undersigned agrees that this Proposal shall remain in force and effect for a period of not less than ninety (90) calendar days following the Proposal opening or such other time as may be agreed to by the Owner and Contractor.

b. If written notice of acceptance of this Proposal is mailed, telegraphed or delivered to the undersigned within sixty (60) calendar days after the date of opening of Bids, or any time thereafter before this Proposal is withdrawn, the undersigned will within ten (10) calendar days after the date of such mailing, telegraphing or delivery of such notice, execute an Agreement between Contractor and Owner, amended and/or supplemented, if required, in accordance with the Proposal as accepted.

c. The undersigned further agrees, if requested by the Owner, to furnish Performance and Payment Bonds pursuant to Article 7 herein within ten (10) calendar days of issuance of such notice.

d. It is understood and agreed that award of the Contract shall be made to the bidder submitting the lowest responsive and responsible bid who, in the opinion of the Owner, is qualified to perform the work. The Owner shall determine the lowest bid by adding to or deducting from the Base Bid of the bidders additive or deductive alternates, if any, the Owner elects to accept after the opening of the Bids. Alternates will be accepted in the order they are set forth in the Bid Form. The unit prices set forth in the Bid for additions to or deductions from the work shall not be considered in determining the lowest bid.

e. It is understood and agreed that the Owner reserves the right to reject any or all proposals, to waive any informalities in bidding, and to hold all proposals for the above noted period of time.

f. The undersigned, if awarded a contract, agrees to complete and return a Vendor Responsibility form with their executed Agreement.

12. ADDENDUM RECEIPT

a. Receipt of the following addenda to the Terms and Conditions, Drawings or Specifications is acknowledged:

Addendum No.	_____	Dated:	_____
Addendum No.	_____	Dated:	_____
Addendum No.	_____	Dated:	_____
Addendum No.	_____	Dated:	_____
Addendum No.	_____	Dated:	_____

14. The undersigned agrees, if they are the low bidder, to furnish within three (3) business days the following:

- (1) MWBE and SDVOB Utilization Plan Form
- (2) EEO Policy Statement
- (3) Six-Month Workforce Projection
- (4) Vendor Responsibility Questionnaire
- (5) Procurement Lobbying Act SFL J&K Forms
- (6) Omnibus Procurement Act Forms I and II (if bid is over One Million Dollars)
- (7) Offerer's Certification Regarding Sexual Harassment Prevention Policies Pursuant to the State Finance Law §139-I
- (8) NY Human Rights Law Executive Order 177 Certification
- (9) New York State Finance Law 139-L Certification
- (10) NYS DOL Public Work Contractor and Subcontractor Registry Certificates

(Bidder)

By: _____

Title: _____

Business Address: _____

Dated: _____

CERTIFICATE OF NON-COLLUSION

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief:

a. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor.

b. Unless required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or with any competitor.

c. No attempt has been made or will be made by the bidder to induce any other persons, partnership, or corporation to submit or not submit a bid for the purpose of restricting competition.

(Bidder)

By: _____

Title: _____

Dated: _____

CERTIFICATE AS TO CORPORATE BIDDER

I, _____, certify that I am the _____ of the Corporation named as Bidder within this Bid Form for General Contractors; that _____, who signed said Bid Form on behalf of the bidder was then _____ of said Corporation; that I know his signature; that his signature thereto is genuine and that said Bid Form and attachments thereto were duly signed, sealed and executed for and in behalf of said Corporation by authority of its governing body.

(Secretary-Clerk)

(CORPORATE SEAL)

Dated: _____

GENERAL CONDITIONS

FOR

RENOVATE 2ND – 5TH FLOOR AT KING-SHAW HALL

**CORNELL UNIVERSITY
ITHACA, NEW YORK**

**GENERAL CONDITIONS
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EXHIBITS

A		Change Order Documentation Instructions Construction Contract Change Order Request Construction Contract Change Order Summary
B		Final Release
C		Guarantee
D	Form I	MWBE/SDVOB Utilization Plan
	Form II	Summary of Bid Activity with MBE, WBE and SDVOB Subcontractors and Vendors
	Form III	Workforce Report
E		Labor Rate Breakdown
F		Stored Materials Invoicing Documentation
G		Contractor Performance Evaluation
H		Schedule A – Provisions Required to be Inserted by Law
I		Vendor Responsibility Questionnaire

ARTICLE 1 -- INTERPRETATION OF CONTRACT DOCUMENTS

Section 1.01 - Owner

A. The Owner is Cornell University as identified in the Agreement and referred to throughout the Contract Documents as the "Owner" or "Cornell University".

B. Ownership of Documents: All drawings, specifications, computations, sketches, test data, survey results, photographs, renderings and other material relating to the Work, whether furnished to or prepared by the Contractor, are the property of Cornell University. The Contractor shall use such materials or information therefrom only in connection with the Work of this Contract. When requested, the Contractor shall deliver such materials to Cornell University.

C. The Owner shall give all orders and directions contemplated under the Contract relative to the execution of the Work. The Owner shall determine the amount, quality, acceptability, and fitness of the Work and shall decide all questions which may arise in relation to said Work. The Owner's estimates and decisions shall be final except as otherwise expressly provided.

D. Any differences or conflicts concerning performance which may arise between the Contractor and other Contractors performing Work for the Owner shall be adjusted and determined by the Owner.

E. The table of contents, titles, captions, headings, running headlines, and marginal notes contained herein and in said documents is intended to facilitate reference to various provisions of the Contract Documents and in no way affect the interpretation of the provisions to which they refer.

Section 1.02 - Meaning and Intent of Specifications, Plans and Drawings

The meaning and intent of all specifications, plans and drawings shall be determined in a manner approved by the Owner.

Section 1.03 - Order of Precedence

A. Should a conflict occur in or between or among any parts of the Contract Documents that are entitled to equal preference, the more expensive way of doing the Work, the better quality or greater quantity of material shall govern, unless the Owner otherwise so directs in writing.

B. Drawings and specifications are reciprocal. Anything shown on the plans and not mentioned in the specifications, or mentioned in the specifications and not shown on the plans, shall have the same effect as if shown or mentioned in both.

C. Requirements of reference standards form a part of these specifications to the extent indicated by the reference thereto. When provisions of reference standards conflict with provisions in these specifications, the specifications shall govern.

ARTICLE 2 -- CONTRACTOR

Section 2.01 - Contractor's Obligations

A. The Contractor shall, in good workmanlike manner, perform all the Work required by the Contract within the time specified in the Contract. The Contractor shall comply with all terms of the Contract, and shall do, carry on, and complete the entire Work to the satisfaction of the Owner.

1. All labor for this project shall be paid in accordance with the New York State Department of Labor Prevailing Rate Case No. 2025002098 dated February 19, 2025. The Contractor must provide a copy of the wage schedule to each subcontractor.
2. The Contractor shall post the appropriate prevailing wage schedules in a conspicuous place at the construction site.
3. The Contractor is required to submit a certified copy of its payrolls with each application for payment but not later than 30 days after issuance of its first payroll. Payrolls shall be attached to the designed secured data field in the electronic project management system Payment Application. The certified payroll records must show the employees name, address, and last 4 digits of their SS# as well as hours and days worked by each worker. Certified payroll must also show the occupation at which they worked, the hourly wage paid, and the supplements paid or provided.

B. The Contractor shall furnish, erect, maintain, and remove such construction plant and such temporary Work as may be required.

C. The Contractor shall provide and pay for all labor, material, tools, equipment, machinery, as well as utility connections, transportation, and all other facilities and services necessary for the proper execution and completion of the Work, except as otherwise specified elsewhere in the Contract Documents.

D. Whenever a provision of the Specifications conflicts with agreements or regulations in force among members of trade associations, unions, or councils which regulate or distinguish what work shall or shall not be included in the work of a particular trade, the Contractor shall make all necessary arrangements to reconcile such conflict without delay, damage, or cost to the Owner and without recourse to the Architect or the Owner. In case progress of the Work is affected by undue delay in furnishing or installing items of material or equipment required under the Contract because of a conflict involving such agreement or regulations, the Owner or the Architect may require that other material or equipment of equal kind and quality be provided at no additional cost to the Owner.

Section 2.02 - Contractor's Title to Materials

A. The Contractor warrants that the Contractor has full, good and clear title to all materials and supplies used by the Contractor in the Work, free from all liens, claims or encumbrances.

B. All materials, equipment and articles which become the property of the Owner shall be new unless specifically stated otherwise.

Section 2.03 - "Or Equal" Clause

A. Whenever a material, article or piece of equipment or method is identified on the plans or in the specifications by reference to manufacturers' or vendors' names, trade name, catalogue number, or make, no others may be substituted. Any and all other "Or Equal" considerations will be handled under this Section in accordance with General Requirements, Section 01 25 00.

B. Where the Architect approves a product proposed by the Contractor and said proposed product requires a revision or redesign of any part of the Work covered by this Contract, or the Work covered by other contracts, all said revision or redesign, and all new drawings and details required therefor shall be provided by the Contractor and shall be approved by the Architect. All time spent by the Architect or its agents to evaluate the proposed substitution and or necessary engineering cost to accommodate the requested change shall be reimbursed to the Owner by the Contractor via the Change Order procedure.

Section 2.04 - Quality, Quantity and Labeling

A. The Contractor shall furnish materials and equipment of the quality and quantity specified in the Contract. Unless otherwise provided, all materials and articles incorporated into the work shall be new and of the most suitable grade of their respective kinds for the purpose. When required by the Contract Documents or when directed by the Owner, the Contractor shall supply the Owner's Representative, for their acceptance, full information concerning any material which the Contractor contemplates incorporating into the work. Materials and articles installed or used without such acceptance shall be at the risk of subsequent rejection.

B. When materials are specified to conform to any standard, the Owner may require that the materials delivered to the Site shall bear manufacturer's labels stating that the materials meet said standards.

C. The above requirements shall not restrict or affect the Owner's right to test materials as provided in the Contract.

D. Whenever several alternative materials or items are specified by name or other particular reference for one use, the Owner's Representative may require the Contractor to submit in writing a list of the particular materials or items the Contractor intends to use before the Contract is executed.

Section 2.05 - Superintendence by Contractor

A. The Contractor shall employ a full-time effective, responsive and competent construction superintendent and necessary staff; the construction superintendent shall devote full time to the Work and shall have full authority to act for the Contractor at all times. The Contractor shall provide the Owner with the names and authority of such personnel in writing.

B. If at any time the superintendent is not satisfactory to the Owner, the Contractor shall, if requested by the Owner, replace said superintendent with another superintendent satisfactory to the Owner. There shall be no change in superintendent without the Owner's approval.

C. The Contractor shall remove from the Work any employee of the Contractor or of any Subcontractor when so directed by the Owner.

Section 2.06 - Subsurface or Site Conditions

A. The Contractor acknowledges that it has assumed the risk and that the contract consideration includes such provision as the Contractor deems proper for all subsurface conditions as the Contractor could reasonably anticipate encountering from the provisions of the Contract Documents, borings, rock cores, topographical maps and such other information as the Owner made available to the Contractor or from their own inspection and examination of the site prior to the Owner's receipt of bids.

B. In the event that the Contractor encounters subsurface physical conditions at the site differing substantially from those shown on or described or indicated in the Contract Documents and which could not have been reasonably anticipated from the aforesaid information made available by the Owner or from the Contractor's aforesaid inspection and examination of the site, the Contractor shall give immediate notice to the Owner of such conditions before they are disturbed. Such notice shall include probable cost and/or any impact to the schedule. The Owner will thereupon promptly investigate the conditions and if Owner finds that they do substantially differ from that which should have been reasonably anticipated by the Contractor, the Owner shall make such changes in the drawings and specifications as may be necessary and a change order shall be issued.

Section 2.07 - Representations of Contractor

The Contractor represents and warrants:

A. That the Contractor is financially solvent and is experienced in and competent to perform the Work;

B. That the Contractor is familiar with all Federal, State, or other laws, ordinances, orders, building codes, rules and regulations, which may in any way affect the Work;

C. That any temporary and permanent Work required by the Contract can be safely and satisfactorily constructed.

D. That the Contractor has carefully examined the Contract and the Site of the Work and that, from the Contractor's own investigations is satisfied as to the nature and location of the Work, the character, quality and quantity of surface and subsurface materials likely to be encountered, the character of equipment and other facilities needed for the performance of the Work, the general and local conditions, and all other materials or items which may affect the Work. The Contractor has correlated those observations with the requirements of the Contract Documents and has made all other investigations essential to a full understanding of the Work and the difficulties which may be encountered in performing the Work.

Section 2.08 - Verifying Dimensions and Site Conditions

A. The Contractor shall take all measurements at the Site and shall verify all dimensions and site conditions at the Site before proceeding with the Work. If said dimensions or conditions are found to be in conflict with the Contract, the Contractor immediately shall refer said conflict to the Owner.

B. During the progress of Work, the Contractor shall verify all field measurements prior to fabrication of building components and equipment, and proceed with the fabrication to meet field conditions.

C. The Contractor shall consult all Contract Documents to determine exact location of all Work and verify spatial relationships of all Work. Any question concerning said location or spatial relationships shall be submitted in a manner approved by the Owner.

D. Specific locations for equipment, pipelines, ductwork and other such items of Work, where not dimensioned on plans, shall be determined in consultation with the Owner and other affected Contractors and Subcontractors.

E. The Contractor shall be responsible for the proper fitting of the Work in place.

F. Should failure of the Contractor to perform services under this section result in additional costs to the Owner, the Contractor shall be responsible for such additional costs.

Section 2.09 - Copies of Contract Documents for Contractors

A. The Owner shall furnish to the Contractor, without charge, up to five (5) sets of Contracts Documents.

B. Any sets in excess of the number mentioned above may be furnished to the Contractor at the cost of reproduction and mailing.

C. All drawings, specifications, and copies thereof furnished by the Owner are the property of the Owner. They are not to be used on other work, and with the exception of the signed Contract Set, are to be returned to the Owner on request at the completion of the work.

Section 2.10 - Meetings

The Contractor and all subcontractors as requested shall attend all meetings as directed by the Owner or the Owner's Representative.

Section 2.11 - Related Work

The Contractor shall examine the Contract for related work to ascertain the relationship of said work to the Work under the Contract.

Section 2.12 - Surveys and Layout

Unless otherwise expressly provided in the Contract, the Owner shall furnish the Contractor all surveys of the property necessary for the Work, but the Contractor shall lay out the Work.

Section 2.13 - Errors, Omissions or Discrepancies

The Contractor shall examine the Contract thoroughly before commencing the Work and report in writing any errors or discrepancies to the Owner or the Owner's Representative.

Section 2.14 - Project Labor Rates

A. The Contractor shall submit to the Owner, for review and approval, within thirty (30) days after Contract is awarded all trade labor rates inclusive of fringe benefits, taxes, insurance for the duration of the individual craft agreement in accordance with Exhibit E. Revised rates shall be provided within thirty (30) days of signing any new agreements with the individual crafts during this project.

B. The Contractor shall submit to the Owner within three days of their Bid their NYSDOL Contractor Certificate of Registration for their firm and all Subcontractors. Contractor is responsible for verifying that all of their Subcontractors are registered. Registration information is located at <https://dol.ny.gov/contractor-and-subcontractor-landing>.

C. The current Prevailing Wage Rate schedule is contained in the Contract Documents. All updates, corrections and future copies of the annual determination are available at the Department of Labor website <https://apps.labor.ny.gov/wpp/publicView>.

Section 2.15 – Daily Reports

The Contractor's Construction Superintendent shall submit a Daily Report to the Cornell University Project Manager or the Resident Field Engineer at the job site. Such reports shall, at a minimum, contain the following information:

- Name of Project
- Project Number
- Date of Report
- Weather Conditions
- Equipment on the site
- Contractors on site including name and number of employees on site for each contractor
- Work/area and activity for each contractor
- Overtime worked and planned work progress
- Environmental problems and corrections
- Other information, such as special events, occurrences, materials delivered, accidents or injuries, recommendations, suggestions, visitors, inspections, equipment start-up and check out, occupancy, etc.

ARTICLE 3 -- INSPECTION AND ACCEPTANCE

Section 3.01 - Access to the Work

The Owner and Architect, or their duly authorized representatives, assistants, or inspectors shall at all times and for any purpose have access to the work and the premises used by the Contractor, and the Contractor shall provide safe and proper facilities therefor. In addition, the Contractor shall, whenever so requested, give the Owner and Architect or their duly authorized representatives access to the proper invoices, bills of lading, specifications, etc., which may be required in determining the adequacy and/or quantity of materials used in completion of the work.

Section 3.02 - Notice for Testing

If the Contract Documents, laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction require any work to be inspected, tested, accepted, or approved, the Contractor shall give the Owner timely notice of its readiness and of the date arranged so the Owner may observe such inspection, testing, or approval. The Contractor shall bear all costs of such inspection, tests, and approvals unless otherwise provided.

Section 3.03 - Inspection of Work

A. The Contractor will cooperate in all ways to facilitate the inspection and examination of the work. The inspections and examinations will be carried out in such a manner that the work will not be delayed.

B. All Work, all materials whether or not incorporated in the Work, all processes of manufacturer, and all methods of construction shall be, at all times and places, subject to the inspection of the Owner and the Owner shall be the final judge of the quality and suitability of the Work. Any Work not approved by the Owner shall immediately be reconstructed, made good, replaced or corrected by the Contractor including all Work of other Contractors destroyed or damaged by said removal or replacement.

C. Required certificates of inspection, testing, acceptance, or approval shall be secured by the Contractor and promptly delivered to the Owner.

Section 3.04 - Inspection and Testing

All materials and equipment used in the Work shall be subject to inspection and testing in accordance with accepted standards to establish conformance with specifications and suitability for uses intended, unless otherwise specified in the Contract. If any Work shall be covered or concealed without the approval or consent of the Owner, said Work shall, if required by the Owner, be uncovered for examination. If any test results are below specified minimums, the Owner may order additional testing. The cost of said additional testing, any additional professional services required, and any other expenses incurred by the Owner as a result of said additional testing shall be paid by the Contractor. Reexamination of any part of the Work may be ordered by the Owner, and if so ordered the Work must be uncovered by the Contractor. If said Work is found to be in accordance with the Contract, the Owner shall pay the cost of reexamination and replacement. If said Work is found not to be in accordance with the Contract, the Contractor shall pay the cost of reexamination and replacement.

Section 3.05 - Defective or Damaged Work

If, in the opinion of the Owner, it is undesirable to replace any defective or damaged materials or to reconstruct or correct any portion of the Work injured or not performed in accordance with the Contract, the compensation to be paid to the Contractor shall be reduced by an amount which, in the judgment of the Owner, shall be deemed to be equitable.

Section 3.06 - Acceptance

No previous inspection shall relieve the Contractor of the obligation to perform the Work in accordance with the Contract. No payment, either partial or full, by the Owner to the Contractor shall excuse any failure by the Contractor to comply fully with the Contract Documents. The Contractor shall remedy all defects, paying the cost of any damage to other Work resulting therefrom.

ARTICLE 4 -- CHANGES IN WORK

Section 4.01 - Changes

A. The Owner, without invalidating the Contract, may order changes within the general scope of the Contract and the Contractor shall promptly comply with such change orders.

B. A change order is a written direction to the Contractor signed by the Owner, issued after execution of the Contract, authorizing a change in the Work, extra work, or an adjustment in the Contract price or time of performance.

C. No claims for changes, extra work or additional time to complete the Contract or an adjustment in the Contract price shall be allowed unless such change is ordered in writing by the Owner.

D. The Owner shall determine the amount by which the Contract consideration is to be increased or decreased by a change order by one (1) or more of the following methods:

1. By agreement with the Contractor.
2. By applying the applicable price or prices previously bid and approved.
 - (i) To the extent that Unit Prices are applicable, as determined by the Owner, work shall be priced and paid for or credited in accordance with such Unit Prices; except that a Unit Price shall not apply to any portion of work which is either reduced or increased by more than 25%. Said Unit Prices shall be valid for the duration of the project as applicable, unless stipulated elsewhere in the Contract Documents.
 - (ii) For Unit Price items, additions and deletion of like items shall be algebraically summed and then multiplied by the applicable Unit Prices. For Direct Labor and Material items, all additions and deletions shall be algebraically summed for each subcontractor and then multiplied by the applicable markup.
 - (iii) Unit Prices are for work complete, measured in place and cover profit and all other costs and expenses. Unit Prices include, without limit, all conditions of the contract and all general requirements such as layout, reproduction of Drawings and Specifications, testing and inspection, shop drawing and sample coordination, supervision (field and home office), small tools and expendable items, insurance, taxes, temporary facilities and services, including access and safety, "as-built" drawings, and general and administrative overhead and profit.
3. By estimating the fair and reasonable cost of:
 - (i) Labor, including all wages, required wage supplements and insurance required by law paid to employees below the rank of superintendent directly employed at the Site.
 - (ii) Materials

- (iii) Equipment, excluding hand tools, which in the judgment of the Owner, would have been or will be employed exclusively and directly on the Work. When submitting change orders, equipment which is common to the project scope at hand is expected to be previously paid for as overhead / general conditions to the project. Special rental equipment or tools not common to the project that are required to perform the change order will be accepted as additional costs.
4. By determining the actual cost of the extra work in the same manner as in Subsection 3 except the actual costs of the Contractor shall be used in lieu of estimated costs.

E. Mark-up Percentages

1. Work performed by the Contractor: Where the Work is performed directly by the Contractor by adding to the total of such estimated costs a sum equal to fifteen percent (15%) thereof.
2. Work performed by a Subcontractor: Where the change order work is performed by a Subcontractor under contract with the Contractor, by adding a sum equal to fifteen (15%) of said costs for the benefit of said Subcontractor, and by adding for the benefit of the Contractor an additional sum equal to ten percent (10%) of said costs.
3. Work performed by a Sub-Subcontractor: Where work is performed by a Sub-Subcontractor, by adding the sum equal to fifteen percent (15%) of said costs for the benefit of said Sub-Subcontractor, by adding for the benefit of the Subcontractor an additional sum equal to five percent (5%) of said cost and by adding for the benefit of the Contractor an additional sum equal to five percent (5%) of said cost. The maximum aggregate of all mark-up percentages may not exceed twenty five percent (25%).
4. No Markup on Bonds and Insurance Costs: Change Order cost adjustments due to increases or decreases in bond or insurance costs (if applicable) shall not be subject to any Markup Percentage.
5. Overtime Pay: No mark-up shall be paid on the premium portion of overtime pay.
6. Direct and Indirect Costs Covered by Markup Percentages: As a further clarification, the agreed upon Markup Percentage is intended to cover the Contractor's profit and all indirect costs and expenses associated with the change order work. Items intended to be covered by the Markup Percentage include, without limit: home office expenses, branch office and field office overhead expense of any kind; project management; superintendents, general foremen; estimating, engineering; coordinating; expediting; purchasing; detailing; legal, accounting, data processing or other administrative expenses; reproduction of drawings and specifications; shop drawings and sample coordination; "as-built" drawings; permits; auto insurance and umbrella insurance; pick-up truck costs; parking permits; cellular phones; testing and inspection; temporary facilities; access and safety provisions; and warranty expense costs. The cost for the use of small tools and/or tools already in use on site are also to be considered covered by the Markup Percentage. Small tools shall be defined as tools and equipment (power or non-power) with an individual purchase cost of less than \$750

7. Deduct Change Orders and Net Deduct Changes: The application of the markup percentage will apply to both additive and deductive change orders. In the case of a deductive change order, the credit will be computed by applying the percentage so that a deductive change order would be computed in the same manner as an additive change order. In those instances where a change involves both additive and deductive work, the additions and deductions will be netted and the markup percentage adjustments will be applied to the net amount

F. Regardless of the method used by the Owner in determining the value of a change order, the Contractor, within thirty (30) calendar days after a request for the estimate of value shall submit to the Owner a detailed breakdown of the Contractor's estimate, including all subcontractors details, of the value of the Change Order Work, in the format detailed in Exhibit A. Each submission shall include an electronic .pdf format of all documentation.

G. Unless otherwise specifically provided for in a change order, the compensation specified therein includes a full payment for both the Work covered by the order and for any damage or expense incurred by the Contractor by any delays, including any delays to other Work to be done under the Contract resulting from said change order. The Contractor waives all rights to any other compensation for said damage or expense.

H. The Contractor shall furnish satisfactory bills, payrolls and vouchers covering all items of cost and when requested by the Owner shall give the Owner access to accounts and records relating thereto.

Section 4.02 – Claims for Extra Work

If the Contractor claims (i) that any work it has been ordered to do is extra work or (ii) that it has performed or is going to perform extra work or (iii) that any action or omission of the Owner or the Architect is contrary to the terms and provisions of the Contract, the Contractor shall:

A. Promptly comply with such order;

B. Notwithstanding the provisions of this Agreement, Article 4 of these General Condition and any other provisions of the Contract documents to the contrary, file with the Owner, within fourteen (14) calendar days after being ordered to perform the work claimed by it to be extra work or within fourteen (14) calendar days after commencing performance of the extra work, whichever date shall be the earlier, or within fourteen (14) calendar days after the said action or omission on the part of the Owner or the Architect occurred, a written notice of the basis of its claim and request a determination thereof;

C. Notwithstanding the provisions of this Agreement and any other provisions of the Contract documents to the contrary, file with the Owner, within thirty (30) calendar days after said alleged extra work was required to be performed or said alleged extra work was commenced, whichever date shall be the earlier, or said alleged action or omission by the Owner or the Architect occurred, a verified detailed statement, with documentary evidence, of the items and basis of its claim;

D. Produce for the Owner's examination, upon notice from the Owner, all its books of account, bills, invoices, payrolls, subcontracts, time books, progress records, daily reports, bank deposit books, bank statements, checkbooks and cancelled checks, showing all of its actions and transactions in connection with or relating to or arising by reason of its claim, and submit persons in its employment and in its subcontractors' employment for examination under oath by any person designated by the Owner to investigate any claims made against the Owner under the Contract, such examination to be made at the offices of the Contractor; and

E. Proceed diligently, pending and subsequent to the determination of the Owner with respect to any such disputed matter, with the performance of the Contract and in accordance with all instructions of the Owner and the Architect.

F. The Contractor's failure to comply with any or all parts of Section 4.02 shall be deemed to be: (i) a conclusive and binding determination on its part that said order, work, action or omission does not involve extra work and is not contrary to the terms and provisions of the Contract; and (ii) a waiver by the Contractor of all claims for additional compensation or damages as a result of said order, work, action or omission. The provisions of Section 4.02 is to promptly afford the Owner opportunity to cancel or revise any order, change its plans, mitigate or remedy the effects or circumstances giving rise to a claim or take such other action as may seem desirable and to verify any claimed expenses or circumstances as they occur. Compliance with such provisions is essential whether or not the Owner is aware of the circumstances of any order or other circumstances which might constitute a basis for a claim and whether or not the Owner has indicated it will consider a claim in connection therewith.

G. No person has power to waive or modify any of the foregoing provisions and, in any action against the Owner to recover any sum in excess of the sum certified by the Owner to be due under or by reason of the Contract, the Contractor must allege in its complaint and prove compliance with the provisions of this Section.

Section 4.03 - Form of Change Orders

All change orders shall be processed, executed and approved via the Owner's electronic project management system Change Order Process. No payment for change order Work shall be due the Contractor unless a change order has been issued and approved as noted above.

ARTICLE 5 -- TIME OF COMPLETION

Section 5.01 - Time of Completion

A. The Work shall be commenced at the time stated in the written order of the Owner and shall be completed no later than the date of completion specified in the Contract. All required overtime to maintain progress schedule is included in the Base Bid.

B. The date of beginning and the time for completion of the Work, as specified in the Contract, are essential conditions of the Contract.

C. The Work shall be prosecuted diligently at such rate of progress as shall insure full completion within the time specified. It is expressly understood and agreed, that the time for the completion of the Work described herein is a reasonable time, taking into consideration the average climatic range and usual business and labor conditions prevailing in the locality of the Site.

D. Time is of the essence on each and every portion of the Work. In any instance in which additional time is allowed for the completion of any Work, the new time of completion established by said extension shall be of the essence. If in the Architect's or Owner's judgment, it becomes necessary at any time during construction to accelerate and/or complete certain areas of the project, the Contractor shall concentrate efforts and manpower on designated areas.

E. Where Work occurs within occupied areas, perform same only on approved schedule, so as not to interfere with normal operation of occupied areas.

F. The Contractor shall not be charged with damages or any excess cost if the Owner determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner. The Contractor shall not be charged with damages or any excess cost for delay in completion of the work if the Owner determines that the delay is due to:

1. any preference, priority or allocation order duly issued by the Government of the United States or the State of New York;
2. unforeseeable cause beyond the control and without the fault or negligence of the Contractor, and approved by the Owner, including, but not limited to, acts of God or of public enemy, acts of the Owner, fires, epidemics, quarantine, restrictions, strikes, freight embargoes and unusually severe weather.

G. The time for completion can only be extended by change order and may be extended for:

1. all of the Work, or
2. only that portion of the Work altered by the change order.

H. Any claim for extension of time shall be made in writing to the Owner not more than ten (10) days after the commencement of the delay; otherwise it shall be waived.

ARTICLE 6 -- TERMINATION

Section 6.01 - Termination for Cause

In the event that any provision of this Contract is violated by the Contractor or by any Subcontractor of the Contractor, the Owner may serve written notice upon the Contractor, and upon the Contractor's surety, if any, of the Owner's intention to terminate the Contract. The notice shall briefly state the reasons for the termination and shall specify a termination date. If arrangements satisfactory to the Owner are not made to remove and remedy the violation, the Contract shall terminate upon the date specified by the Owner in the notice. In the event of termination, the Owner may take over and complete the Work at the expense of the Contractor. The Contractor and Contractor's surety shall be liable to the Owner for all costs thereby incurred by the Owner. In the event of such termination the Owner may take possession of and may utilize such materials, appliances, and plant as may be located on the Site and which may be necessary or useful in completing the Work.

Section 6.02 - Termination for Convenience of Owner

The Owner, at any time, may terminate the Contract in whole or in part. Any said termination shall be effected by delivering to the Contractor a notice of termination specifying the extent to which performance of Work under the Contract is terminated and the date upon which said termination becomes effective. Upon receipt of the notice of termination, the Contractor shall act promptly to minimize the expenses resulting from said termination. The Owner shall pay the Contractor for costs actually incurred by the Contractor up to the effective date of said termination, but in no event shall the Contractor be entitled to compensation in excess of the total consideration of the Contract. In the event of said termination the Owner may take over the Work and prosecute same to completion.

Section 6.03 – Termination under New York State Finance Law §139-k

The Owner reserves the right to terminate this contract in the event it is found that the certification filed by the Contractor in accordance with New York State Finance Law §139-k was intentionally false or intentionally incomplete. Upon such finding, the Owner may exercise its termination right by providing written notification to the Contractor in accordance with the written notification terms of this contract.

Section 6.04 - Owner's Right to do Work

The Owner may, after notice to the Contractor, without terminating the Contract and without prejudice to any other right or remedy the Owner may have, perform or have performed by others all of the Work or any part thereof and may deduct the cost thereof from any monies due or to become due the Contractor.

ARTICLE 7 -- DISPUTES

Section 7.01 - Disputes Procedure

A. If the Contractor claims that any Work which the Contractor has been ordered to perform will be Work which should have been authorized or directed by change order, or that any action or omission of the Owner is contrary to the terms of the Contract, the Contractor shall:

1. File a notice with the Owner which sets forth the basis of the Contractor's claim and requests a resolution of the dispute. Such notice shall be filed within fifteen (15) working days after being ordered to perform the disputed work or within fifteen (15) working days after commencing performance of the disputed work, whichever is earlier, or within fifteen (15) working days after the act or omission of the Owner which the Contractor claims is contrary to the terms of the Contract.
2. Proceed diligently with the performance of the work in accordance with the instructions of the Owner pending the resolution of the dispute by the Owner.
3. Promptly comply with the order of the Owner regarding the disputed matter.

4. Any such decision, or any other decision of the Owner in respect to a dispute, shall be final unless the Contractor, within ten (10) working days after such decision, shall deliver to the Owner a verified written statement which sets forth the Contractor's contention that the decision is contrary to a provision of the contract. Pending the decision of the Owner, the Contractor shall proceed in accordance with the original decision. The Owner shall determine the validity of the Contractor's claim and such determination shall be final. The Contractor may file a notice with the Owner reserving its rights in connection with the dispute but shall comply with the Owner's decision and complete the work as directed.

B. No claim for additional costs regarding changed or extra work shall be allowed unless the work was done pursuant to a written order of the Owner.

C. The value of claims for extra work, if allowed, shall be determined by the methods described in the Contract. Refer to Article 4 of these General Conditions.

D. The Contractor's failure to comply with any or all parts of Article 7 shall be deemed to be:

1. a conclusive and binding determination on the part of the Contractor that the order, work, action or omission is not contrary to the terms and provisions of the Contract;
2. a waiver by the Contractor of all claims for additional compensation, time extension, or damages as a result of said order, work, action or omission.

ARTICLE 8 -- SUBCONTRACTS

Section 8.01 - Subcontracting

A. The Contractor may utilize the services of Subcontractors.

B. The Contractor shall submit to the Owner, in writing, the name of each proposed Subcontractor and Sub-Subcontractor, as required by the Contract. The Contractor shall not award any Work to any Subcontractor or Sub-Subcontractor without the prior written approval of the Owner.

C. The Contractor shall be fully responsible for the Work, acts and omissions of Subcontractors, and of persons either directly or indirectly employed by Subcontractors.

D. The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind Subcontractors to the Contractor by the terms of the Contract insofar as applicable to the Work of Subcontractors, indemnification and to give the Contractor the same power to terminate any subcontract that the Owner may exercise over the Contractor.

E. The Contractor's use of Subcontractors shall not diminish the Contractor's obligation to complete the Work in accordance with the Contract. The Contractor shall control and coordinate the Work of Subcontractors.

F. Nothing contained in the Contract shall create any contractual relationship between Subcontractors and the Owner.

ARTICLE 9 -- COORDINATION AND COOPERATION

Section 9.01 - Cooperation with Other Contractors

A. Normally, the Work will be performed by a single Contractor. However, the Owner reserves the right to perform work related to the Work with its own forces or award separate contracts. In that event, the Contractor shall coordinate its operations with the Owner's forces or separate Contractors.

B. The Owner cannot guarantee the responsibility, efficiency, unimpeded operations or performance of any contractor. The Contractor acknowledges these conditions and shall bear the risk of all delays including, but not limited to, delays caused by the presence or operations of other contractors.

C. The Contractor shall keep informed of the progress and workmanship of other contractors and shall notify the Owner immediately of lack of progress or defective workmanship on the part of other contractors where said delay or defective workmanship may interfere with the Contractor's operations.

D. Failure of a Contractor to keep so informed and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by the Contractor of said progress and workmanship as being satisfactory for proper coordination with the Work.

E. If the Contractor notifies the Owner, in writing, that another contractor on the Site is failing to coordinate the work of said contractor with the Work, the Owner shall investigate the charge. If the Owner finds it to be true, the Owner shall promptly issue such directions to the other contractor with respect thereto as the situation may require. The Owner shall not be liable for any damages suffered by the Contractor by reason of the other contractor's failure to promptly comply with the directions so issued by the Owner, or by reason of another contractor's default in performance.

F. If the Owner shall determine that the Contractor is failing to coordinate the Work with the work of other contractors as the Owner has directed:

1. the Owner shall have the right to withhold any payments due under the Contract until the Owner's directions are complied with by the Contractor; and
2. the Contractor shall indemnify and hold the Owner harmless from any and all claims or judgments for damages and from any costs or damages to which the Owner may be subjected or which the Owner may suffer or incur by reason of the Contractor's failure promptly to comply with the Owner's directions.

G. Should the Contractor sustain any damage through any act or omission of any other contractor having a contract with the Owner or through any act or omission of any Subcontractor of said other contractor, the Contractor shall have no claim against the Owner for said damage.

H. Should any other contractor having a Contract with the Owner sustain damage through any act or omission of the Contractor or its Subcontractor, the Contractor shall reimburse said other contractor for all said damages and shall indemnify and hold the Owner harmless from all said claims.

ARTICLE 10 -- PROTECTION OF RIGHTS, PERSONS AND PROPERTY

Section 10.01 - Accidents and Accident Prevention

A. The Contractor shall at all times take reasonable precautions for the safety of persons engaged in the performance of the work. The Contractor shall comply fully with all applicable provisions of federal, state, and local law. The Contractor alone shall be responsible for the safety, efficiency and adequacy of the Contractor's Work, plant, appliances and methods, and for any damage which may result from the failure or the improper construction, maintenance, or operation of said Work, plant, appliances and methods.

B. The Contractor shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of or in the course of employment on Work under the Contract, and shall immediately notify the Owner in writing of any injury which results in hospitalization or death, or significant near miss incidents that had the potential to result in serious injury or death. The Contractor shall upload all completed Contractor and Subcontractor incident investigation forms and reports within five (5) working days of the incident. The report shall include the extent of damage or injury, the persons involved and their employers, the number of days persons are hospitalized, and any other pertinent information required by Cornell University. Such reporting shall be submitted on the electronic project management system Accident Form.

C. The Contractor shall provide to the Project Manager, Material Safety Data Sheets (OSHA Form 20 or the equivalent) for all chemicals to be used on site. All chemicals requiring any precautionary measures (eg. special storage or disposal requirements, personal protective equipment, or additional ventilation), shall be brought to the attention of Cornell University for review and approval, prior to their use on site.

1. All chemicals brought on site by the Contractor shall be clearly labeled. The label shall state the identity of the chemical, any associated hazards, and the Contractor's name.
2. All Contractor employees who are using chemicals shall be made aware of the hazards associated with their use. Safe chemical handling procedures in accordance with OSHA or other governmental agencies, and manufacturer's recommendations shall be used at all times.
3. The Contractor shall dispose of all chemicals in accordance with EPA and Cornell University requirements, regardless of the size of the container or the quantity of waste, and must receive prior approval of Cornell University.
4. A Contractor's Waste Material Disposal Plan form is required (with or without waste) to be submitted with submission of the first payment. The form can be found at: <https://ehs.cornell.edu/sites/default/files/FRM-CWMDP-Contractor-Waste-Material-Disposal-Plan-IPDF.pdf>

D. The Contractor shall be responsible for the initiation, maintenance and supervision of safety precautions and programs in connection with the Work.

E. The Contractor shall, at all times, guard the Owner's property from injury or loss in connection with the Work. The Contractor shall, at all times, guard and protect the Contractor's Work. The Contractor shall replace or make good any said loss or injury unless said loss or injury is caused directly by the Owner.

F. The Contractor shall have full responsibility to install, protect and maintain all materials and supplies in proper condition and forthwith repair, replace and make good any damage thereto until Final Acceptance.

Section 10.02 - Adjoining Property

A. The Contractor shall be required to protect all the adjoining property and to repair or replace any such properties damaged or destroyed by the Contractor, its employees or subcontractors thereof, by reason of, or as a result of activities under, for or related to the Contract.

Section 10.03 - Emergencies

A. In case of an emergency which threatens loss or injury to persons or property, the Contractor will be allowed to act, without previous instructions from the Owner, in a diligent manner, to the extent required to avoid or limit such loss or injury, and the Contractor shall notify the Owner immediately thereafter of the action taken.

Section 10.04 - Bonds

A. Before commencing the performance of any work covered by the Contract, the Contractor shall furnish to the Owner any required Bonds. The failure of the Contractor to supply the required Bonds within ten (10) days after the Contract signing shall constitute a default.

Section 10.05 - Risks Assumed by the Contractor

A. Indemnification. The Contractor shall defend, indemnify and hold harmless the Owner and its trustees, officers, agents and employees from and against all claims, damages, losses, fines, and expenses, including reasonable attorneys' fees, arising out of or resulting from the performance of the work including, but not limited to, bodily or personal injury, sickness, disease, death, or injury or damage to tangible property, to the extent they arise out of or result from:

1. any negligent act or omission, or intentional or willful misconduct, violation of law, or breach of this Contract by the Contractor, or any of its subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, or
2. any injury to an employee of the Contractor, its subcontractors, anyone directly or indirectly employed by them. The indemnification obligation under this section shall not be limited by the amount or type of damages, compensation or benefits payable by or for the Contractor under workers' compensation, disability benefit or other employee benefit laws.

B. In the event that Contractor is requested but refuses to honor its indemnification obligations hereunder, then the Contractor shall, in addition to all other obligations, pay the cost, including reasonable attorneys' fees, of bringing an action to enforce such indemnification obligations.

C. Neither the Owner's final acceptance of the work to be performed hereunder nor the making of any payment shall release the Contractor from its obligations under this Section. The enumeration elsewhere in the Contract of particular risks assumed by the Contractor or of particular claims for which the Contractor is responsible shall not be deemed to limit the effect of the provisions of this Section or to imply that the Contractor assumes or is only responsible for risk or claims of the type enumerated.

Section 10.06 - Contractor's Compensation and Liability Insurance

A. The Contractor shall procure and maintain, at its own cost and expense, until final acceptance by the Owner of all the work covered by this Contract, the following kinds of insurance:

1. Worker's Compensation Insurance. A policy complying with the requirements of the laws of the State of New York, including Coverage B - Employer's Liability with limits as follows: (1) Bodily injury by accident - \$1,000,000 each accident; (2) Bodily injury by disease - \$1,000,000 each employee; and (3) Bodily injury by disease - \$1,000,000 policy limit. This policy shall provide a Waiver of Subrogation in favor of the Owner.

2. Contractor's Comprehensive General Liability Insurance. A standard commercial general liability insurance policy, with contractual, completed operations, explosion, collapse and underground property damage coverage's issued to and covering the liability of the Contractor for all work and operations under this Contract and all obligations assumed by the Contractor under this Contract. The Contractor shall provide Broad Form Commercial General Liability Insurance, and the Owner shall be an additional insured in the policy utilizing additional insured endorsements CG 20 10 10 01 and CG 20 37 10 01 or their equivalents and provide a Waiver of Subrogation in favor of Owner. The completed operations coverage's shall be maintained for not less than two years after acceptance of the work or until the end of the applicable Statute of Repose, whichever is greater. The limits of the Commercial General Liability policy shall be as follows:

\$ 1,000,000	Each Occurrence
\$ 1,000,000	Personal and Advertising Injury per Occurrence
\$ 2,000,000	General Aggregate
\$ 2,000,000	Completed Operations

- a) No exclusionary language or limitations relating to soils or earth movement.
- b) No exclusions for Bodily Injury and Property Damage, Labor Law (240) products liability/completed operations coverage (including any product manufactured or assembled), premises operations, blanket contractual liability (for this agreement), broad form property damage, personal and advertising injury, independent contractor's liability, mobile equipment, elevators, damage from explosion, collapse and underground hazards ("XCU") cross-liability, cross suits or severability of interest clauses are acceptable.

3. Automobile Liability Insurance. A policy covering the use in connection with the work covered by the Contract Documents of all owned, non-owned and hired vehicles bearing, or, under the circumstance under which they are being used, required by the Motor Vehicle Laws of the State of New York to bear license plates. If vehicles are used for transporting hazardous materials, the commercial automobile liability insurance shall be endorsed to provide pollution liability broadened coverage for covered vehicles (endorsement CA 99 48) as well as proof of MCS-90. This policy shall name Owner as an Additional Insured and provide a Waiver of Subrogation in favor of Owner. The coverage under such policy shall be not less than a combined single limit for Bodily Injury and Property Damage of:

COMBINED SINGLE LIMIT

\$ 1,000,000 Each Accident

4. Umbrella Liability Insurance. Umbrella and/or Excess Liability policy(ies) will be provided on a following form basis subject to limits not less than \$10,000,000 per occurrence and follow-form of the primary General Liability, Automobile Liability, and Employers Liability policies. These policies shall contain an endorsement stating that any entity qualifying as an additional insured on the insurance stated in the Schedule of Underlying Insurance shall be an Additional Insured on the Umbrella/Excess liability policy and that they apply immediately upon exhaustion of the insurance stated in the Schedule of Underlying Insurance as respects to the coverage afforded to any Additional Insured. No trailing retentions on Umbrella or Excess Liability policy(ies) shall be allowed without Owner prior written consent. When approved in advance by Owner, the policies provided in this section may have policy limits lower than indicated above if the excess liability insurance policy limits provided by Contractor, when combined with the corresponding underlying policy limits, total at least the sum of all required minimum policy limits required by this section.

\$ 10,000,000 Each Occurrence/Aggregate

5. Professional Liability Insurance. I Contractor shall purchase and maintain Contractor's Professional Liability Insurance if Contractor or any of its Subcontractors or agents will provide any design, engineering or other professional services under the Subcontract Documents, covering Subcontractor and Sub-subcontractors, and their respective professionals, for liability for negligent acts, errors, or omissions, arising out of the performance of the Contractor's Work. The Retroactive date must be prior to start of the Work required under this Agreement. Coverage must be maintained for a minimum period of 3 years or until the applicable Statute of Repose, whichever is greater. The policy shall contain a blanket endorsement for contractual liability and afford coverage on a claim made basis:

\$ 2,000,000 Each Occurrence Aggregate

6. Contractors Pollution Liability Insurance: Contractor shall purchase and maintain Pollution Liability Insurance as will protect the Owner and Contractor from claims of Bodily Injury, Property Damage and cleanup, which may arise out of or result from Contractor's operations under the Contract and for which the Contractor may be legally liable. Pollution liability coverage shall extent to microbial matter including mold, mold remediation and diminution in value. The insurance shall be maintained from inception of the Work through the earlier of Substantial Completion or Final Payment. This insurance shall include coverage and limits as follows.

\$ 2,000,000

Each Occurrence/Aggregate

7. Contractor's Equipment. Contractor shall purchase and maintain coverage for its property and equipment to be used in the prosecution of the Contract Work. Such coverage shall be on a Replacement Cost basis. A Waiver of Subrogation in favor of Owner for any loss to Contractor's tools, equipment, machinery, and appliances shall be provided prior to the commencement of the Contract Work.

B. In addition to maintaining all of the above insurances, the Contractor shall indemnify and hold harmless the Owner and its agents and employees from and against liability, including additional premium due because of the Contractor's failure to maintain coverage limits as required under this section.

C. Insurance similar to that required of the Contractor shall be provided by or on behalf of all subcontractors to cover their own operations performed under this Contract. The Contractor shall be held responsible for any modifications in these insurance requirements as they apply to subcontractors.

A. Subcontractors' Insurance: Before permitting any of its Subcontractors to perform any Work, Contractor shall require and verify that all subcontractors maintain insurance meeting all the requirements stated herein, and Contractor shall ensure that Owner is an additional insured on insurance required from subcontractors. Such Additional Insured endorsement shall be attached to the certificate of insurance in order to be valid and on a form at least as broad as ISO Additional Insured Endorsement CG2010 1093 with CG2037 1001 or an endorsement providing equivalent or broader coverage. The policy shall not contain any exclusions for New York Labor Law §§ 200, 240, 240(1), 241, 241(6) and any related sections, and their insurance certificate or accompanying letter from Authorized Representative must specifically state the same. If any sub contractor's coverage does not comply with the foregoing provisions, Contractor shall defend and indemnify the Owner from any damage, loss, cost, or expense, including attorneys' fees, incurred by Owner as a result of subcontractor's failure to maintain required coverage.

B. Subcontractor insurance shall be in such amounts and against such risks as is consistent with Contractor's customary practices for such types of subcontracts for projects of similar type and capacity to the Project, PROVIDED that such insurance shall at least be in such amounts and against such risks as is customarily carried by persons engaged in similar businesses in the same geographic area.

C. Applicable subcontractor minimum insurance limits shall be:

For Subcontracts 1,000,000 or less:

- Workman's compensation as per Section 10.06.A.1
- Comprehensive General Liability as per Section 10.06.A.2 with the following limits:

BODILY INJURY AND PROPERTY
DAMAGE LIABILITY (BROAD FORM)
\$ 1,000,000 Each Occurrence
\$ 2,000,000 Aggregate

- Automobile Liability Insurance as per Section 10.06.A3
- Professional Liability Insurance – if applicable to the Subcontractor's Scope of Work – as per Section 10.06.A.5 with the following limits:

Minimum Limits Required: \$2,000,000 per claim and
\$2,000,000 aggregate

- Umbrella/Excess Liability as per Section 10.06A.4 with the following limits:

Not less than \$5,000,000 per occurrence

- Pollution Liability Insurance as per section 10.06.A.6 with the following limits:

Not less than \$2,000,000 aggregate

For Subcontracts \$1,000,000 or more:

- Workman's compensation as per Section 10.06.A.1
- Comprehensive General Liability as per Section 10.06.A.2 with the following limits:

BODILY INJURY AND PROPERTY
DAMAGE LIABILITY (BROAD FORM)
\$ 1,000,000 Each Occurrence
\$ 2,000,000 Aggregate

- Automobile Liability Insurance as per Section 10.06.A3
- Professional Liability Insurance – if applicable to the Subcontractor's Scope of Work – as per Section 10.06.A.5 with the following limits:

Minimum Limits Required: \$2,000,000 per claim and
\$2,000,000 aggregate

- Umbrella/Excess Liability as per Section 10.06A.4 with the following limits:

Not less than \$5,000,000 per occurrence

- Pollution Liability Insurance as per section 10.06.A.6 with the following limits:

Not less than \$5,000,000 aggregate

D. Before commencing the performance of any work covered by the Contract, the Contractor shall furnish to the Owner a current certificate or certificates, in duplicate, of the insurance required under the foregoing provisions including copies of subcontractor's certificates. Such certificates shall be on a form prescribed by the Owner, shall list the various coverage's and shall contain, in addition to any provisions hereinbefore required, a provision that the policy shall not be changed or cancelled and that it will be automatically renewed upon expiration and continued in force until final acceptance by the Owner of all the work covered by the Contract, unless the Owner is given thirty (30) days written notice to the contrary. Upon renewal of each of the Contractor's insurance coverage's, the Owner shall be provided with a new certificate of insurance showing such renewal. Certificates and written notices shall be directed to the Office of Facilities Contracts. The Contractor shall furnish the Owner with a certified copy of each policy including any and all exclusions to such policy.

E. If at any time any of the above required insurance policies should be cancelled, terminated or modified so that insurance is not in effect as above required, then, if the Owner shall so direct, the Contractor shall suspend performance of the work covered in the Contract. If the said work is so suspended, no extension of time shall be due on account thereof. The Owner may, at its option, obtain insurance affording coverage equal to that above required, at the Contractor's expense.

Section 10.07 - Liability Insurance of the Owner

A. The Owner, at its own cost and expense, shall procure and maintain such liability insurance as will, in its opinion, protect the Owner from its contingent liability to others for damages because of bodily injury, including death, and property damage which may arise from operations under this Contract.

Section 10.08 - Owner's and Contractor's Responsibilities for Fire and Extended Coverage Insurance Hazards

A. The Contractor shall purchase and maintain in force a Builders Risk insurance policy on the entire work. Such insurance shall be written on a completed value form and in an amount equal to the initial contract sum and modified by any subsequent modifications to the contract sum. The insurance shall name Cornell University and the State of New York, all subcontractors and sub- subcontractors. The insurance policy shall contain a provision that the insurance will not be cancelled or allowed to expire until the Contractor has given at least thirty (30) days prior written notice to Cornell University. The insurance shall cover the entire work at the site, including reasonable compensation for Architect's services and expenses made necessary by an insured loss. Insured property shall include portions of the work located away from the site and in transit to the site. The policy shall cover the cost of removing debris and demolition as may be legally necessary. The policy shall cover any boiler or machinery loss which may be suffered during installation and until final acceptance. The insurance required shall be written to cover "all risk" of physical loss including a loss due to collapse. Any deductible shall be the responsibility of the Contractor but in no case shall the deductible be more than \$50,000 unless Cornell University has agreed to a higher deductible. The Contractor shall provide to Cornell University a certificate of insurance and a summary of coverage's including all endorsements and exclusions prior to commencement of the work. Once the policy is received, the Contractor shall provide a copy of such policy to Cornell University. There shall be a mutual waiver of recovery between Cornell

University, the Contractor and all other parties to the extent such losses are covered by the builders risk policy. If Cornell University wishes to occupy the building prior to final acceptance and if the policy contains a provision which limits coverage for such partial occupancy, the parties agree work together to obtain consent of the insurance company for such partial occupancy or use under mutually acceptable terms.

B. Losses, if any, under such insurance shall be payable to the Owner.

C. The Contractor shall be responsible for any and all loss of materials connected with the construction due to unexplainable disappearance, theft or misappropriation of any kind or nature.

D. The foregoing provisions shall not operate to relieve the Contractor and subcontractors of responsibility for any loss or damage to their own or rented property or property of their employees, of whatever kind or nature, or on account of labor performed under the Contract incidental to the repair, replacement, salvage, or restoration of such items, including but not limited to tools, equipment, forms, scaffolding, and temporary structures, including their contents, regardless of ownership of such contents, except for such contents as are to be included in and remain a part of the permanent construction. The Owner shall in no event be liable for any loss or damage to any of the aforementioned items, or any other property of the Contractor, subcontractors and the Architect, or employees, agents, or servants of same, which is not to be included in and remain a part of the permanent construction. The Contractor and subcontractors severally waive any rights of recovery they may have against the Owner and the Architect for damage or destruction of their own or rented property, or property of their employees of whatever kind or nature.

Section 10.09 - Effect of Procurement of Insurance

A. Neither the procurement nor the maintenance of any type of insurance by the Owner or the Contractor shall in any way be construed or be deemed to limit, discharge, waive or release the Contractor from any of the obligations and risks imposed upon the Contractor by the Contract or to be a limitation on the nature or extent of such obligations and risks.

Section 10.10 - No Third Party Rights

A. Nothing in the Contract shall create or give to third parties; any claim or right of action against the Contractor, the Architect, and the Owner beyond such as may legally exist irrespective of the Contract.

Section 10.11 – Assumption of Risk

Vendors/Consultants/Contractors/Subcontractors are required to bring to jobsite all tools, equipment, and applicable personal safety devices required or needed to perform and complete the relevant scope of Work. Use of Cornell equipment or tools, with or without permission, involves inherent risk of injury to User(s). Any use of Cornell equipment is conditioned upon the assumption of all risks attendant to the use of any tools or equipment – including personal injury, death or permanent disability – arising from the Use of Cornell equipment or tools. These risks also include but are not limited to: accidents, collisions, falling, as well as unforeseen risks resulting in injuries to User and/or bystanders. Participation in a walk-through or similar activity constitutes acceptance of risk assumption.

Section 10.12 - Health And Safety Plan Requisites for Construction Activity Applicable To High Impact Respiratory Pathogen Pandemics And Contagions

Contractor agrees it shall follow all applicable safety requirements to a prospective health and safety event, emergency, epidemic or pandemic. Contractor is required to protect the health and safety of employees as required by applicable law, rule, regulation, and/or protocols based upon then current information, requirements, recommendations, and guidelines from civil authorities including, but not limited to, federal or New York State Executive Orders, CDC, OSHA and New York State Department of Health surrounding health and safety measures designed to eliminate or reduce the transmission of the high impact respiratory pathogen pandemics (HIRPP), or other emergent public health and safety events, epidemics, pandemics and conditions.

ARTICLE 11 -- USE OR OCCUPANCY PRIOR TO ACCEPTANCE BY OWNER

Section 11.01 – Substantial Completion

A. The term "substantial completion" means the completion of the Work to the extent that Cornell University may have uninterrupted occupancy or use of the facility or specified portion thereof for the purpose for which intended. The Contractor shall obtain all certificates of occupancy required prior to occupancy, and any electrical, mechanical and plumbing certificates, or other certificates or required approvals and acceptances by City, County, and State governments or other authority having jurisdiction.

Section 11.02 - Occupancy Prior to Acceptance

A. If, before Final Acceptance, the Owner desires Beneficial Occupancy of the Work, or any part thereof, which is completed or partly completed, or to place or install therein equipment and furnishings, the Owner shall have the right to do so, and the Contractor shall in no way interfere with or object to said Beneficial Occupancy by the Owner.

B. Said Beneficial Occupancy (1) shall not constitute acceptance of space, systems, materials or elements of the Work, nor shall said Beneficial Occupancy affect the start of any guarantee period, and (2) shall not affect the obligations of the Contractor for Work which is not in accordance with the requirements of the Contract or other obligations of the Contractor under the Contract.

C. The Contractor shall continue the performance of the Work in a manner which shall not unreasonably interfere with said use, occupancy and operation by the Owner.

ARTICLE 12 -- PAYMENT

Section 12.01 - Provision for Payment

A. The Owner agrees to pay the Contract Price to the Contractor for the performance of this Contract and the fulfillment of all the Contractor's obligations. The Contract Price means all costs reimbursable under the Contract Documents.

B. The final certificate of the Architect shall certify that the Contract has been completed within the stipulated time, and shall not be issued until all drawings and specifications have been returned to the Owner. The issuance of said certificates, however, or any payments made thereon shall not lessen the total responsibility of the Contractor to complete the work to the satisfaction of the Owner in accordance with the Contract.

C. Payments on the Contract Price shall be made each month as the work progresses in accord with the following procedure:

1. The Contractor's schedule of values, including quantities, aggregating the total Contract Price, divided so as to facilitate payments to subcontractors as specified herein, shall be the basis for monthly progress payments. This schedule, as shown in the electronic project management system Schedule of Values Process, when approved by the Owner shall be used as a basis for progress payments. In applying for payments, the Contractor shall submit a statement based upon this approved schedule.

2. (a) On a date agreed upon by the Owner, Architect, and Contractor, a meeting shall be held by the Owner to review the work completed and materials on hand. This meeting shall review each item to be submitted by the Contractor in the requisition for payment.

(b) On the first day of each month, or as soon thereafter as practicable, the Contractor shall submit via the electronic project management system Payment Application Process, a statement and all applicable documentation setting forth in detail the cost of the work done and materials delivered to the job site up to and including the last day of the previous month and shall make application for payment of ninety five percent (95%) of the amount of said statement, less the aggregate of all previous payments made by the Owner against the Contract Price.

(c) Each statement and application shall be accompanied by an affidavit, executed by the Contractor, certifying that the statement is true and correct, and that all bills for labor, and materials incorporated in or delivered to the job, due and payable at the time of the preceding progress payment, have been paid. The Contractor shall attach a single .pdf file of certified payrolls for all employees on the project as indicated in the electronic project management system Payment Application Process. Before final payment is made, the Contractor shall submit evidence that all payrolls, material bills and other indebtedness incurred in connection with the Contract have been paid, including final waivers of any liens.

3. Each such application for payment shall be subject to the review and approval of the Architect. If the Architect finds that the affidavit and application for payment are acceptable and that all the above requirements in connection therewith have been complied with, the Architect shall, within seven (7) calendar days after receiving such application for payment, certify to the Owner that the payment applied for is due and payable to the Contractor.

4. The issuance of a Certificate for Payment constitutes a representation by the Architect to the Owner, based on the date of the Application for Payment, that the work has progressed to the point indicated, that, to the best of their knowledge, information, and belief, the quality of the work is in accordance with the Contract Documents and that the Contractor is entitled to payment in the amount certified.

The Owner shall make payment in the manner provided in the Agreement within thirty (30) calendar days of receipt of the approved Certificate in the Electronic project management system.

Approval of the Payment Application by the Architect shall not be deemed to represent that the Architect has made exhaustive or continuous on-site inspections to check the quality or quantity of the work or that the Architect has reviewed the construction means, methods, techniques, sequences, or proceedings or that the Architect has made any examination to ascertain how or for what purpose the Contractor has used the monies previously paid on account of the Contract Sum.

Section 12.02 – Stored Materials & Equipment

A. The Contractor may submit, no more than thirty (30) calendar days after contract approval and prior to the first application for payment, a written request to Cornell University for permission to invoice for critical materials and equipment ready, but not yet incorporated into the work. For the purpose of this paragraph, "critical materials and equipment" eligible for payment are defined as those items affecting project schedule or budget as determined by Cornell University's evaluation of the project schedule. This includes finished goods normally shipped to the job site in a condition ready for incorporation into the work that require significant time for delivery. Raw materials or work-in-process at a manufacturer's plant location shall not be eligible for such consideration unless the Contractor can demonstrate that Cornell University can save money by purchasing material in bulk quantities at the beginning of the project.

B. Cornell University will be under no obligation to accept such requests.

C. Payment authorized by Cornell University for such "long-lead" critical materials and equipment not yet incorporated in the work will be made provided the Contractor submits Exhibit F and complies with the following:

1. Items shall be listed in the "Total Materials Presently Stored" column on the Application for Payment.
2. Transfer of Title shall be executed and included in the Application for Payment.
3. The method used to store off-site items shall be described in the Contractor's request to invoice for such materials and equipment. Cornell University shall give prior approval of the location of off-site storage. Items requiring special environmental conditions to protect their integrity (temperature, humidity, etc.) shall be continuously stored in such an environment.
4. Items in storage shall be identified as property of Cornell University, and a description of the identification method used shall be submitted in the Application for Payment. Contractor shall maintain all necessary insurance on items in storage.
5. A written and photographic inventory of items and method used to verify such inventory, including Contractor's certification that all quantities have been received in good condition at the job site or other location acceptable to Cornell University shall be submitted with the Application for Payment.
6. A copy of the vendor's invoice is included with the Contractor's invoice. Packing lists will not be accepted.

D. Cornell University retains the right to verify storage by physical inspection prior to payment approval and at any time thereafter. Such payment shall not relieve the Contractor of the responsibility for protecting, safeguarding, and properly installing the equipment or materials. The Warranty and Guarantee period shall not commence until installation and final acceptance of the completed work by Cornell University. The Contractor shall bear the cost of transporting materials stored off-site to the site

E. Each subsequent invoice will restate the prior months' materials and equipment not incorporated in the Work and current month additions and deletions for materials and equipment incorporated into the Work.

F. Upon the making of partial payment by Cornell University, all work, materials, and equipment covered thereby shall become the sole property of Cornell University. Partial payments, however, shall not constitute acceptance of the Contractor's work by Cornell University, nor be construed as a waiver of any right or claim by Cornell University.

Section 12.03 – Retention

A. Retention in the amount of five percent (5%) of the value of the work done and materials furnished and installed under this Agreement shall be retained by the Owner as part security for the faithful performance of the Contractor's work within the time specified, and shall be paid as indicated in Section 12.06.

B. Cornell University in its sole discretion may, upon the Contractor's application thereof, release retention applicable to a subcontractor, provided that there are no outstanding claims associated with the subcontractor's work and the subcontractor and Contractor submit an acceptable partial or final release when submitting the payment application process. A Consent of Surety to the reduction must be attached as well.

Section 12.04 - Withholding Payments

A. The Owner may, on account of subsequently discovered evidence, withhold or nullify the whole or a part of any Certificate to such extent as may be necessary to protect the Owner from loss on account of:

1. Defective work not remedied.
2. To assure payment of just claims of any persons supplying labor or materials for the work and to discharge any lien filed against the Owner's property.
3. A reasonable doubt that the Contract can be completed for the balance of the Contract Price then unpaid.
4. Damage to another Contractor.
5. Unsatisfactory prosecution of the work by the Contractor.
6. Failure to provide and maintain an acceptable Critical Path Method Network Schedule.

Section 12.05 – Documents and Conditions Precedent to Final Payment

A. As-Built Documentation

1. Prior to acceptance by the Owner of all work covered by the Contract, the Contractor shall furnish to the Owner through the Architect one (1) set of current reproducible full-size Contract Drawings on which the Contractor has recorded in a neat and workmanlike manner all instances where actual field construction differs from work as indicated on the Contract Drawings.

B. Final Documentation:

1. Prior to final payment, and before the issuance of a final certificate for payment in accordance with the provisions of these General Conditions, file the following documents with the Owner.
 - a. Warranties, Bonds, Service & Maintenance Contracts and any other extended guarantees stated in the technical sections of the Specifications.
 - b. Release or Waiver of Lien for the Contractor and Sub-Contractors in accordance with Exhibit B, attached hereto.
 - c. Project Record Documents as defined in General Requirements Section 01 78 39.
 - d. Notification that Final Punch List work has been completed.
 - e. Manufacturers Instruction and Maintenance Manuals as defined in General Requirements Section 01 78 23.
 - f. Fixed Equipment Inventory as defined in General Requirements Section 01 78 22.
2. The Contractor shall also provide a CD containing scanned .pdf format and/or Word Documents of all documentation.

Section 12.06 - Final Payment and Release

A. When the Contractor determines that the work or a designated portion thereof is substantially complete, the Contractor shall prepare for submission to the Owner a list of items to be completed or corrected. This list, prepared by the Contractor, shall constitute a complete detailed list of defects and deficiencies which, when remedied, will complete all Contract requirements. The submittal shall be accompanied by a statement to that effect.

B. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all work in accordance with the Contract Documents. When the Architect, on the basis of an inspection, determines that the work is substantially complete, the Architect will then prepare a Certificate of Substantial Completion.

C. Upon receipt of written notice that the work is ready for final inspection and acceptance, the Architect will promptly make such inspection and, when the Architect finds the work acceptable under the provisions of the Contract Documents, and the Contract fully performed, and if bonds have been required, the written Consent of the Surety to the payment of the balance due, and a satisfactory Release of Lien, attached hereto as Exhibit "B" and made a part of the Contract Documents, has been submitted by the Contractor, each subcontractor and sub-subcontractor, the Contractor will promptly issue a final Certificate for Payment, stating that to the best of their knowledge, information, and belief, and on the basis of their observations and inspections the work has been completed in accordance with the terms and conditions of the Contract Documents, and that the entire balance is due and payable.

D. All prior certificates upon which progress payments may have been made, being estimates, shall be subject to correction to the final certificate.

E. The acceptance by the Contractor of the final payment aforesaid shall constitute a general release of the Owner and its agents or representatives from all claims and liability to the Contractor.

ARTICLE 13 -- TAX EXEMPTION

Section 13.01 - Tax Exemption

A. The Owner is exempt from payment of Federal, State and local taxes, including sales and compensating use taxes on all materials and supplies incorporated into the completed Work. These taxes are not to be included in bids. This exemption does not apply to tools, machinery, equipment or other property leased by or to the Contractor or a Subcontractor, or to supplies and materials which, even though they are consumed, are not incorporated into the completed Work, and the Contractor and Subcontractors shall be responsible for and pay any and all applicable taxes, including sales and compensating use taxes, on said leased tools, machinery, equipment or other property and upon all said unincorporated supplies and materials.

B. The Contractor and Subcontractor shall obtain any and all necessary certificates or other documentation from the appropriate governmental agency or agencies, and use said certificates or other documentation as required by law, rule or regulation.

ARTICLE 14 -- GUARANTEE

Section 14.01 - Guarantee

A. The Contractor, at the convenience of the Owner, shall remove, replace and/or repair at their own costs and expense any defects in workmanship, materials, ratings, capacities or characteristics occurring in or to the work covered by Contract for the period of one (1) year or within such longer period as may otherwise be provided in the Contract, the period of such guarantee to commence with the Owner's final acceptance of all work covered under the Contract, and the Contractor, upon demand, shall pay for all damage to all other work resulting from such defects and all expenses necessary to remove, replace and/or repair such work which may be damaged in removing, replacing or repairing the said defects. Acceptance means final acceptance of the entire work, early partial occupancy notwithstanding

B. In some instances the nature of the work may require the Owner to accept various components, equipment, spaces or phase of the project. In such cases the Contractor shall submit a separate guarantee for the Owner's acceptance on the form attached hereto as Exhibit "C". Upon completion of the project, the Contractor shall submit to the Owner a guarantee for the project on the form attached hereto as Exhibit "C".

ARTICLE 15 -- STANDARD PROVISIONS

Section 15.01 - Provisions Required by Law Deemed Inserted

Each and every provision of law or clause required by law to be inserted in the Contract, including, but not limited to, the provisions set forth in Schedule "A", attached hereto as Exhibit H and made a part hereof, shall be deemed to be inserted herein and, in the event any such provision is not inserted or is not correctly inserted, then upon the application of either party, this Contract shall forthwith be physically amended to make such insertion or correction.

Section 15.02 – Vendor Responsibility Form

The State of New York requires each Contracting Agency conduct a review of prospective contractors ("vendors") to provide reasonable assurances that the vendor is responsible. Acting as agent for the State University of New York, Cornell University is required to collect this information. This questionnaire, attached hereto as Exhibit I, is designed to provide information to assess a vendor's authorization to do business in New York State, as well as business integrity, financial and organizational capacity, and performance history. The Contractor shall complete and return this form with their executed Agreement.

Section 15.03 - Laws Governing the Contract

The Contractor shall not assign the Contract in whole or in part without prior written consent of the Owner.

Section 15.04 - Assignments

The Contractor shall not assign the Contract in whole or in part without prior written consent of the Owner.

Section 15.05 - No Third Party Rights

Nothing in the Contract shall create or shall give to third parties any claim or right of action against the Owner, beyond such rights as may legally exist irrespective of the Contract.

Section 15.06 - Waiver of Rights of Owner

A. None of the provisions of the Contract will be considered waived by the Owner except when such waiver is given in writing.

Section 15.07 - Limitation on Actions

No action or proceeding shall be filed or shall be maintained by the Contractor against the Owner unless said action shall be commenced within six (6) months after receipt by the Owner of the Contractor's final requisition or, if the Contract is terminated by the Owner, unless said action is commenced within six (6) months after the date of said termination.

Section 15.08 - Owner's Representative

The Owner shall designate a representative authorized to act in its behalf with respect to the Project. The Owner or its representative shall examine documents and shall render approvals and decisions pertaining thereto promptly, to avoid unreasonable delay in the progress of the Contractor's work. Only directives from Cornell University's designated representative (Frank Parish) shall be recognized by the Contractor.

Section 15.09 - Cost Escalation / De-escalation

A. The Contract Pricing for all materials, supplies and services will remain firm for the duration of the Contract. Only properly documented and timely advanced notice requests for an actual cost increase in excess of 10% for the subject materials due to a tariff tax imposed that result in significant and actual cost impacts after the date of Bid Proposal will be entertained.

B. A proper request for a cost escalation will:

1. only be considered for advanced, timely noticed, and properly documented materials escalation due to tariffs or natural disasters through no fault of the Contractor; and
2. must be submitted within thirty (30) days of actual tariff related cost escalation exceeding a total cost increase of 10% or more of the commodity's documented bid pricing; and
3. must be approved by the Owner and allowed only on a shared impact at actual pass-through cost basis, absent any mark-ups.

C. Approval of a cost escalation request will be at the sole discretion of the Owner on a shared cost basis. Retroactive cost increase adjustments will not be considered, nor will increases unrelated to tariff taxes. Adjustments to pricing shall be the result of increases at the manufacturer's level pricing incurred after the Contract commencement date that:

1. will not yield a higher profit margin than that reflected in the costs awarded in the original proposal; and
2. clearly identifies the items impacted by the increase; and
3. is accompanied by sufficient documentation, acceptable to the Owner, and subject to audit requirements below.

D. Contractor will be required to provide sufficient documentation to justify the requested cost escalations(s), and Owner will determine the acceptability of documentation and sources. Documentation will include a cost proposal in sufficient detail for the Owner to perform a cost/price analysis upon which the original proposal was made. An evaluation and/or audit will be performed on the cost proposal, as well as other submitted documentation in order to determine if the requested cost increase is a fair and reasonable reflection of the actual material cost increase(s).

E. In addition to the General Conditions Article 17 surrounding Accounting, Inspection and Audit requirements, the Contractor agrees to maintain and retain books and records showing all relevant and original costs included in Contractor bids surrounding the materials and pricing in the asserted cost escalation, as well records satisfactorily demonstrating the actual cost(s) incurred for the subject materials that are asserted to be the result of tariff impacts. Each Sub-Contractor shall be similarly obligated to maintain, for inspection and audit by the Owner, books and records respecting the relevant materials and their original pricing, as well as the subsequent actual cost(s). If requested by the Owner, the Contractor shall furnish copies of any and all relevant documents, subcontracts, purchase orders and/or requisitions of any nature associated with the project and the impacts due to tariffs. The absence of sufficient documentation shall be grounds to deny any claimed escalation in pricing due to tariffs.

F. If the Owner does not find the documentation sufficient to support a cost escalation request on a pass-through basis the Owner reserves the option to counter-offer. When agreed upon by both Parties, the contract cost changes shall be binding on the Contractor. This escalation/de-escalation provision shall apply equally to cost decreases as well as increases. Cost decreases may be considered and implemented at any time during the term of the Contract.

G. All cost escalations/de-escalations shall be processed via a Change Order to the Contract.

ARTICLE 16 – MINORITY AND WOMEN BUSINESS ENTERPRISES AND SERVICE DISABLED VETERAN OWNED BUSINESSES

Section 16.01 – Definitions

The terms "Minority-owned business enterprise" ("MBE") or "Women-owned business enterprise" ("WBE") or "minority group member" shall have the same meaning as under Section 310 of the New York State Executive Law, as the same may be from time to time amended.

The Term "Service Disabled Veteran Owned Business" ("SDVOB") shall have the same meaning as under NYS Executive Law Article 17-B and 9 NYCRR Part 252.

Section 16.02 – Participation by Minority and Women Business Enterprises and Service Disabled Veteran Owned Businesses.

A. The Contractor shall, in addition to any other nondiscrimination provision of the Contract and at no additional cost to Owner, fully comply and cooperate with the Owner in the implementation of MBE, WBE and SDVOB goals. These requirements include equal employment opportunities for minority group members and women ("EEO") and contracting opportunities for certified MWBEs and SDVOBs. The Contractor's demonstration of "good faith efforts" shall be a part of these requirements. These provisions shall be deemed supplementary to, and not in lieu of, the nondiscrimination provisions required by New York State or other applicable federal, state or local laws.

B. The Contractor shall include the provisions of this Article in each and every Agreement and/or Contract in such a manner that the provisions of this Article will be binding upon each subcontractor and supplier as to work in connection with and related to this Agreement.

C. For purposes of this procurement, the Owner has established goals as outlined in the Bid Form for Minority-Owned Business Enterprises ("MBE") and Women-Owned Business Enterprises ("WBE") participation.

1. The goal for Minority-Owned Business Enterprise participation shall be applied as follows: a maximum of one third (1/3) of the goal may be applied to purchases of materials, supplies, and equipment from MBEs.
2. The goal for Women-Owned Business Enterprise participation shall be applied as follows: a maximum of one third (1/3) of the goal may be applied to purchases of materials, supplies, and equipment from WBEs.
3. The goal for Service Disabled Veteran Owned Businesses (“SDVOB”) participation shall be applied as follows: a maximum of one-third (1/3) of the goal may be applied to purchases of materials, supplies, and equipment from SDVOBs.

D. For purposes of providing meaningful participation by MWBEs and SDVOBs on the Contract and achieving the Contract Goals established in paragraph C above, the Contractor should reference the Directory of New York State Certified MWBEs and SDVOBs found at the following internet address: <http://www.esd.ny.gov/mwbe.html> and https://ogs.ny.gov/Core/docs/CertifiedNYS_SDVOB.pdf

E. Where MWBE and SDVOB goals have been established herein, the Contractor must document “good faith efforts” to provide meaningful participation by MWBEs and SDVOBs as sub-contractors or suppliers in the performance of the Contract.

F. Where it appears that a Contractor is unable to comply with the MWBE or SDVOB participation requirements, Contractor may submit in writing for the Owner’s consideration, the reasons for Contractor’s inability to meet any or all of the participation requirements together with an explanation of the efforts taken by the Contractor to obtain the stated MWBE and SDVOB participation.

Section 16.03 MWBE and SDVOB Utilization Plan

A. The Contractor shall submit a MBE/WBE/SDVOB Utilization Plan for the Owner’s review prior within fifteen (15) calendar days after receipt of a Letter of Intent or Notice to Proceed.

B. The Contractor shall use such Owner approved MBE/WBE/SDVOB Utilization Plan for the performance of MWBEs and SDVOBs on the Contract pursuant to the prescribed MWBE goals established in Article 16 hereof. The Contractor shall designate a Compliance Officer in their organization who shall be responsible for implementing the MBE/WBE/SDVOB Utilization Plan of the Contractor and its subcontractors. Said Compliance Officer shall make such periodic, but not less than monthly, reports on the Plans' progress and on the number of women and minority workers employed. These reports shall be submitted to the Owner Representative on the Affirmative Action Workforce Report attached hereto as Exhibit "D".

Section 16.04 Reports and Records

A. The following forms, attached hereto as Exhibit "D" and made a part of the Contract Documents, are to be used in submitting MBE/WBE/SDVOB Utilization Plans. Electronic versions are available in the Electronic project management system Resources Project or at <https://fcs.cornell.edu/project-contractors-and-consultants>.

1. MWBE/SDVOB Utilization Plan
2. Workforce Report

B. The Contractor shall provide a single monthly report inclusive of all subcontractor information for the project labor and such report must document the progress made towards achievement of the MWBE and SDVOB goals of the Contract. Such forms shall be uploaded monthly to the electronic project management system.

C. The Contractor shall permit access to its books, records and accounts by the Owner for purposes of investigation to ascertain compliance with the provisions of this Article. The Contractor shall include this provision in every subcontract so that such provision will be binding upon each subcontractor.

ARTICLE 17 -- ACCOUNTINGS, INSPECTION AND AUDIT

The Contractor agrees to keep books and records showing the actual costs incurred for the Work. Such books and records (including, without limitation, any electronic data processing files used by the Contractor in analyzing and recording the Work) shall be open for inspection and audit by the Owner and its authorized representatives at reasonable hours at the Contractor's local office or at the Owner's office, if necessary, and shall be retained by the Contractor for a period of seven years after the Work has been completed, except that if any litigation, claim or audit is started before the expiration date of the seven year period, the records shall be retained until all litigation, claims or audit findings involving the records have been resolved.. Each Sub-Contractor shall be similarly obligated to maintain, for inspection and audit by the Owner, books and records respecting the Work. If requested by the Owner, the Contractor shall furnish copies of any and all subcontracts, purchase orders and/or requisitions of any nature associated with the project.

ARTICLE 18 – CONTRACTOR PERFORMANCE EVALUATION

At project completion the Owner shall schedule a meeting to review with the Contractor their performance for the project unless performance warrants additional reviews. The Owner may schedule a meeting at fifty percent (50% completion) based on project complexity and/or duration. The Owner shall present its review based on the attached “Contractor Performance Evaluation”, Exhibit G. The Contractor shall be given the opportunity to provide input as to the findings of the evaluation after completion by the Owner.

ARTICLE 19 -- ROYALTIES AND PATENTS

The Contractor shall pay all royalties and license fees and shall defend all suits or claims for infringement of any patents, and shall save Cornell University harmless from loss on account thereof; except that Cornell University shall be responsible for all such loss when a particular process or product is specified by Cornell University unless the Contractor shall have reason to believe that the particular process or product infringes a patent, in which event it shall be responsible for loss on account thereof unless it promptly provides such information to Cornell University.

ARTICLE 20 -- CONFIDENTIALITY AND USE OF OWNER'S NAME

Section 20.01 - Release of Information

The Contractor shall not divulge information concerning the Work (including news releases, social media, internal house organizations, applications for permits, etc.) to anyone without Cornell University's prior written approval, except to subcontractors and suppliers to the extent that they need such information to perform their work. The Contractor shall require a similar agreement from each such subcontractor and supplier, requiring their compliance with the foregoing. Cornell University reserves the right to release all information, as well as to time its release and specify its form and content. The Contractor may obtain Cornell University's approval to release information by submitting such request to the Cornell University Project Manager.

Section 20.02 - Confidential Information

The term "Confidential Information" means all unpublished information obtained or received from Cornell University during the term of this Contract which relates to Cornell University's research, development, manufacturing and business affairs. The Contractor shall not disclose confidential information to any person, except to its employees and subcontractors to the extent that they require it in the performance of their Work, during the term of this Contract and until authorized by Cornell University in writing. The Contractor and its subcontractors shall hold all confidential information in trust and confidence for Cornell University, and shall use confidential information only for the purpose of this Contract. The Contractor and its subcontractors shall require all of their employees to whom confidential information is revealed to comply with these provisions. The Contractor shall have an agreement with each subcontractor, requiring their compliance with the foregoing. If it becomes necessary for the Contractor to defend in case of litigation related to its services rendered, permission shall be sought from Cornell University, who shall not unreasonably withhold such permission, before any disclosures are made. This Section does not apply to information which (1) is or becomes known in public domain or (2) is learned by the Contractor from third parties.

Section 20.03 - Use of Owner's Name

The Contractor shall not use, in its external, advertising, marketing program, social media, or other promotional efforts, any date, pictures, or other representation of the Owner except on the specific written authorization in advance of the Owner's Representative.

ARTICLE 21 -- CORNELL UNIVERSITY STANDARDS OF ETHICAL CONDUCT

Cornell University expects all executive officers, trustees, faculty, staff, student employees, and others, when acting on behalf of the university, to maintain the highest standard of ethical conduct as per Cornell University's Policy 4.6 - Standards of Ethical Conduct, a copy of which is available at <https://fcs.cornell.edu/project-contractors-and-consultants>. This includes treating equally all persons and firms currently doing business with or seeking to do business with or for Cornell University, whether as contractors, subcontractors, or suppliers. Such persons and firms are respectfully reminded that Cornell University employees and their families may not personally benefit from Cornell University's business relationships by the acceptance of gifts or gratuities, defined as a gift in excess of \$75.00 given to a Cornell employee for personal use. Items not considered gifts/gratuities include occasional business meals, items of an advertising nature, and items that are generally distributed to all potential customers. In addition, it is expected that the Contractor's officers and employees shall conduct all business related to this Contract within the highest ethical standards, observing applicable policies, practices, regulations, law, and professional standards. All parties are expected to report violations of this policy to appropriate university personnel. You may file a report to on the web https://secure.ethicspoint.com/domain/en/report_custom.asp?clientid=6357 or contact Cornell University through EthicsPoint by dialing toll-free 1-866-293-3077.

Section 21.01 Private Job Site

Cornell University, its campuses and construction job sites, are private property, owned and operated by a private university. Cornell requires its Contractors, their employees and subcontractors, to conduct job sites under their project control in a professional manner free of discrimination, harassment, and intimidation.

As a private university, Cornell University job sites are neither a public nor quasi-public forums. The Contractor, subcontractors, and their respective employees and visitors to the job sites have no expectation to rights of free expression while working on a Cornell job site, surrounding campus property, or its buildings and grounds. This practice is a content neutral, non-discriminatory, and represents time, place, and manner restrictions of a private employer. A Cornell construction job site is not an appropriate venue for the exercise of personal speech or expression, political or apolitical, offensive or inoffensive, or whether made on an individual's own time. Actions involving flags, posters, shirts, emblems, symbols, protests, messaging and the like are not permitted on the job site and the Contractor controlling the job site shall ensure its subcontractors, all workers, suppliers and visitors to the job site comply with the foregoing. Violations may result in removal from the job site for those responsible.

CORNELL UNIVERSITY

**Construction Contract Change Order Forms
Instructions to Change Order Documentation**

Cornell University has several standard forms related to Changes in the Work. These forms have been prepared to comply with contract requirements related to Changes in the Work. The standard Construction Contract Change Order Request and Change Order Summary Forms shall be used to facilitate preparation of change order requests in conformity with construction contract requirements.

These forms shall be used by the Contractor and by all Subcontractors in preparing their respective cost estimates for services associated with the Changed Work for the Owner's consideration and shall include all associated back-up documentation supporting the request.

Direct Cost of the Work:

- 1. Direct Labor** – Include the “wages paid” hourly direct labor and/or foreman necessary to perform the required change. “Wages paid” is the burdened labor rate documented in accordance with Section 2.14 – Project Labor Rates of the General Conditions. “Assigned Personnel or Work Crews” should be stated by trade or type of work performed not by name of person or company title. For example carpenter, mason, backhoe operator, etc. Supervisory personnel in district or home office shall not be included. Supervisory personnel on the job-site, but with broad supervisory responsibility and paid as salaried personnel, shall not be included as Direct Labor
- 2. Direct Material** – Include the acquisition cost of all materials directly required to perform the required change. Examples of “Unit of Measure” include square feet, cubic yards, linear feet, days, gallons, etc.
- 3. Equipment** – Include the rental cost of equipment items necessary to perform the change. For company-owned equipment items, include documentation of internal rental rates. Charges for small tools, and craft specific tools are not allowed.

Bond Premiums

The Contractor's actual documented bond premium rate as stated on their Bid Form at time of bid shall be added to all direct and indirect costs of the proposed change.

Overhead & Profit

The Contractor's overhead & profit rate shall be added to all direct and indirect costs of the proposed change in accordance with the Contract.

CONSTRUCTION CONTRACT CHANGE ORDER REQUEST

DATE: _____ COR # _____

PROJECT TITLE:

CONTRACT NO. _____

Name of Contractor/Subcontractor performing Work: _____

DESCRIPTION OF WORK: _____

A. DIRECT COST OF WORK:

1 LABOR (Attach Supporting Documentation)

ASSIGNED PERSONNEL OR WORK CREW

HOURLY WAGE RATE PAID	HOURS WORKED

TOTAL COST
\$0
\$0
\$0
\$0

LABOR TOTAL

\$0

2 MATERIAL (Attach Supporting Documentation)

MATERIAL REQUIRED FOR CHANGE

UNIT PRICE	UNIT OF MEASURE	REQUIRED UNITS

TOTAL COST
\$0
\$0
\$0
\$0

MATERIAL TOTAL

\$0

3 EQUIPMENT (Attach Supporting Documentation)

EQUIPMENT REQUIRED FOR CHANGE

UNIT PRICE	UNIT OF MEASURE	REQUIRED UNITS

TOTAL COST
\$0
\$0
\$0
\$0
\$0

EQUIPMENT TOTAL

\$0

4

DIRECT COST (SUM 1, 2, 3)

\$0

5

OH&P Rate _____

\$0

6 SUBCONTRACTOR (Attach Supporting Documentation)

SUB-SUBCONTRACTOR REQD FOR CHANGE

SUB-SUB COST OF WORK	SUB-SUB MARK UP %

TOTAL COST
\$0
\$0
\$0

SUB-SUBCONTRACTOR TOTAL

\$0

7 OVERHEAD AND PROFIT

OH&P Rate _____

\$0

TOTAL COST PLUS OH&P (SUM 4, 5, 6, 7)

\$0

8 BOND PREMIUM (If applicable)

Bond Premium Rate _____

\$0

TOTAL COR COST

\$0

TOTAL CONTRACT DAYS ADDED/DELETED FROM PROJECT SCHEDULE

0

EXHIBIT "A"

CONSTRUCTION CONTRACT CHANGE ORDER SUMMARY

DATE: _____

PCO # _____

PROJECT TITLE:

CONTRACT NO.

CONTRACTOR:

DETAILED DESCRIPTION OF WORK:

1 DIRECT COST OF WORK:

NAME OF CONTRACTOR/SUBCONTRACTORS
PERFORMING WORK

TOTAL
COST

TOTAL COST OF PROPOSED CHANGE ORDER ITEM

_____ \$0

TOTAL CONTRACT DAYS ADDED/DELETED FROM PROJECT SCHEDULE

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FINAL RELEASE

FINAL WAIVER OF CLAIMS AND LIENS AND RELEASE OF RIGHTS

Date	_____	Contract Date	_____
Project	_____	Contract Price	_____
Address	_____	Net Extras and Deductions	_____
City	_____	Adjusted Contract Price	_____
County	_____	Amount Previously Paid	_____
State	_____	Balance Due - Final Payment	_____

The undersigned hereby acknowledges that the above Balance Due when paid represents payment in full for all labor, materials, etc., furnished by the below named Contractor or Supplier in connection with its work on the above Project in accordance with the Contract.

In consideration of the amounts and sums previously received, and the payment of \$_____ being the full and Final Payment amount due, the below named Contractor or Supplier does hereby waive and release the Owner from any and all claims and liens and rights of liens upon the premises described above, and upon improvements now or hereafter thereon, and upon the monies or other considerations due or to become due from the Owner or from any other person, firm or corporation, said claims, liens and rights of liens being on account of labor, services, materials, fixtures or apparatus heretofore furnished by the below named Contractor or Supplier to the Project. The premises as to which said claims and liens are hereby released are identified as follows: _____

The undersigned further represents and warrants that he/she is duly authorized and empowered to sign and execute this waiver on his/her own behalf and on behalf of the company or business for which he/she is signing; that it has properly performed all work and furnished all materials of the specified quality per plans and specifications and in a good and workmanlike manner, fully and completely; that it has paid for all the labor, materials, equipment and services that it has used or supplied, that it has no other outstanding and unpaid applications, invoices, retentions, holdbacks, expenses employed in the prosecution of work, chargebacks or unbilled work or materials against the Owner as of the date of the aforementioned last and final payment application; and that any materials which have been supplied or incorporated into the above premises were either taken from its fully-paid or open stock or were fully paid for and supplied on the last and final payment application or invoice.

The undersigned further agrees to defend, indemnify and hold harmless the Owner for any losses or expenses (including without limitation reasonable attorneys' fees) should any such claim, lien or right of lien be asserted by the below named Contractor or Supplier or by any of its or their laborers, material persons or subcontractors.

In addition, for and in consideration of the amounts and sums received, the below named Contractor or Supplier hereby waives, releases and relinquishes any and all claims, rights or causes of action in equity or law whatsoever arising out of through or under the above mentioned Contract and the performance of work pursuant thereto.

The below named Contractor or Supplier further guarantees that all portions of the work furnished and installed are in accordance with the Contract and that the terms of the Contract with respect to this guarantee will remain in effect for the period specified in said Contract.

Sworn to before me this _____ Day of _____ 20__

_____ Corporation or Business Name

By: _____

Title: _____

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GUARANTEE

Date: _____

In accordance with plans and specifications and the terms and conditions of our contract with Cornell University dated _____, we hereby guarantee the _____ as found in the specifications for _____, Ithaca, New York to be free
(Project Title)
from defects in materials and workmanship for the period of ____ year(s) from _____, the date of acceptance by the Owner.
(Date)

(COMPANY)

By: _____

Title: _____

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MWBE/SDVOB Utilization Plan

Project No. _____ Bid Date: Click here to enter a date. Agreement/Contract Value: _____
 Contractor: _____ Primary Contact: _____
 Address: _____ City: _____ State: _____ Zip Code: _____
 Phone Number: _____ Fax Number: _____ E-Mail: _____

GOALS: MBE 4.47% WBE 2.75% SDVOB 6.00% Campus: _____

SUBCONTRACTOR	FEDERAL ID #	DOLLAR VALUE OF CONTRACT OR PURCHASE ORDER	DESCRIPTION OF WORK OR SUPPLIES	SUBCONTRACTOR/SUPPLIER SCHEDULE	
				START DATE	COMPLETION DATE
Company Name: _____ Street Address: _____ Contact Name: _____ E-Mail Address: _____ Check One: MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVOB <input type="checkbox"/>				Click here to enter a date.	Click here to enter a date.
Company Name: _____ Street Address: _____ Contact Name: _____ E-Mail Address: _____ Check One: MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVOB <input type="checkbox"/>				Click here to enter a date.	Click here to enter a date.
Company Name: _____ Street Address: _____ Contact Name: _____ E-Mail Address: _____ Check One: MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVOB <input type="checkbox"/>				Click here to enter a date.	Click here to enter a date.
Company Name: _____ Street Address: _____ Contact Name: _____ E-Mail Address: _____ Check One: MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVOB <input type="checkbox"/>				Click here to enter a date.	Click here to enter a date.

In accordance with the SUNY Contract Documents and Executive Law Article 15-A, my firm seriously expects to use the NYS certified MBE/WBE certified firms listed above. The Contractor shall immediately notify and request approval prior to any changes to this plan from the University-wide MWBE Program Office.

NAME: _____ TITLE: _____ COMPANY OFFICER'S SIGNATURE _____ DATE: _____
Click here to enter a date.

APPROVED: DEFICIENT: MWBE PROGRAM COORDINATOR: _____ DATE: _____

**SUMMARY OF BID ACTIVITY WITH MBE, WBE AND SDVOB
SUBCONTRACTORS AND VENDORS**

Please print or type all information, except where a signature is required.

PROJECT: _____

Name of Prime Contract Bidder:

Address (Street, City, State and Zip Code):

Contact Person (Name, Title and Telephone Number):

MBE, WBE and SDVOB Subcontractor/Vendor (Indicate which)	Trade	Item/ Date	Bid Submitted: Amount Date	Award Status Amount	Date of Elimination

EXPLANATION OF ELIMINATION: Include meetings held for negotiation, etc.
(Use additional sheet if necessary)

OFFICER OF FIRM:
Name and Title: _____ Date: _____
Signature: _____

LABOR RATE BREAKDOWN

PROJECT TITLE:

CONTRACT NO.

CONTRACTOR:

TRADE:

EFFECTIVE DATE:

EXPIRATION DATE:

Base Hourly Rate:

\$

Payroll Taxes and Insurance

% per Hour

F.I.C.A.

Federal Unemployment (*Base on 1500 hours of work*)

State Unemployment (*Base on 1500 hours of work*)

* Worker's Compensation

* Bodity Injury & Property Damage

Disability

TOTAL

%

Payroll Taxes and Insurance Rates: Base Rate (x) Total % =

\$

* Rates are net Contractor cost after premium discounts and experience modifications have been applied against manual rate.

Supplemental Benefits

\$ per Hour

Vacation

Health & Welfare

Pension

Annuity

Education / Training

Industry

Total Hourly Fringe Benefits

\$

Hourly Labor Rate: Base Rate, Taxes/Insurance and Fringe Benefits

\$

Adjustment for a composite rate which includes apprentices:

\$

CONTRACTOR'S CERTIFICATION

I certify that the labor rates, insurance enumerations, labor fringe enumerations and expenses are correct and in accordance with actual and true cost incurred.

Signature of Authorized Representative:

Print Name:

Print Title:

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STORED MATERIALS INVOICING
DOCUMENTATION

PROJECT TITLE:

CONTRACTOR:

SUBCONTRACTOR:

CONTRACT NO.

REASON FOR REQUEST:

APPLICATION FOR PAYMENT NO. _____

DATE:

1 **Material Identification**

Description:

Quantity:

Provide Specific Location of Materials Stored:

2 **Material Value**

Attach an Invoice or Quantified Statement of Value.

\$ _____

3 **Certificate of Insurance**

Attach a Certificate of Insurance for the above specified materials. Certificate shall name "Cornell University" as a loss payee with respect to the specified materials.

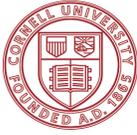
4 **Transfer of Title**

The Contractor hereby agrees to transfer complete ownership of all listed materials to Cornell University at the time payment is made to Contractor for the above referenced Application for Payment. The Contractor remains responsible for all contractual requirements for the above listed materials including complete installation and providing of all warranties.

Signed:

Date:

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Cornell University

**Contractor Performance
Evaluation**

Project Information

Project Name: _____ Date Of Evaluation _____
Project Number _____ Evaluators; _____
Project Team _____
Campus _____
Project Start Date _____ Substantial Completion _____

Contractor _____ Prequalification Status _____
Original Contract Amount _____ Total Change Order Amount _____
Contractor Project Manager _____ Initial Evaluation _____
Contractor Superintendent _____ Final Evaluation _____

Type Of Contract

Prime Contractor ___ Subcontractor ___ Construction Manager ___

Project Comments/Description

Performance Evaluation

Please give one rating for each category. Add comments as required to justify your rating.

Fails to Achieve Expectation	Needs Improvement	Fully Achieve Expectation	Freq Exceeds Expectation	Cons Exceed Expectation
1	2	3	4	5

1 Quality of Workmanship

Rate this contractor's performance in regards to quality of work

- a. Compliance with project drawings and specifications
- b. Workmanship quality and accuracy
- c. Tools- quality and sufficient quantity
- d. Equipment - sufficient quantity and operating condition
- e. Quality of jobsite craft personnel

Comments:

2 Scheduling/Productivity

Rate this contractor's performance with regard to producing and meeting contract schedules and milestones

- a. Project schedule quality and completeness
- b. Controlling of project schedule
- c. Manpower allocation for maintaining schedule
- d. Material deliveries to support project schedule
- e. Ability to meet substantial completion date and project milestones
- f. Productivity of work force
- g. Ability to deal with added work and unforeseen issues.

Comments:

3 Subcontractor Management

Rate this contractor's ability, effort and success in managing and coordinating subcontractors (if no subcontractors rate overall management performance)

Comments:

3A Major subcontractor performance(score not added in final Contractor Evaluation)

For contractor information only

- a. Plumbing Contractor overall Performance

Comments:

- b. HVAC Contractor overall Performance

Comments:

- c. Electrical Contractor overall Performance

Comments:

Fails to Achieve Expectation	Needs Improvement	Fully Achieve Expectation	Freq Exceeds Expectation	Cons Exceed Expectation
1	2	3	4	5

4 MBE/WBE Participation

Rate this contractor's MBE/WBE solicitation effort and participation for this project for, Project Team, Subcontractors, Material Vendors

Comments:

5 Safety

Rate this contractor's performance in regards to project safety

- a. Timely submission of site specific safety program
- b. Knowledge of OSHA standards
- c. Implementation of safety rules and regulations
- d. Promotion and creation of safety awareness
- e. Daily overall housekeeping
- f. Safety record
- g. Response to safety concerns
- h. Awareness of public safety

Comments:

6 Contract Administration

Rate this contractor's performance in regards to contract administration as per criteria below

- a. Timely submission of complete and correct documentation required for insurance and bond
- b. Change order processing
- c. Timely submission of RFI's, Shop Drawings, and change orders
- d. Subcontractor payments made promptly
- e. Timely submission of complete and correct payment applications
- f. Quality of paperwork

Comments:

7 Working Relationships

Rate this contractor's working relationships with other parties (Cornell, Design Team, subcontractors, ect.)

Comments:

Fails to Achieve Expectation	Needs Improvement	Fully Achieve Expectation	Freq Exceeds Expectation	Cons Exceed Expectation
1	2	3	4	5

8 Supervisory Personnel Rating

Rate the overall performance of this contractor's on site supervisory personnel and project management staff

Comments:

9 Contract Close-Out

Rate this contractor's overall ability to efficiently close out the project

- a. Timely completion of all punchlist items
- b. Timely resolution of all outstanding change orders
- c. Timely submission of all close out documents (O&M's, As-Builts, warranties, final releases and consent of surety)
- d. Quality of close out documentation and timely completion of any outstanding audit questions

Comments:

Summary Sheet

Project: _____

Contractor: _____

Performance Categories		Rating Per Category	Weight %	Scoring
1	Quality of Workmanship	0	15.00%	0
2	Scheduling	0	10.00%	0
3	Subcontractor Management	0	10.00%	0
4	MBE/WBE Participation	0	10.00%	0
5	Safety	0	10.00%	0
6	Contract Administration	0	10.00%	0
7	Working Relationships	0	10.00%	0
8	On Site Supervisory Personnel Rating	0	18.00%	0
9	Contract Close Out	0	7.00%	0

Over All Rating

Rating Reference	
Fails to achieve expectation	1
Needs improvement	2
Fully achieves expectation	3
Frequently exceeds expectation	4
Consistently exceeds expectatio	5

OWNER COMMENTS:

OWNER COMMENTS on 3A Ratings:

CONTRACTOR COMMENTS:

(To be completed by Contractor prior to Owner/Contractor discussion meeting)

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Standard Contract Clauses

SCHEDULE A

State University of New York

June 21, 2023

The parties to the attached contract, license, lease, amendment or other agreement of any kind (hereinafter, "contract") agree to be bound by the following clauses which are hereby made a part of the contract (the word "Contractor" herein refers to any party other than the State or State University of New York, whether a Contractor, licensor, licensee, lessor, lessee or any other party; the State University of New York shall hereinafter be referred to as "SUNY"):

1. EXECUTORY CLAUSE. In accordance with Section 41 of the State Finance Law, the State shall have no liability under this contract to the Contractor or to anyone else beyond funds appropriated and available for this contract.

2. PROHIBITION AGAINST ASSIGNMENT. In accordance with Section 138 of the State Finance Law, this contract may not be assigned by the Contractor or its right, title or interest therein assigned, transferred, conveyed, sublet or otherwise disposed of without the State's previous written consent, and attempts to do so are null and void. Notwithstanding the foregoing, such prior written consent of an assignment of a contract let pursuant to Article XI of the State Finance Law may be waived at the discretion of SUNY and with the concurrence of the State Comptroller where the original contract was subject to the State Comptroller's approval, where the assignment is due to a reorganization, merger or consolidation of the Contractor's business entity or enterprise. SUNY retains its right to approve an assignment and to require that any Contractor demonstrate its responsibility to do business with SUNY. The Contractor may, however, assign its right to receive payments without SUNY's prior written consent unless this contract concerns Certificates of Participation pursuant to Article 5-A of the State Finance Law.

3. COMPTROLLER'S APPROVAL. (a) In accordance with Section 112 of the State Finance Law, the State Comptroller's approval is required for the following contracts: (i) goods, services, construction, and construction-related services for State University hospital or healthcare facilities which exceed \$150,000; (ii) purchases utilizing an Office of General Services (OGS) centralized contract which exceed \$200,000 (iii) goods, services, construction, and construction-related services not described in (i) or (ii) and which exceed \$75,000;

(b) If this contract exceeds the threshold amounts listed above in Paragraph 3(a), or, if this is an amendment for any amount to a contract which, as so amended, exceeds said threshold amounts, or if, by this contract, the State agrees to give something other than money when the value or reasonably estimated value of such consideration exceeds \$25,000, it shall not be valid, effective or binding upon the State, and the State shall bear no liability, until it has been approved by the State Comptroller and filed in his or her office.

4. WORKERS' COMPENSATION BENEFITS. In accordance with Section 142 of the State Finance Law, this contract shall be void and of no force and effect unless the Contractor shall provide and maintain coverage during the life of this contract for the benefit of such employees as are required to be covered by the provisions of the Workers' Compensation Law.

5. NON-DISCRIMINATION REQUIREMENTS. To the extent required by Article 15 of the Executive Law (also known as the Human Rights Law) and all other State and Federal statutory and constitutional non-discrimination provisions, the Contractor will not discriminate against any employee or applicant for employment, nor subject any individual to harassment, because of age, race, creed, color, national origin, citizenship or immigration status, sexual orientation, gender identity or expression, military status, sex, disability, predisposing genetic characteristics, familial status, marital status, or domestic violence victim status or because the individual has opposed any practices forbidden under the Human Rights Law or has filed a complaint, testified, or assisted in any proceeding under the Human Rights Law. Furthermore, in accordance with Section 220-e of the Labor Law, if this is a contract for the construction, alteration or repair of any public building or public work or for the manufacture, sale or distribution of materials, equipment or supplies, and to the extent that this contract shall be performed within the State of New York, Contractor agrees that neither it nor its subcontractors shall, by reason of race, creed, color, disability, sex, or national origin: (a) discriminate in hiring against any New York State citizen who is qualified and available to perform the work; or (b) discriminate against or intimidate any employee hired for the performance of work under this contract. If this is a building service contract as defined in Section 230 of the Labor Law, then, in accordance with Section 239 thereof, Contractor agrees that neither it nor its subcontractors shall by reason of race, creed, color, national origin, age, sex or disability: (a) discriminate in hiring against any New York State citizen who is qualified and available to perform the work; or (b) discriminate against or intimidate any employee hired for the performance of work under this contract. Contractor is subject to fines of \$50.00 per person per day for any violation of Section 220-e or Section 239 as well as possible termination of this contract and forfeiture of all moneys due hereunder for a second or subsequent violation

6. WAGE AND HOURS PROVISIONS. If this is a public work contract covered by Article 8 of the Labor Law or a building service contract covered by Article 9 thereof, neither Contractor's employees nor the employees of its subcontractors may be required or permitted to work more than the number of hours or days stated in said statutes, except as otherwise provided in the Labor Law and as set forth in prevailing wage and supplement schedules issued by the State Labor Department. Furthermore, Contractor and its subcontractors must pay at least the prevailing wage rate and pay or provide the prevailing supplements, including the premium rates for overtime pay, as determined by the State Labor Department in accordance with the Labor Law. Additionally, effective April 28, 2008, if this is a public work contract covered by Article 8 of the Labor Law, the Contractor understands and agrees that the filing of payrolls in a manner consistent with Subdivision 3-a of Section 220 of the Labor Law shall be a condition precedent to payment by the State of any State-approved sums due and owing for work done upon the project.

7. NON-COLLUSIVE BIDDING CERTIFICATION. In accordance with Section 139-d of the State Finance Law, if this contract was awarded based upon the submission of competitive bids, Contractor affirms, under penalty of perjury, that its bid was arrived at independently and without collusion aimed at restricting competition. Contractor further affirms that, at the time Contractor submitted its bid, an authorized and responsible person executed and delivered to SUNY a non-collusive bidding certification on Contractor's behalf.

8. INTERNATIONAL BOYCOTT PROHIBITION. In accordance with Section 220-f of the Labor Law and Section 139-h of the State Finance Law, if this contract exceeds \$5,000, the Contractor agrees, as a material condition of the contract, that neither the Contractor nor any substantially owned or affiliated person, firm, partnership or corporation has participated, is participating, or shall participate in an international boycott in violation of the federal Export Administration Act of 1979 (50 USC App. Sections 2401 *et seq.*) or regulations thereunder. If such Contractor, or any of the aforesaid affiliates of Contractor, is convicted or is otherwise found to have violated said laws or regulations upon the final determination of the United States Commerce Department or any other appropriate agency of the United States subsequent to the contract's execution, such contract, amendment or modification thereto shall be rendered forfeit and void. The Contractor shall so notify the State Comptroller within five (5) business days of such conviction, determination or disposition of appeal (2 NYCRR § 105.4).

9. SET-OFF RIGHTS. The State shall have all of its common law, equitable and statutory rights of set-off. These rights shall include, but not be limited to, the State's option to withhold for the purposes of set-off any moneys due to the Contractor under this contract up to any amounts due and owing to the State with regard to this contract, any other contract with any State department or agency, including any contract for a term commencing prior to the term of this contract, plus any amounts due and owing to the State for any other reason including, without limitation, tax delinquencies, fee delinquencies or monetary penalties relative thereto. The State shall exercise its set-off rights in accordance with normal State practices including, in cases of set-off pursuant to an audit, the finalization of such audit by SUNY, its representatives, or the State Comptroller.

10. RECORDS. The Contractor shall establish and maintain complete and accurate books, records, documents, accounts and other evidence directly pertinent to performance under this contract (hereinafter, collectively, "the Records"). The Records must be kept for the balance of the calendar year in which they were made and for six (6) additional years thereafter. The State Comptroller, the Attorney General and any other person or entity authorized to conduct an examination, as well as SUNY and any other agencies involved in this contract, shall have access to the Records during normal business hours at an office of the Contractor within the State of New York or, if no such office is available, at a mutually agreeable and reasonable venue within the State, for the term specified above for the purposes of inspection, auditing and copying. SUNY shall take reasonable steps to protect from public disclosure any of the Records which are exempt from disclosure under Section 87 of the Public Officers Law (the "Statute") provided that: (i) the Contractor shall timely inform an appropriate SUNY official, in writing, that said Records should not be disclosed; and (ii) said Records shall be sufficiently identified; and (iii) designation of said Records as exempt under the Statute is reasonable. Nothing contained herein shall diminish, or in any way adversely affect, SUNY's or the State's right to discovery in any pending or future litigation.

11. IDENTIFYING INFORMATION AND PRIVACY NOTIFICATION.

(a) Identification Number(s). Every invoice or New York State Claim for Payment submitted to SUNY by a payee, for payment for the sale of goods or services or for transactions (e.g., leases, easements, licenses, etc.) related to real or personal property must include the payee's identification number. The number is any or all of the following: (i) the payee's Federal employer identification number, (ii) the payee's Federal social security number, and/or (iii) the payee's Vendor Identification Number assigned by the Statewide Financial System. Failure to include such number or numbers may delay payment. Where the payee does not have such number or numbers, the payee, on its invoice or Claim for Payment, must give the reason or reasons why the payee does not have such number or numbers.

(b) Privacy Notification. (1) The authority to request the above personal information from a seller of goods or services or a lessor of real or personal property, and the authority to maintain such information, is found in Section 5 of the State Tax Law. Disclosure of this information by the seller or lessor to SUNY or the State is mandatory. The principal purpose for which the information is collected is to enable the State to identify individuals, businesses and others who have been delinquent in filing tax returns or may have understated their tax liabilities and to generally identify persons affected by the taxes administered by the Commissioner of Taxation and Finance. The information will be used for tax administration purposes and for any other purpose authorized by law. (2) The personal information is requested by the purchasing unit of SUNY contracting to purchase the goods or services or lease the real or personal property covered by this contract or lease. The information is maintained in the Statewide Financial System by the Vendor Management Unit within the Bureau of State Expenditures, Office of the State Comptroller, 110 State Street, Albany, New York 12236.

12. EQUAL EMPLOYMENT OPPORTUNITIES FOR MINORITIES AND WOMEN.

In accordance with Section 312 of the Executive Law and 5 NYCRR Part 143, if this contract is: (i) a written agreement or purchase order instrument, providing for a total expenditure in excess of \$25,000.00, whereby a contracting agency is committed to expend or does expend funds in return for labor, services, supplies, equipment, materials or any combination of the foregoing, to be performed for, or rendered or furnished to the contracting agency; or (ii) a written agreement in excess of \$100,000.00 whereby a contracting agency is committed to expend or does expend funds for the acquisition, construction, demolition, replacement, major repair or renovation of real property and improvements thereon; or (iii) a written agreement in excess of \$100,000.00 whereby the owner of a State assisted housing project is committed to expend or does expend funds for the acquisition, construction, demolition, replacement, major repair or renovation of real property and improvements thereon for such project, then the following shall apply and by signing this agreement the Contractor certifies and affirms that it is Contractor's equal employment opportunity policy that:

(a) The Contractor will not discriminate against employees or applicants for employment because of race, creed, color, national origin, sex, age, disability or marital status, shall make and document its conscientious and active efforts to employ and utilize minority group members and women its workforce on State contracts and will undertake or continue existing programs of affirmative action to ensure that minority group members and women are afforded equal employment opportunities without discrimination. Affirmative action shall mean recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff, or termination and rates of pay or other forms of compensation;

(b) at SUNY's request, Contractor shall request each employment agency, labor union, or authorized representative of workers with which it has a collective bargaining or other agreement or understanding, to furnish a written statement that such employment agency, labor union or representative will not discriminate on the basis of race, creed, color, national origin, sex, age, disability or marital status and that such union or representative will affirmatively cooperate in the implementation of the Contractor's obligations herein; and

(c) the Contractor shall state, in all solicitations or advertisements for employees, that, in the performance of the State contract, all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability or marital status.

Contractor will include the provisions of "a," "b," and "c" above, in every subcontract over \$25,000.00 for the construction, demolition, replacement, major repair, renovation, planning or design of real property and improvements thereon (the "Work") except where the Work is for the beneficial use of the Contractor. Section 312 does not apply to: (i) work, goods or services unrelated to this contract; or (ii) employment outside New York State. The State shall consider compliance by a contractor or sub-contractor with the requirements of any federal law concerning equal employment opportunity which effectuates the purpose of this clause. SUNY shall determine whether the imposition of the requirements of the provisions hereof duplicate or conflict with any such federal law and if such duplication or conflict exists, SUNY shall waive the applicability of Section 312 to the extent of such duplication or conflict. Contractor will comply with all duly promulgated and lawful rules and regulations of the Department of Economic Development's Division of Minority and Women's Business Development pertaining hereto.

13. **CONFLICTING TERMS.** In the event of a conflict between the terms of the contract (including any and all attachments thereto and amendments thereof) and the terms of this Schedule A, the terms of this Schedule A shall control.

14. **GOVERNING LAW.** This contract shall be governed by the laws of the State of New York except where the Federal supremacy clause requires otherwise.

15. **LATE PAYMENT.** Timeliness of payment and any interest to be paid to Contractor for late payment shall be governed by Article 11-A of the State Finance Law to the extent required by law.

16. **NO ARBITRATION.** Disputes involving this contract, including the breach or alleged breach thereof, may not be submitted to binding arbitration (except where statutorily authorized) but must, instead, be heard in a court of competent jurisdiction of the State of New York.

17. **SERVICE OF PROCESS.** In addition to the methods of service allowed by the State Civil Practice Law & Rules ("CPLR"), Contractor hereby consents to service of process upon it by registered or certified mail, return receipt requested. Service hereunder shall be complete upon Contractor's actual receipt of process or upon the State's receipt of the return thereof by the United States Postal Service as refused or undeliverable. Contractor must promptly notify the State, in writing, of each and every change of address to which service of process can be made. Service by the State to the last known address shall be sufficient. Contractor will have thirty (30) calendar days after service hereunder is complete in which to respond.

18. **PROHIBITION ON PURCHASE OF TROPICAL HARDWOODS.** The Contractor certifies and warrants that all wood products to be used under this contract award will be in accordance with, but not limited to, the specifications and provisions of State Finance Law §165 (Use of Tropical Hardwoods), which prohibits purchase and use of tropical hardwoods, unless specifically exempted, by the State or any governmental agency or political subdivision or public benefit corporation. Qualification for an exemption under this law will be the responsibility of the contractor to establish to meet with the approval of the State.

In addition, when any portion of this contract involving the use of woods, whether supply or installation, is to be performed by any subcontractor, the prime Contractor will indicate and certify in the submitted bid proposal that the subcontractor has been informed and is in compliance with specifications and provisions regarding use of tropical hardwoods as detailed in Section 165 of the State Finance Law. Any such use must meet with the approval of the State, otherwise, the bid may not be considered responsive. Under bidder certifications, proof of qualification for exemption will be the responsibility of the Contractor to meet with the approval of the State.

19. **MACBRIDE FAIR EMPLOYMENT PRINCIPLES.** In accordance with the MacBride Fair Employment Principles (Chapter 807 of the Laws of 1992), the Contractor hereby stipulates that the Contractor either (a) has no business operations in Northern Ireland, or (b) shall take lawful steps in good faith to conduct any business operations in Northern Ireland in accordance with the

MacBride Fair Employment Principles (as described in Section 165 of the New York State Finance Law), and shall permit independent monitoring of compliance with such principles.

20. OMNIBUS PROCUREMENT ACT OF 1992.

It is the policy of New York State to maximize opportunities for the participation of New York State business enterprises, including minority and women-owned business enterprises as bidders, subcontractors and suppliers on its procurement contracts.

Information on the availability of New York State subcontractors and suppliers is available from:

NYS Department of Economic Development
Division for Small Business and Technology Development
625 Broadway
Albany, NY 12245
Telephone: 518-292-5100

A directory of certified minority and women-owned business enterprises is available from:

NYS Department of Economic Development
Division of Minority and Women's Business Development
633 Third Avenue 33rd Floor
New York, NY 10017
646-846-7364
email: mwbebusinessdev@esd.ny.gov
<https://ny.newnycontracts.com/FrontEnd/searchcertifieddirectory.asp>

The Omnibus Procurement Act of 1992 (Chapter 844 of the Laws of 1992, codified in State Finance Law § 139-i and Public Authorities Law § 2879(3)(n)-(p)) requires that by signing this bid proposal or contract, as applicable, Contractors certify that whenever the total bid amount is greater than \$1 million:

(a) The Contractor has made reasonable efforts to encourage the participation of New York State Business Enterprises as suppliers and subcontractors, including certified minority and women-owned business enterprises, on this project, and has retained the documentation of these efforts to be provided upon request to SUNY;

(b) The Contractor has complied with the Federal Equal Employment Opportunity Act of 1972 (P.L. 92-261), as amended;

(c) The Contractor agrees to make reasonable efforts to provide notification to New York State residents of employment opportunities on this project through listing any such positions with the Job Service Division of the New York State Department of Labor, or providing such notification in such manner as is consistent with existing collective bargaining contracts or agreements. The Contractor agrees to document these efforts and to provide said documentation to the State upon request; and

(d) The Contractor acknowledges notice that the State may seek to obtain offset credits from foreign countries as a result of this contract and agrees to cooperate with the State in these efforts.

21. **RECIPROCITY AND SANCTIONS PROVISIONS.** Bidders are hereby notified that if their principal place of business is located in a country, nation, province, state or political subdivision that penalizes New York State vendors, and if the goods or services they offer will be substantially produced or performed outside New York State, the Omnibus Procurement Act of 1994 and 2000 amendments (Chapter 684 and Chapter 383, respectively, codified in State Finance Law § 165(6) and Public Authorities Law § 2879(5)) require that they be denied contracts which they would otherwise obtain.

NOTE: As of May 2023, the list of discriminatory jurisdictions subject to this provision includes the states of South Carolina, Alaska, West Virginia, Wyoming, Louisiana and Hawaii.

22. **COMPLIANCE WITH BREACH NOTIFICATION AND DATA SECURITY LAWS.** Contractor shall comply with the provisions of the New York State Information Security Breach and Notification Act (General Business Law § 899-aa, § 899-bb, and State Technology Law § 208).

23. **COMPLIANCE WITH CONSULTANT DISCLOSURE LAW.** If this is a contract for consulting services, defined for purposes of this requirement to include analysis, evaluation, research, training, data processing, computer programming, engineering, environmental health and mental health services, accounting, auditing, paralegal, legal or similar services, then in accordance with Section 163(4)(g) of the State Finance Law (as amended by Chapter 10 of the Laws of 2006), the Contractor shall timely, accurately and properly comply with the requirement to submit an annual employment report for the contract to SUNY, the Department of Civil Service and the State Comptroller.

24. **PURCHASES OF APPAREL AND SPORTS EQUIPMENT.** In accordance with State Finance Law Section 165(7), SUNY may determine that a bidder on a contract for the purchase of apparel or sports equipment is not a responsible bidder as defined in State Finance Law Section 163 based on (a) the labor standards applicable to the manufacture of the apparel or sports equipment, including employee compensation, working conditions, employee rights to form unions and the use of child labor; or (b) bidder's failure to provide information sufficient for SUNY to determine the labor conditions applicable to the manufacture of the apparel or sports equipment.

25. **PROCUREMENT LOBBYING.** To the extent this contract is a "procurement contract" as defined by State Finance Law §§ 139-j and 139-k, by signing this contract the Contractor certifies

and affirms that all disclosures made in accordance with State Finance Law §§ 139-j and 139-k are complete, true and accurate. In the event such certification is found to be intentionally false or intentionally incomplete, the State may terminate the contract by providing written notification to the Contractor in accordance with the terms of the contract.

26. CERTIFICATION OF REGISTRATION TO COLLECT SALES AND COMPENSATING USE TAX BY CERTAIN STATE CONTRACTORS, AFFILIATES AND SUBCONTRACTORS. To the extent this contract is a contract as defined by Tax Law § 5-a, if the Contractor fails to make the certification required by Tax Law § 5-a or if during the term of the contract, the Department of Taxation and Finance or SUNY discovers that the certification, made under penalty of perjury, is false, then such failure to file or false certification shall be a material breach of this contract and this contract may be terminated, by providing written notification to the Contractor in accordance with the terms of the contract, if SUNY determines that such action is in the best interests of the State.

27. IRAN DIVESTMENT ACT. By entering into this contract, Contractor certifies in accordance with State Finance Law §165-a that it is not on the "Entities Determined to be Non-Responsive Bidders/Offerers pursuant to the New York State Iran Divestment Act of 2012" ("Prohibited Entities List") posted at: <https://ogs.ny.gov/iran-divestment-act-2012>.

Contractor further certifies that it will not utilize on this contract any subcontractor that is identified on the Prohibited Entities List. Contractor agrees that should it seek to renew or extend this contract, it must provide the same certification at the time the contract is renewed or extended.

Contractor also agrees that any proposed Assignee of this contract will be required to certify that it is not on the Prohibited Entities List before the contract assignment will be approved by the State.

During the term of the contract, should SUNY receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, SUNY will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then SUNY shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, imposing sanctions, seeking compliance, recovering damages, or declaring the Contractor in default.

SUNY reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

28. ADMISSIBILITY OF REPRODUCTION OF CONTRACT. Notwithstanding the best evidence rule or any other legal principle or rule of evidence to the contrary, the Contractor acknowledges and agrees that it waives any and all objections to the admissibility into evidence at any court proceeding or to the use at any examination before trial of an electronic reproduction of this contract, in the form approved by the State Comptroller, if such approval was required, regardless of whether the original of said contract is in existence.

THE FOLLOWING PROVISIONS SHALL APPLY ONLY TO THOSE CONTRACTS TO WHICH A HOSPITAL OR OTHER HEALTH SERVICE FACILITY IS A PARTY

29. Notwithstanding any other provision in this contract, the hospital or other health service facility remains responsible for insuring that any service provided pursuant to this contract complies with all pertinent provisions of Federal, state and local statutes, rules and regulations. In the foregoing sentence, the word "service" shall be construed to refer to the health care service rendered by the hospital or other health service facility.

30. (a) In accordance with the 1980 Omnibus Reconciliation Act (Public Law 96-499), Contractor hereby agrees that until the expiration of four years after the furnishing of services under this agreement, Contractor shall make available upon written request to the Secretary of Health and Human Services, or upon request, to the Comptroller General of the United States or any of their duly authorized representatives, copies of this contract, books, documents and records of the Contractor that are necessary to certify the nature and extent of the costs hereunder.

(b) If Contractor carries out any of the duties of the contract hereunder, through a subcontract having a value or cost of \$10,000 or more over a twelve-month period, such subcontract shall contain a clause to the effect that, until the expiration of four years after the furnishing of such services pursuant to such subcontract, the subcontractor shall make available upon written request to the Secretary of Health and Human Services or upon request to the Comptroller General of the United States, or any of their duly authorized representatives, copies of the subcontract and books, documents and records of the subcontractor that are necessary to verify the nature and extent of the costs of such subcontract.

(c) The provisions of this section shall apply only to such contracts as are within the definition established by the Health Care Financing Administration, as may be amended or modified from time to time.

31. Hospital Retained Authority: Hospital Retained Authority: The Hospital retains direct, independent authority over the appointment and/or dismissal, in its sole discretion, of the facility's management level employees (including but not limited to, the Facility/Service Administrator/Director, the Medical Director, the Director of Nursing, the Chief Executive Officer, the Chief Financial Officer and the Chief Operating Officer) and all licensed or certified health care staff. The Hospital retains the right to adopt and approve, at its sole discretion, the facility's operating and capital budgets. The Hospital retains independent control over and physical possession of the facility's books and records. The Hospital retains independent control over and physical possession of the facility's operating policies and procedures. The Hospital retains full authority and responsibility for, and control over, the operations and management of the facility. The Hospital retains the right and authority to independently adopt, approve and enforce, in its sole discretion, policies affecting the facility's delivery of health care services. The Hospital retains the right to independently adopt, approve and enforce, at its sole discretion, the disposition of assets and authority to incur debts. The Hospital retains the right to approve, at its sole discretion, contracts for administrative services, management and/or clinical services. The Hospital retains the right to approve, at its sole discretion, any facility debt. The Hospital retains the right to approve, at its sole discretion, settlements of administrative proceeding or litigation to which the facility is a party. No powers specifically reserved to the Hospital may be delegated to, or shared by, the Contractor or any other person. In addition, if there is any disagreement between the parties to this Agreement regarding control between the Hospital and the Contractor, the terms of this Section shall control.

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New York State Vendor Responsibility

Cornell University recommends that vendors file the required Vendor Responsibility Questionnaire online via the New York State VendRep System. To enroll in and use the New York State VendRep System, see the VendRep System Instructions available at http://www.osc.state.ny.us/vendrep/vendor_index.htm.

or go directly to the VendRep System online at <https://portal.osc.state.ny.us>.

Vendors must provide their New York State Vendor Identification Number when enrolling. To request assignment of a Vendor ID or for VendRep System assistance, contact the Office of the State Comptroller's Help Desk at 866-370-4672 or 518-408-4672 or by email at ciohelpdesk@osc.state.ny.us.

When enrolled in the VendRep System, your company will be able to:

- Find out if your new contract or change order is being reviewed by OSC and if it has been approved (or non-approved) – you can know the very next business day.
- Complete your CCA-2 online once for multiple State agencies to view. If your company bids on multiple State contracts, or submits bids to multiple State agencies, you won't need to submit multiple questionnaires.
- Revise as needed by updating only relevant responses, easily view the entire questionnaire and re-certify with just a few simple keystrokes.
- Attach documents in response to most questions.

Vendors opting to complete and submit a paper questionnaire can obtain the appropriate questionnaire from the VendRep website: www.osc.state.ny.us/vendrep

or may contact the Facilities Contracts Office (607-255-3982) or the Office of the State Comptroller's Help Desk for a copy of the paper form.

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**NEW YORK STATE DEPARTMENT OF LABOR
PREVAILING WAGE RATES**

FOR

RENOVATE 2ND – 5TH FLOOR AT KING-SHAW HALL

**CORNELL UNIVERSITY
ITHACA, NEW YORK**



Kathy Hochul, Governor

Roberta Reardon, Commissioner

Cornell University
Breanna Brann, Contracts Specialist
121 Humphreys Service Building
Ithaca NY 14853

Schedule Year 2024 through 2025
Date Requested 02/19/2025
PRC# 2025002098

Location King-Shaw Hall
Project ID# eB #12775
Project Type Renovate 2nd - 5th Floor at King-Shaw Hall

PREVAILING WAGE SCHEDULE FOR ARTICLE 8 PUBLIC WORK PROJECT

Attached is the current schedule(s) of the prevailing wage rates and prevailing hourly supplements for the project referenced above. A unique Prevailing Rate Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2024 through June 2025. All updates, corrections, posted on the 1st business day of each month, and future copies of the annual determination are available on the Department's website www.labor.ny.gov. Updated PDF copies of your schedule can be accessed by entering your assigned PRC# at the proper location on the website.

It is the responsibility of the contracting agency or its agent to annex and make part, the attached schedule, to the specifications for this project, when it is advertised for bids and /or to forward said schedules to the successful bidder(s), immediately upon receipt, in order to insure the proper payment of wages.

Please refer to the "General Provisions of Laws Covering Workers on Public Work Contracts" provided with this schedule, for the specific details relating to other responsibilities of the Department of Jurisdiction.

Upon completion or cancellation of this project, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

NOTICE OF COMPLETION / CANCELLATION OF PROJECT

Date Completed: _____ Date Cancelled: _____

Name & Title of Representative: _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12240

General Provisions of Laws Covering Workers on Article 8 Public Work Contracts

Introduction

The Labor Law requires public work contractors and subcontractors to pay laborers, workers, or mechanics employed in the performance of a public work contract not less than the prevailing rate of wage and supplements (fringe benefits) in the locality where the work is performed.

Responsibilities of the Department of Jurisdiction

A Department of Jurisdiction (Contracting Agency) includes a state department, agency, board or commission; a county, city, town or village; a school district, board of education or board of cooperative educational services; a sewer, water, fire, improvement and other district corporation; a public benefit corporation; and a public authority awarding a public work contract.

The Department of Jurisdiction (Contracting Agency) awarding a public work contract MUST obtain a Prevailing Rate Schedule listing the hourly rates of wages and supplements due the workers to be employed on a public work project. This schedule may be obtained by completing and forwarding a "Request for wage and Supplement Information" form (PW 39) to the Bureau of Public Work. The Prevailing Rate Schedule MUST be included in the specifications for the contract to be awarded and is deemed part of the public work contract.

Upon the awarding of the contract, the law requires that the Department of Jurisdiction (Contracting Agency) furnish the following information to the Bureau: the name and address of the contractor, the date the contract was let and the approximate dollar value of the contract. To facilitate compliance with this provision of the Labor Law, a copy of the Department's "Notice of Contract Award" form (PW 16) is provided with the original Prevailing Rate Schedule.

The Department of Jurisdiction (Contracting Agency) is required to notify the Bureau of the completion or cancellation of any public work project. The Department's PW 200 form is provided for that purpose.

Both the PW 16 and PW 200 forms are available for completion [online](#).

Hours

No laborer, worker, or mechanic in the employ of a contractor or subcontractor engaged in the performance of any public work project shall be permitted to work more than eight hours in any day or more than five days in any week, except in cases of extraordinary emergency. The contractor and the Department of Jurisdiction (Contracting Agency) may apply to the Bureau of Public Work for a dispensation permitting workers to work additional hours or days per week on a particular public work project.

Wages and Supplements

The wages and supplements to be paid and/or provided to laborers, workers, and mechanics employed on a public work project shall be not less than those listed in the current Prevailing Rate Schedule for the locality where the work is performed. If a prime contractor on a public work project has not been provided with a Prevailing Rate Schedule, the contractor must notify the Department of Jurisdiction (Contracting Agency) who in turn must request an original Prevailing Rate Schedule from the Bureau of Public Work. Requests may be submitted by: mail to NYSDOL, Bureau of Public Work, State Office Bldg. Campus, Bldg. 12, Rm. 130, Albany, NY 12226; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website www.labor.ny.gov.

Upon receiving the original schedule, the Department of Jurisdiction (Contracting Agency) is REQUIRED to provide complete copies to all prime contractors who in turn MUST, by law, provide copies of all applicable county schedules to each subcontractor and obtain from each subcontractor, an affidavit certifying such schedules were received. If the original schedule expired, the contractor may obtain a copy of the new annual determination from the NYSDOL website www.labor.ny.gov.

The Commissioner of Labor makes an annual determination of the prevailing rates. This determination is in effect from July 1st through June 30th of the following year. The annual determination is available on the NYSDOL website www.labor.ny.gov.

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. As per Article 6 of the Labor law, contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemporaneous, true, and accurate payroll records. At a minimum, payrolls must show the following information for each person employed on a public work project: Name, Address, Last 4 Digits of Social Security Number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

The filing of payrolls to the Department of Jurisdiction is a condition of payment. Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury. The Department of Jurisdiction (Contracting Agency) shall collect, review for facial validity, and maintain such payrolls.

In addition, the Commissioner of Labor may require contractors to furnish, with ten (10) days of a request, payroll records sworn to as their validity and accuracy for public work and private work. Payroll records include, but are not limited to time cards, work description sheets, proof that supplements were provided, cancelled payroll checks and payrolls. Failure to provide the requested information within the allotted ten (10) days will result in the withholding of up to 25% of the contract, not to exceed \$100,000.00. If the contractor or subcontractor does not maintain a place of business in New York State and the amount of the contract exceeds \$25,000.00, payroll records and certifications must be kept on the project worksite.

The prime contractor is responsible for any underpayments of prevailing wages or supplements by any subcontractor.

All contractors or their subcontractors shall provide to their subcontractors a copy of the Prevailing Rate Schedule specified in the public work contract as well as any subsequently issued schedules. A failure to provide these schedules by a contractor or subcontractor is a violation of Article 8, Section 220-a of the Labor Law.

All subcontractors engaged by a public work project contractor or its subcontractor, upon receipt of the original schedule and any subsequently issued schedules, shall provide to such contractor a verified statement attesting that the subcontractor has received the Prevailing Rate Schedule and will pay or provide the applicable rates of wages and supplements specified therein. (See NYS Labor Laws, Article 8 . Section 220-a).

Determination of Prevailing Wage and Supplement Rate Updates Applicable to All Counties

The wages and supplements contained in the annual determination become effective July 1st whether or not the new determination has been received by a given contractor. Care should be taken to review the rates for obvious errors. Any corrections should be brought to the Department's attention immediately. It is the responsibility of the public work contractor to use the proper rates. If there is a question on the proper classification to be used, please call the district office located nearest the project. Any errors in the annual determination will be corrected and posted to the NYS DOL website on the first business day of each month. Contractors are responsible for paying these updated rates as well, retroactive to July 1st.

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. To the extent possible, the Department posts rates in its possession that cover periods of time beyond the July 1st to June 30th time frame covered by a particular annual determination. Rates that extend beyond that instant time period are informational ONLY and may be updated in future annual determinations that actually cover the then appropriate July 1st to June 30th time period.

Withholding of Payments

When a complaint is filed with the Commissioner of Labor alleging the failure of a contractor or subcontractor to pay or provide the prevailing wages or supplements, or when the Commissioner of Labor believes that unpaid wages or supplements may be due, payments on the public work contract shall be withheld from the prime contractor in a sufficient amount to satisfy the alleged unpaid wages and supplements, including interest and civil penalty, pending a final determination.

When the Bureau of Public Work finds that a contractor or subcontractor on a public work project failed to pay or provide the requisite prevailing wages or supplements, the Bureau is authorized by Sections 220-b and 235.2 of the Labor Law to so notify the financial officer of the Department of Jurisdiction (Contracting Agency) that awarded the public work contract. Such officer MUST then withhold or cause to be withheld from any payment due the prime contractor on account of such contract the amount indicated by the Bureau as sufficient to satisfy the unpaid wages and supplements, including interest and any civil penalty that may be assessed by the Commissioner of Labor. The withholding continues until there is a final determination of the underpayment by the Commissioner of Labor or by the court in the event a legal proceeding is instituted for review of the determination of the Commissioner of Labor.

The Department of Jurisdiction (Contracting Agency) shall comply with this order of the Commissioner of Labor or of the court with respect to the release of the funds so withheld.

Summary of Notice Posting Requirements

The current Prevailing Rate Schedule must be posted in a prominent and accessible place on the site of the public work project. The prevailing wage schedule must be encased in, or constructed of, materials capable of withstanding adverse weather conditions and be titled "PREVAILING RATE OF WAGES" in letters no smaller than two (2) inches by two (2) inches.

The "[Public Work Project](#)" notice must be posted at the beginning of the performance of every public work contract, on each job site.

Every employer providing workers. compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers. Compensation Board in a conspicuous place on the jobsite.

Every employer subject to the NYS Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers, notices furnished by the State Division of Human Rights.

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the NYS Department of Labor.

Apprentices

Employees cannot be paid apprentice rates unless they are individually registered in a program registered with the NYS Commissioner of Labor. The allowable ratio of apprentices to journeyworkers in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 12226 or by Fax to NYSDOL Apprenticeship Training (518) 457-7154. All requests for verification must include the name and social security number of the person for whom the information is requested.

The only conclusive proof of individual apprentice registration is written verification from the NYSDOL Apprenticeship Training Albany Central office. Neither Federal nor State Apprenticeship Training offices outside of Albany can provide conclusive registration information.

It should be noted that the existence of a registered apprenticeship program is not conclusive proof that any person is registered in that program. Furthermore, the existence or possession of wallet cards, identification cards, or copies of state forms is not conclusive proof of the registration of any person as an apprentice.

Interest and Penalties

In the event that an underpayment of wages and/or supplements is found:

- Interest shall be assessed at the rate then in effect as prescribed by the Superintendent of Banks pursuant to section 14-a of the Banking Law, per annum from the date of underpayment to the date restitution is made.
- A Civil Penalty may also be assessed, not to exceed 25% of the total of wages, supplements, and interest due.

Debarment

Any contractor or subcontractor and/or its successor shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with any state, municipal corporation or public body for a period of five (5) years when:

- Two (2) willful determinations have been rendered against that contractor or subcontractor and/or its successor within any consecutive six (6) year period.
- There is any willful determination that involves the falsification of payroll records or the kickback of wages or supplements.

Criminal Sanctions

Willful violations of the Prevailing Wage Law (Article 8 of the Labor Law) may be a felony punishable by fine or imprisonment of up to 15 years, or both.

Discrimination

No employee or applicant for employment may be discriminated against on account of age, race, creed, color, national origin, sex, disability or marital status.

No contractor, subcontractor nor any person acting on its behalf, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates (NYS Labor Law, Article 8, Section 220-e(a)).

No contractor, subcontractor, nor any person acting on its behalf, shall in any manner, discriminate against or intimidate any employee on account of race, creed, color, disability, sex, or national origin (NYS Labor Law, Article 8, Section 220-e(b)).

The Human Rights Law also prohibits discrimination in employment because of age, marital status, or religion.

There may be deducted from the amount payable to the contractor under the contract a penalty of \$50.00 for each calendar day during which such person was discriminated against or intimidated in violation of the provision of the contract (NYS Labor Law, Article 8, Section 220-e(c)).

The contract may be cancelled or terminated by the State or municipality. All monies due or to become due thereunder may be forfeited for a second or any subsequent violation of the terms or conditions of the anti-discrimination sections of the contract (NYS Labor Law, Article 8, Section 220-e(d)).

Every employer subject to the New York State Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers notices furnished by the State Division of Human Rights.

Workers' Compensation

In accordance with Section 142 of the State Finance Law, the contractor shall maintain coverage during the life of the contract for the benefit of such employees as required by the provisions of the New York State Workers' Compensation Law.

A contractor who is awarded a public work contract must provide proof of workers' compensation coverage prior to being allowed to begin work.

The insurance policy must be issued by a company authorized to provide workers' compensation coverage in New York State. Proof of coverage must be on form C-105.2 (Certificate of Workers' Compensation Insurance) and must name this agency as a certificate holder.

If New York State coverage is added to an existing out-of-state policy, it can only be added to a policy from a company authorized to write workers' compensation coverage in this state. The coverage must be listed under item 3A of the information page.

The contractor must maintain proof that subcontractors doing work covered under this contract secured and maintained a workers' compensation policy for all employees working in New York State.

Every employer providing worker's compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Unemployment Insurance

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the New York State Department of Labor.



Kathy Hochul, Governor

Roberta Reardon, Commissioner

Cornell University
Breanna Brann, Contracts Specialist
121 Humphreys Service Building
Ithaca NY 14853

Schedule Year 2024 through 2025
Date Requested 02/19/2025
PRC# 2025002098

Location King-Shaw Hall
Project ID# eB #12775
Project Type Renovate 2nd - 5th Floor at King-Shaw Hall

Notice of Contract Award

New York State Labor Law, Article 8, Section 220.3a requires that certain information regarding the awarding of public work contracts, be furnished to the Commissioner of Labor. One "Notice of Contract Award" (PW 16, which may be photocopied), **MUST** be completed for **EACH** prime contractor on the above referenced project.

Upon notifying the successful bidder(s) of this contract, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

Contractor Information

All information must be supplied

Federal Employer Identification Number: _____		
Name: _____		
Address: _____ _____		
City: _____	State: _____	Zip: _____
Amount of Contract: \$ _____	Contract Type:	
Approximate Starting Date: ____/____/____	<input type="checkbox"/> (01) General Construction	
Approximate Completion Date: ____/____/____	<input type="checkbox"/> (02) Heating/Ventilation	
	<input type="checkbox"/> (03) Electrical	
	<input type="checkbox"/> (04) Plumbing	
	<input type="checkbox"/> (05) Other : _____	

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12226

Social Security Numbers on Certified Payrolls:

The Department of Labor is cognizant of the concerns of the potential for misuse or inadvertent disclosure of social security numbers. Identity theft is a growing problem and we are sympathetic to contractors' concern regarding inclusion of this information on payrolls if another identifier will suffice.

For these reasons, the substitution of the use of the last four digits of the social security number on certified payrolls submitted to contracting agencies on public work projects is now acceptable to the Department of Labor. This change does not affect the Department's ability to request and receive the entire social security number from employers during its public work/ prevailing wage investigations.

Construction Industry Fair Play Act: Required Posting for Labor Law Article 25-B § 861-d

Construction industry employers must post the "Construction Industry Fair Play Act" notice in a prominent and accessible place on the job site. Failure to post the notice can result in penalties of up to \$1,500 for a first offense and up to \$5,000 for a second offense. The posting is included as part of this wage schedule. Additional copies may be obtained from the NYS DOL website, <https://dol.ny.gov/public-work-and-prevailing-wage>

If you have any questions concerning the Fair Play Act, please call the State Labor Department toll-free at 1-866-435-1499 or email us at: dol.misclassified@labor.ny.gov .

Worker Notification: (Labor Law §220, paragraph a of subdivision 3-a)

Effective June 23, 2020

This provision is an addition to the existing wage rate law, Labor Law §220, paragraph a of subdivision 3-a. It requires contractors and subcontractors to provide written notice to all laborers, workers or mechanics of the *prevailing wage and supplement rate* for their particular job classification *on each pay stub**. It also requires contractors and subcontractors to *post a notice* at the beginning of the performance of every public work contract *on each job site* that includes the telephone number and address for the Department of Labor and a statement informing laborers, workers or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her job classification. The required notification will be provided with each wage schedule, may be downloaded from our website www.labor.ny.gov or be made available upon request by contacting the Bureau of Public Work at 518-457-5589. *In the event the required information will not fit on the pay stub, an accompanying sheet or attachment of the information will suffice.

(12.20)

**To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND**

Budget Policy & Reporting Manual

B-610

Public Work Enforcement Fund

effective date December 7, 2005

1. Purpose and Scope:

This Item describes the Public Work Enforcement Fund (the Fund, PWEF) and its relevance to State agencies and public benefit corporations engaged in construction or reconstruction contracts, maintenance and repair, and announces the recently-enacted increase to the percentage of the dollar value of such contracts that must be deposited into the Fund. This item also describes the roles of the following entities with respect to the Fund:

- New York State Department of Labor (DOL),
- The Office of the State of Comptroller (OSC), and
- State agencies and public benefit corporations.

2. Background and Statutory References:

DOL uses the Fund to enforce the State's Labor Law as it relates to contracts for construction or reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law. State agencies and public benefit corporations participating in such contracts are required to make payments to the Fund.

Chapter 511 of the Laws of 1995 (as amended by Chapter 513 of the Laws of 1997, Chapter 655 of the Laws of 1999, Chapter 376 of the Laws of 2003 and Chapter 407 of the Laws of 2005) established the Fund.

3. Procedures and Agency Responsibilities:

The Fund is supported by transfers and deposits based on the value of contracts for construction and reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law, into which all State agencies and public benefit corporations enter.

Chapter 407 of the Laws of 2005 increased the amount required to be provided to this fund to .10 of one-percent of the total cost of each such contract, to be calculated at the time agencies or public benefit corporations enter into a new contract or if a contract is amended. The provisions of this bill became effective August 2, 2005.

**To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND**

OSC will report to DOL on all construction-related ("D") contracts approved during the month, including contract amendments, and then DOL will bill agencies the appropriate assessment monthly. An agency may then make a determination if any of the billed contracts are exempt and so note on the bill submitted back to DOL. For any instance where an agency is unsure if a contract is or is not exempt, they can call the Bureau of Public Work at the number noted below for a determination. Payment by check or journal voucher is due to DOL within thirty days from the date of the billing. DOL will verify the amounts and forward them to OSC for processing.

For those contracts which are not approved or administered by the Comptroller, monthly reports and payments for deposit into the Public Work Enforcement Fund must be provided to the Administrative Finance Bureau at the DOL within 30 days of the end of each month or on a payment schedule mutually agreed upon with DOL.

Reports should contain the following information:

- Name and billing address of State agency or public benefit corporation;
- State agency or public benefit corporation contact and phone number;
- Name and address of contractor receiving the award;
- Contract number and effective dates;
- Contract amount and PWEF assessment charge (if contract amount has been amended, reflect increase or decrease to original contract and the adjustment in the PWEF charge); and
- Brief description of the work to be performed under each contract.

Checks and Journal Vouchers, payable to the "New York State Department of Labor" should be sent to:

Department of Labor
Administrative Finance Bureau-PWEF Unit
Building 12, Room 464
State Office Campus
Albany, NY 12226

Any questions regarding billing should be directed to NYSDOL's Administrative Finance Bureau-PWEF Unit at (518) 457-3624 and any questions regarding Public Work Contracts should be directed to the Bureau of Public Work at (518) 457-5589.

Required Notice under Article 25-B of the Labor Law

**Attention All Employees, Contractors and Subcontractors:
You are Covered by the Construction Industry Fair Play Act**

The law says that you are an employee unless:

- You are free from direction and control in performing your job, **and**
- You perform work that is not part of the usual work done by the business that hired you, **and**
- You have an independently established business.

Your employer cannot consider you to be an independent contractor unless all three of these facts apply to your work.

It is against the law for an employer to misclassify employees as independent contractors or pay employees off the books.

Employee Rights: If you are an employee, you are entitled to state and federal worker protections. These include:

- Unemployment Insurance benefits, if you are unemployed through no fault of your own, able to work, and otherwise qualified,
- Workers' compensation benefits for on-the-job injuries,
- Payment for wages earned, minimum wage, and overtime (under certain conditions),
- Prevailing wages on public work projects,
- The provisions of the National Labor Relations Act, and
- A safe work environment.

It is a violation of this law for employers to retaliate against anyone who asserts their rights under the law. Retaliation subjects an employer to civil penalties, a private lawsuit or both.

Independent Contractors: If you are an independent contractor, **you must pay all taxes and Unemployment Insurance contributions required by New York State and Federal Law.**

Penalties for paying workers off the books or improperly treating employees as independent contractors:

- **Civil Penalty** First offense: Up to \$2,500 per employee
 Subsequent offense(s): Up to \$5,000 per employee
- **Criminal Penalty** First offense: Misdemeanor - up to 30 days in jail, up to a \$25,000 fine and debarment from performing public work for up to one year.
 Subsequent offense(s): Misdemeanor - up to 60 days in jail or up to a \$50,000 fine and debarment from performing public work for up to 5 years.

If you have questions about your employment status or believe that your employer may have violated your rights and you want to file a complaint, call the Department of Labor at (866) 435-1499 or send an email to dol.misclassified@labor.ny.gov. All complaints of fraud and violations are taken seriously. You can remain anonymous.

Employer Name:

IA 999 (09/16)



Attention Employees

THIS IS A: **PUBLIC WORK PROJECT**

If you are employed on this project as a **worker, laborer, or mechanic** you are entitled to receive the **prevailing wage and supplements rate** for the classification at which you are working.

Your pay stub and wage notice received upon hire must clearly state your wage rate and supplement rate.

Chapter 629 of the Labor Laws of 2007:

These wages are set by law and must be posted at the work site. They can also be found at:
<https://dol.ny.gov/bureau-public-work>



If you feel that you have not received proper wages or benefits, please call our nearest office.*

Albany	(518) 457-2744	Patchogue	(631) 687-4882
Binghamton	(607) 721-8005	Rochester	(585) 258-4505
Buffalo	(716) 847-7159	Syracuse	(315) 428-4056
Garden City	(516) 228-3915	Utica	(315) 793-2314
New York City	(212) 932-2419	White Plains	(914) 997-9507
Newburgh	(845) 568-5287		

* For New York City government agency construction projects, please contact the Office of the NYC Comptroller at (212) 669-4443, or www.comptroller.nyc.gov – click on Bureau of Labor Law.

Contractor Name: _____

Project Location: _____

Requirements for OSHA 10 Compliance

Article 8 §220-h requires that when the advertised specifications, for every contract for public work, is \$250,000.00 or more the contract must contain a provision requiring that every worker employed in the performance of a public work contract shall be certified as having completed an OSHA 10 safety training course. The clear intent of this provision is to require that all employees of public work contractors, required to be paid prevailing rates, receive such training "prior to the performing any work on the project."

The Bureau will enforce the statute as follows:

All contractors and sub contractors must attach a copy of proof of completion of the OSHA 10 course to the first certified payroll submitted to the contracting agency and on each succeeding payroll where any new or additional employee is first listed.

Proof of completion may include but is not limited to:

- Copies of bona fide course completion card (*Note: Completion cards do not have an expiration date.*)
- Training roster, attendance record or other documentation from the certified trainer pending the issuance of the card.
- Other valid proof

**A certification by the employer attesting that all employees have completed such a course is not sufficient proof that the course has been completed.

Any questions regarding this statute may be directed to the New York State Department of Labor, Bureau of Public Work at 518-457-5589.

WICKS

Public work projects are subject to the Wicks Law requiring separate specifications and bidding for the plumbing, heating and electrical work, when the total project's threshold is \$3 million in Bronx, Kings, New York, Queens and, Richmond counties; \$1.5 million in Nassau, Suffolk and Westchester counties; and \$500,000 in all other counties.

For projects below the monetary threshold, bidders must submit a sealed list naming each subcontractor for the plumbing, HVAC and electrical and the amount to be paid to each. The list may not be changed unless the public owner finds a legitimate construction need, including a change in specifications or costs or the use of a Project Labor Agreement (PLA), and must be open to public inspection.

Allows the state and local agencies and authorities to waive the Wicks Law and use a PLA if it will provide the best work at the lowest possible price. If a PLA is used, all contractors shall participate in apprentice training programs in the trades of work it employs that have been approved by the Department of Labor (DOL) for not less than three years. They shall also have at least one graduate in the last three years and use affirmative efforts to retain minority apprentices. PLA's would be exempt from Wicks, but deemed to be public work subject to prevailing wage enforcement.

The Commissioner of Labor shall have the power to enforce separate specification requirements on projects, and may issue stop-bid orders against public owners for non-compliance.

Other new monetary thresholds, and similar sealed bidding for non-Wicks projects, would apply to certain public authorities including municipal housing authorities, NYC Construction Fund, Yonkers Educational Construction Fund, NYC Municipal Water Finance Authority, Buffalo Municipal Water Finance Authority, Westchester County Health Care Association, Nassau County Health Care Corp., Clifton-Fine Health Care Corp., Erie County Medical Center Corp., NYC Solid Waste Management Facilities, and the Dormitory Authority.

Contractors must pay subcontractors within a 7 days period.

(07.19)

Introduction to the Prevailing Rate Schedule

Information About Prevailing Rate Schedule

This information is provided to assist you in the interpretation of particular requirements for each classification of worker contained in the attached Schedule of Prevailing Rates.

Classification

It is the duty of the Commissioner of Labor to make the proper classification of workers taking into account whether the work is heavy and highway, building, sewer and water, tunnel work, or residential, and to make a determination of wages and supplements to be paid or provided. It is the responsibility of the public work contractor to use the proper rate. If there is a question on the proper classification to be used, please call the district office located nearest the project. District office locations and phone numbers are listed below.

Prevailing Wage Schedules are issued separately for "General Construction Projects" and "Residential Construction Projects" on a county-by-county basis.

General Construction Rates apply to projects such as: Buildings, Heavy & Highway, and Tunnel and Water & Sewer rates.

Residential Construction Rates generally apply to construction, reconstruction, repair, alteration, or demolition of one family, two family, row housing, or rental type units intended for residential use.

Some rates listed in the Residential Construction Rate Schedule have a very limited applicability listed along with the rate. Rates for occupations or locations not shown on the residential schedule must be obtained from the General Construction Rate Schedule. Please contact the local Bureau of Public Work office before using Residential Rate Schedules, to ensure that the project meets the required criteria.

Payrolls and Payroll Records

Contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemporaneous, true, and accurate payroll records.

Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury.

Paid Holidays

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

Overtime

At a minimum, all work performed on a public work project in excess of eight hours in any one day or more than five days in any workweek is overtime. However, the specific overtime requirements for each trade or occupation on a public work project may differ. Specific overtime requirements for each trade or occupation are contained in the prevailing rate schedules.

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays.

The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Supplemental Benefits

Particular attention should be given to the supplemental benefit requirements. Although in most cases the payment or provision of supplements is straight time for all hours worked, some classifications require the payment or provision of supplements, or a portion of the supplements, to be paid or provided at a premium rate for premium hours worked. Supplements may also be required to be paid or provided on paid holidays, regardless of whether the day is worked. The Overtime Codes and Notes listed on the particular wage classification will indicate these conditions as required.

Effective Dates

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. The rate listed is valid until the next effective rate change or until the new annual determination which takes effect on July 1 of each year. All contractors and subcontractors are required to pay the current prevailing rates of wages and supplements. If you have any questions please contact the Bureau of Public Work or visit the New York State Department of Labor website (www.labor.ny.gov) for current wage rate information.

Apprentice Training Ratios

The following are the allowable ratios of registered Apprentices to Journey-workers.

For example, the ratio 1:1,1:3 indicates the allowable initial ratio is one Apprentice to one Journeyworker. The Journeyworker must be in place on the project before an Apprentice is allowed. Then three additional Journeyworkers are needed before a second Apprentice is allowed. The last ratio repeats indefinitely. Therefore, three more Journeyworkers must be present before a third Apprentice can be hired, and so on.

Please call Apprentice Training Central Office at (518) 457-6820 if you have any questions.

Title (Trade)	Ratio
Boilermaker (Construction)	1:1,1:4
Boilermaker (Shop)	1:1,1:3
Carpenter (Bldg.,H&H, Pile Driver/Dockbuilder)	1:1,1:4
Carpenter (Residential)	1:1,1:3
Electrical (Outside) Lineman	1:1,1:2
Electrician (Inside)	1:1,1:3
Elevator/Escalator Construction & Modernizer	1:1,1:2
Glazier	1:1,1:3
Insulation & Asbestos Worker	1:1,1:3
Iron Worker	1:1,1:4
Laborer	1:1,1:3
Mason	1:1,1:4
Millwright	1:1,1:4
Op Engineer	1:1,1:5
Painter	1:1,1:3
Plumber & Steamfitter	1:1,1:3
Rofer	1:1,1:2
Sheet Metal Worker	1:1,1:3
Sprinkler Fitter	1:1,1:2

If you have any questions concerning the attached schedule or would like additional information, please contact the nearest BUREAU of PUBLIC WORK District Office or write to:

New York State Department of Labor
 Bureau of Public Work
 State Office Campus, Bldg. 12
 Albany, NY 12226

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004
Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518
Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

Tompkins County General Construction

Boilermaker **02/01/2025**

JOB DESCRIPTION Boilermaker **DISTRICT 7**

ENTIRE COUNTIES
 Cayuga, Clinton, Cortland, Franklin, Jefferson, Lewis, Madison, Oneida, Onondaga, Oswego, Seneca, St. Lawrence, Tompkins

WAGES
 Per hour: 07/01/2024

Boilermaker \$ 37.98

SUPPLEMENTAL BENEFITS

Per hour:
 Journeyworker \$ 26.62*
 + 1.48

*This portion of the benefits subject to the same premium rate as shown for overtime wages.

OVERTIME PAY
 See (B, E, Q) on OVERTIME PAGE

HOLIDAY
 Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 15, 25) on HOLIDAY PAGE

NOTE: When a holiday falls on Sunday, the day observed by the State or Nation shall be observed. When Christmas Day and New Year's fall on Saturday, Friday will be observed as the holiday.

REGISTERED APPRENTICES

WAGES per hour: Six (6) month terms at the following percentage of Journeyworker's wage.

1st	2nd	3rd	4th	5th	6th	7th	8th
65%	65%	70%	75%	80%	85%	90%	95%

SUPPLEMENTAL BENEFITS per hour:

\$ 19.78*	\$ 19.78*	\$ 20.76*	\$ 21.73*	\$ 22.71*	\$ 23.69*	\$ 24.67*	\$ 25.64*
+ 1.48	+ 1.48	+ 1.48	+ 1.48	+ 1.48	+ 1.48	+ 1.48	+ 1.48

*This portion of the benefits subject to the same premium rate as shown for overtime wages.

7-175

Carpenter - Building **02/01/2025**

JOB DESCRIPTION Carpenter - Building **DISTRICT 2**

ENTIRE COUNTIES
 Chemung, Cortland, Jefferson, Lewis, Oswego, Schuyler, St. Lawrence, Steuben, Tompkins

PARTIAL COUNTIES
 Allegany: Only the Township of Alfred.

WAGES
 Per hour: 07/01/2024 07/01/2025

		Additional
Carpenter	\$ 31.10	\$ 1.00*
Floor Coverer	31.10	1.00*
Carpet Layer	31.10	1.00*
Dry-Wall	31.10	1.00*
Diver-Wet Day	61.25	0.00
Diver -Dry Day	32.10	1.00*
Diver Tender	32.10	1.00*

*To be allocated at a later date

NOTE ADDITIONAL AMOUNTS PAID FOR THE FOLLOWING WORK LISTED BELOW (per hour worked):
 - Pile Drivers/Dock Builders shall receive \$0.25 per hour over the journeyworker's rate of pay when performing piledriving/dock building work.
 - Certified welders shall receive \$1.00 per hour over the journeyworker's rate of pay when the employee is required to be certified and performs DOT or ABS specified welding work

- When an employee performs work within a contaminated area on a State and/or Federally designated hazardous waste site, and where relevant State and/or Federal regulations require employees to be furnished and use or wear required forms of personal protection, then the employee shall receive his regular hourly rate plus \$1.50 per hour.
- Depth pay for Divers based upon deepest depth on the day of the dive (per diem payment):
 - 0' to 80' no additional fee
 - 81'to 100' additional \$.50 per foot
 - 101'to 150' additional \$0.75 per foot
 - 151'and deeper additional \$1.25 per foot
- Penetration pay for Divers based upon deepest penetration on the day of the dive (per diem payment):
 - 0' to 50' no additional fee
 - 51' to 100' additional \$.75 per foot
 - 101' and deeper additional \$1.00 per foot
- Diver rates applies to all hours worked on dive day.

SHIFT WORK

On Agency/Owner mandated shift work, the following rates will be applicable:

- 1st Shift - Regular Rate
- 2nd Shift - Premium of 7% of base wage per hour
- 3rd Shift - Premium of 14% of base wage per hour

Shift work shall be defined as implementing at least two (2) shifts in a twenty-four (24) consecutive hour period. Shift work must be for a minimum of three (3) consecutive days.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 22.88*

*NOTE: For work performed inside the secure area of Nuclear Power Plants - benefits calculated at same premium as shown for overtime(per hour paid).

OVERTIME PAY

See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

Note: Any holiday which occurs on Sunday shall be observed the following Monday. If Christmas falls on a Saturday, it shall be observed on the prior Friday.

REGISTERED APPRENTICES

Wages per hour (1300 hour terms at the following percentage of Journeyworker's base wage):

1st	2nd	3rd	4th
65%	70%	75%	80%

Supplemental Benefits per hour:

\$ 12.55	\$ 12.55	\$ 15.15	\$ 15.15
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NOTE ADDITIONAL AMOUNTS PAID TO APPRENTICES FOR THE FOLLOWING WORK LISTED BELOW (per hour worked):

- Pile Driving/Dock Builder apprentices shall receive an additional \$0.25 per hour worked when performing piledriving/dock building work.
- Certified Welders shall receive \$1.00 per hour over the apprentices rate of pay when the apprentice is required to be certified and performs DOT or ABS specified welding work.
- When an apprentice performs work within a contaminated area on a State and/or Federally designated hazardous waste site, and where relevant State and/or Federal regulations require the apprentice to be furnished and use or wear required forms of personal protection, then the apprentice shall receive his regular hourly rate plus \$1.50 per hour.

2-277B-CS

Carpenter - Building / Heavy&Highway

02/01/2025

JOB DESCRIPTION Carpenter - Building / Heavy&Highway

DISTRICT 2

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

PARTIAL COUNTIES

Orange: The area lying on Northern side of Orange County demarcated by a line drawn from the Bear Mountain Bridge continuing west to the Bear Mountain Circle, continue North on 9W to the town of Cornwall where County Road 107 (also known as Quaker Rd) crosses under 9W, then east on County Road 107 to Route 32, then north on Route 32 to Orrs Mills Rd, then west on Orrs Mills Rd to Route 94, continue west and south on Route 94 to the Town of Chester, to the intersection of Kings Highway, continue south on Kings Highway to Bellvale Rd, west on Bellvale Rd to Bellvale Lakes Rd, then south on Bellvale Lakes Rd to Kain Rd, southeast on Kain Rd to Route 17A, then north and southeast along Route 17A to Route 210, then follow Route 210 to NJ Border.

WAGES

Wages per hour: 07/01/2024

Carpenter - ONLY for
 Artificial Turf/Synthetic
 Sport Surface \$ 36.48

Note - Does not include the operation of equipment. Please see Operating Engineers rates.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 26.55

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE

HOLIDAY

Paid: See (5) on HOLIDAY PAGE

Overtime: See (5, 6, 16) on HOLIDAY PAGE

Notes:

When a holiday falls upon a Saturday, it shall be observed on the preceding Friday. When a holiday falls upon a Sunday, it shall be observed on the following Monday.

An employee taking an unexcused day off the regularly scheduled day before or after a paid Holiday shall not receive Holiday pay.

REGISTERED APPRENTICES

Wages per hour (1300 hour terms at the following percentage of Journeyworker's wage):

1st	2nd	3rd	4th
65%	70%	75%	80%

Supplemental Benefits per hour:

\$18.58	\$19.14	\$21.24	\$21.79
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2-42AtSS

Carpenter - Heavy&Highway

02/01/2025

JOB DESCRIPTION Carpenter - Heavy&Highway

DISTRICT 2

ENTIRE COUNTIES

Broome, Cayuga, Chemung, Cortland, Delaware, Jefferson, Lewis, Onondaga, Oswego, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Yates

WAGES

Per hour 07/01/2024

Carpenter	\$ 38.28
Piledriver	38.28
Diver-Wet Day	63.28
Diver-Dry Day	39.28
Diver-Tender	39.28

NOTE ADDITIONAL AMOUNTS PAID FOR THE FOLLOWING WORK LISTED BELOW (per hour worked):

- State or Federal designated hazardous site, requiring protective gear shall be an additional \$2.50 per hour.
- Certified welders when required to perform welding work will receive an additional \$2.50 per hour.

ADDITIONAL NOTES PERTAINING TO DIVERS/TENDERS:

- Divers and Tenders shall receive one and one half (1 1/2) times their regular diver and tender rate of pay for Effluent and Slurry diving.
- Divers and tenders being paid at the specified rate for Effluent and Slurry diving shall have all overtime rates based on the specified rate plus the appropriate overtime rates (one and one half or two times the specified rate for Slurry and Effluent divers and tenders).
- The pilot of an ADS or submersible will receive one and one-half (1 1/2) times the Diver-Wet Day Rate for time submerged.
- All crew members aboard a submersible shall receive the Diver-Wet Day rate.
- Depth pay for Divers based upon deepest depth on the day of the dive (per diem payment):
 - 0' to 50' no additional fee
 - 51'to 100' additional \$.50 per foot
 - 101'to 150' additional \$0.75 per foot
 - 151'and deeper additional \$1.25 per foot
- Penetration pay for Divers based upon deepest penetration on the day of the dive (per diem payment):
 - 0' to 50' no additional fee
 - 51' to 100' additional \$.75 per foot
 - 101' and deeper additional \$1.00 per foot
- Diver rates applies to all hours worked on dive day.

SHIFT WORK

When project owner mandates a single irregular work shift, the Journeyworkers and Apprentices will receive an additional \$3.00 per hour. A single irregular work shift can start any time from 5:00 p.m. to 1:00 a.m.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 26.55

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

- In the event a Holiday falls on a Saturday, the Friday before will be observed as a Holiday. If a Holiday falls on a Sunday, then Monday will be observed as a Holiday.

- The employee must work their scheduled workday before and their scheduled workday after the holiday to receive holiday pay.

REGISTERED APPRENTICES

CAPRENTER APPRENTICES

Wages per hour (1040 hour terms at the following percentage of journeyworker's base wage):

1st	2nd	3rd	4th	5th
65%	70%	75%	80%	85%

Supplemental Benefits per hour:

\$ 18.58	\$ 19.14	\$ 21.19	\$ 21.74	\$ 22.29
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PILEDRIVER/DOCKBUILDER APPRENTICES

Wages per hour (1300 hour terms at the following percentage of journeyworker's base wage):

1st	2nd	3rd	4th
65%	70%	75%	80%

Supplemental Benefits per hour:

\$ 18.58	\$ 19.14	\$ 21.19	\$ 21.74
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NOTE ADDITIONAL AMOUNTS PAID PER HOUR WORKED TO APPRENTICES FOR SPECIFIC TYPES OF WORK PERFORMED:

- State or Federal designated hazardous site, requiring protective gear shall be an additional \$2.50 per hour.

- Certified welders when required to perform welding work will receive an additional \$2.50 per hour.

2-277HH-Bro

Electrician

02/01/2025

JOB DESCRIPTION Electrician

DISTRICT 6

ENTIRE COUNTIES

Cortland, Herkimer, Madison, Oneida, Oswego

PARTIAL COUNTIES

Cayuga: Townships of Ira, Locke, Sempronius, Sterling, Summerhill and Victory.

Chenango: Only the Townships of Columbus, New Berlin and Sherburne.

Onondaga: Entire County except Townships of Elbridge and Skaneateles.

Otsego: Only the Townships of Plainfield, Richfield, Springfield, Cherry Valley, Roseboom, Middlefield, Otsego, Exeter, Edmeston, Burlington, Pittsfield and New Lisbon.

Tompkins: Only the Township of Groton.

Wayne: Only the Townships of Huron, Wolcott, Rose and Butler.

WAGES

Per hour:	07/01/2024	06/01/2025 Additional	06/01/2026 Additional
Electrician	\$ 47.00	\$ 5.00*	\$ 5.25*
Teledata	47.00		
Cable Splicer	51.70		

* To be allocated at a later date.

NOTE: Additional premiums for the following work listed (Amounts subject to premiums):

- Additional \$2.50 per hour for work performed over 35 feet above the ground, floor, or roof levels or where work is required in tunnels, shafts, or under compressed air 35 feet below the ground level.

- Additional \$3.00 per hour for working over 50 feet above or below ground, floor, or roof level. This includes work on ladders, "toothpicks", scaffolds, boatswain chairs, towers, smokestacks or other open structures, or mechanical lifts used over 60 feet.

Occupied Conditions: When necessary to perform alteration and/or renovation work and owner mandates (due to occupied conditions) prevent the work from being performed during "normal" working hours (defined as between 6:00 a.m. and 4:30 p.m. Monday through Friday), alternate hours may be worked, provided: 1) The hours are established for a minimum of five (5) days duration or the length of the job, whichever is shorter; and 2) An entire work scope within a job-site area is performed utilizing the varied hours. If these conditions are satisfied, all hours worked Monday through Friday of a shift that starts before or ends after the "normal" hours, shall be paid at the appropriate rate plus fifteen percent (15%). However, the following restrictions shall apply:

- 1) "Alternate" hours shall consist of a minimum of eight (8) consecutive hours per day.
- 2) Hours worked in excess of eight (8) hours per day, Monday through Friday, shall be paid at a rate of one and one-half times the applicable rate (day-shift + 15%).
- 3) Hours worked on Saturday shall be paid at time and one-half the applicable rate.
- 4) Hours worked on Sundays and Holidays shall be paid at double the straight time rate.
- 5) Work of a new construction nature may not be worked under these conditions.

SHIFT WORK

THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF EIGHT (8) HOURS FOR AT LEAST FIVE (5) DAYS DURATION WHICH MAY HAVE BEEN WORKED. WHEN TWO (2) SHIFTS OR THREE (3) SHIFTS ARE WORKED:

1ST SHIFT	8:00AM - 4:30PM:	Regular wage rate
2ND SHIFT	4:30 PM - 1:00 AM:	Regular wage rate plus 15%
3RD SHIFT	12:30 AM - 9:00 AM:	Regular wage rate plus 25%

SUPPLEMENTAL BENEFITS

Per hour:

	\$ 31.92 plus
Journeyworker	3% of hourly wage paid*

*NOTE: The 3% is based on the hourly wage paid, straight time or premium rate.

OVERTIME PAY

See (B, *E, Q) on OVERTIME PAGE

* NOTE: On Saturday the first 8 hours worked shall be paid at a rate of one and one-half times the applicable rate. All additional hours are payable at double the straight time rate.

WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 15, 26) on HOLIDAY PAGE

NOTE: If any of the above holidays fall on Saturday, Friday shall be observed as the holiday. If any of the above holidays fall on Sunday, Monday shall be observed as the holiday.

REGISTERED APPRENTICES

WAGES per hour: Hourly terms at the following percentage of Journeyworker's wage.

1st period 40% (0-1000 hrs.)	\$ 18.80
2nd period 45% (1001-2000)	21.15
3rd period 50% (2001-3500)	23.50
4th period 60% (3501-5000)	28.20
5th period 70% (5001-6500)	32.90
6th Period 80% (6501-8000)	37.60

SUPPLEMENTAL BENEFITS per hour:

1st period	\$ 14.34*
2nd period	14.34*
3rd period	28.92*
4th period	29.52*
5th period	30.12*
6th period	30.72*

* PLUS 3% OF HOURLY WAGE PAID, STRAIGHT TIME RATE OR PREMIUM RATE.

Electrician

02/01/2025

JOB DESCRIPTION Electrician

DISTRICT 6

ENTIRE COUNTIES

PARTIAL COUNTIES

- Cayuga: Only the Township of Genoa.
- Schuyler: Only the Townships of Cayuta, Catharine, and Hector.
- Seneca: Only the Townships of Lodi and Covert.
- Tioga: Only the Townships of Spencer and Candor.
- Tompkins: Entire county except the Township of Groton.

WAGES

Per hour: 07/01/2024

Electrician \$ 42.00

Additional \$1.00 per hour for work from trusses, scaffolds, frames, spider baskets, ladders, etc. 40 feet or more from ground floor or in underground mines or tunnels. Work done from personal lift equipment that complies with OSHA requirements are excluded.

Additional \$2.00 per hour when required to work under compressed air, on radio towers, on asbestos abatement projects which require the use of a respirator, work of a hazardous nature, work where gas masks are required or work requiring use of protective arc flash suits.

NOTE: Additional amounts subject to premiums.

SHIFT WORK

THE FOLLOWING RATES WILL APPLY WHEN SHIFT WORK IS MANDATED EITHER IN THE JOB SPECIFICATION OR BY THE CONTRACTING AGENCY:

1ST SHIFT	8:00 AM to 4:30 PM	Regular wage rate
2ND SHIFT	4:30 PM to 1:00 AM	Regular wage rate plus 17.3%
3RD SHIFT	12:30 AM to 9:00 AM	Regular wage rate plus 31.4%

SUPPLEMENTAL BENEFITS

Per hour: \$ 29.55 plus
Journeyworker 3% of hourly wage paid*

* NOTE: The 3% is based on the hourly wage paid, straight time rate or premium rate.

OVERTIME PAY

See (B, *E, Q) on OVERTIME PAGE

* NOTE: On Saturday the first 8 hours worked shall be paid at a rate of one and one-half times the applicable rate. All additional hours are payable at double the straight time rate.

WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

NOTE: When a holiday falls on a Saturday, the day preceding shall be celebrated as such, and when falling on a Sunday, Monday will be celebrated as the holiday.

REGISTERED APPRENTICES

WAGES per hour: One year terms at the following percentage of Journeyworker's wage.

1st year (47.5%)	\$ 19.95
2nd year (52.5%)	22.05
3rd year (65%)	27.30
4th year (75%)	31.50
5th year (85%)	35.70

SUPPLEMENTAL BENEFITS per hour:

1st year	\$ 13.75*
2nd year	13.75*
3rd year	22.47*
4th year	23.97*
5th year	25.46*

* PLUS 3% OF HOURLY WAGE PAID, STRAIGHT TIME RATE OR PREMIUM RATE.

Elevator Constructor

02/01/2025

JOB DESCRIPTION Elevator Constructor

DISTRICT 6

ENTIRE COUNTIES

Broome, Cayuga, Chenango, Cortland, Franklin, Jefferson, Lewis, Onondaga, Oswego, St. Lawrence, Tioga, Tompkins

PARTIAL COUNTIES

Delaware: Only the towns of: Tompkins, Walton, Masonville, Sidney, Franklin and Deposit.

Madison: Only the towns of: Cazenovia, DeRuyter, Eaton, Fenner, Georgetown, Lebanon, Lenox, Nelson and Sullivan.

Oneida: Only the towns of: Camden, Florence and Vienna.

WAGES

Per hour:	07/01/2024	01/01/2025	01/01/2026
Elevator Constructor	\$ 56.01	\$ 58.455	\$ 61.003
Helper	39.21	40.92	42.70

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker	\$ 37.885*	\$ 38.435*	\$ 38.985*
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*NOTE - add 6% of regular hourly rate for all hours worked. Add 8% of regular hourly rate if more than 5 years of service.

OVERTIME PAY

See (D, O) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 15, 16) on HOLIDAY PAGE

Overtime: See (5, 6, 15, 16) on HOLIDAY PAGE

NOTE: When a holiday falls on a Saturday, it shall be observed on Friday. When a holiday falls on Sunday, it shall be observed on Monday.

REGISTERED APPRENTICES

WAGES per hour: 1 year terms at the following percentage of the Elevator Constructor wage.

0-6	6-12	2nd	3rd	4th
months	months	year	year	year
50%	55%	65%	70%	80%

SUPPLEMENTAL BENEFITS per hour:

0-6 months: 6% of the hourly apprentice rate paid, no additional supplemental benefits.

All other terms: Same as Journeyworker

6-62.1

Glazier

02/01/2025

JOB DESCRIPTION Glazier

DISTRICT 5

ENTIRE COUNTIES

Broome, Chemung, Chenango, Delaware, Otsego, Schuyler, Steuben, Tioga, Tompkins

WAGES

Per hour: 07/01/2024

Glazier	\$ 28.90
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SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 30.20
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OVERTIME PAY

See (B, E*, E2, Q**) on OVERTIME PAGE.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

1000 hour terms

Appr. 1st term	\$18.00
Appr. 2nd term	19.00
Appr. 3rd term	20.00
Appr. 4th term	21.00
Appr. 5th term	22.00
Appr. 6th term	23.00
Appr. 7th term	24.00
Appr. 8th term	25.00

Supplemental Benefits per hour:

Appr. 1st term	\$ 13.22
Appr. 2nd term	13.22
Appr. 3rd term	19.22
Appr. 4th term	19.22
Appr. 5th term	20.22
Appr. 6th term	20.22
Appr. 7th term	21.22
Appr. 8th term	21.22

5-677z3

Insulator - Heat & Frost **02/01/2025**

JOB DESCRIPTION Insulator - Heat & Frost **DISTRICT 7**

ENTIRE COUNTIES
 Broome, Cayuga, Chemung, Chenango, Cortland, Herkimer, Jefferson, Lewis, Madison, Oneida, Onondaga, Oswego, Otsego, Schuyler, Seneca, St. Lawrence, Tioga, Tompkins

WAGES
 Per hour: 07/01/2024

Asbestos Installer	\$ 41.50
Insulation Installer	41.50
(On mechanical systems only)	

SHIFT WORK
 The following rates will apply on all contracting agency-mandated shifts worked:

1st Shift	\$ 41.50
2nd Shift	47.72
3rd Shift	49.80

SUPPLEMENTAL BENEFITS
 Per hour:
 Journeyworker \$ 25.09

OVERTIME PAY
 See (*B1, **K, P) on OVERTIME PAGE
 *NOTE: First 10 hours on Saturday.
 **NOTE: Holidays that fall on Sunday are subject to double time.

HOLIDAY
 Paid: See (1) on HOLIDAY PAGE
 Overtime: See (2*,4,6,28) on HOLIDAY PAGE
 *Triple time for Labor Day if worked.

REGISTERED APPRENTICES
 WAGES per hour: One (1) year terms at the following percentage of Journeyworker's wage.

1st	2nd	3rd	4th
60%	70%	80%	90%
\$ 24.90	\$ 29.05	\$ 33.20	\$ 37.35

SUPPLEMENTAL BENEFITS per hour:
 \$ 22.59 \$ 22.59 \$ 25.09 \$ 25.09

7-30-Syracuse

Ironworker **02/01/2025**

JOB DESCRIPTION Ironworker **DISTRICT 6**

ENTIRE COUNTIES
 Broome, Cayuga, Cortland, Onondaga, Oswego, Seneca, Tioga, Tompkins

PARTIAL COUNTIES
 Chenango: Only the townships of Afton, Bainbridge, Coventry, German, Greene, Guilford, Lincklaen, McDonough, Norwich, Otselic, Oxford, Pharsalia, Pitcher, Preston and Smithville.
 Jefferson: Only the townships of Adams, Alexandria, Brownville, Cape Vincent, Clayton, Ellisburg, Henderson, Hounsfield, LeRay, Lorraine, Lyme, Orleans, Pamela, Rodman, Rutland, Theresa, Watertown and Worth.
 Madison: Only the townships of Cazenovia, DeRuyter, Fenner, Georgetown, Lenox, Lincoln, Nelson, Smithfield and Sullivan.
 Schuyler: Only the townships of Cayuta, Catharine, Hector and Montour.
 Wayne: Only the townships of Butler, Galen, Huron, Rose, Savannah and Wolcott.

WAGES

Structural, Reinforcing, Re-bar, Machinery Mover & Rigger, Ornamental & Curtain Wall, Window Wall, Pre-Glazed Metal Framed Windows Attached to Steel or Masonry Including Caulking, Fence Erector (Chain Link/Security), Sheeter/Bridge Rail, Pre-Cast Erector, Stone Derrickman, Pre-Engineered Building Erector, Welder

Per hour:	07/01/2024	07/01/2025	07/01/2026
		Additional	Additional
Ironworker	\$ 34.65	\$ 2.66*	\$ 2.76*

*To be allocated at a later date.

SHIFT WORK

Multiple shifts mandated by the project owner. All shifts will be eight (8) hours.

1st Shift	\$ 34.65	
2nd Shift	38.12	Starting times between 2PM and 7PM
3rd Shift	39.85	Starting times between 7PM and 12AM

WHEN A SINGLE IRREGULAR SHIFT IS WORKED, WITH START TIMES BASED ON SECOND AND THIRD SHIFTS, ADD 10% TO THE 1ST SHIFT WAGE RATE POSTED ABOVE.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker	\$ 31.73
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OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6) on HOLIDAY PAGE

NOTE: Any holiday which occurs on Saturday shall be observed on the preceding Friday. Any holiday which occurs on Sunday shall be observed the following Monday.

REGISTERED APPRENTICES

WAGES per hour: One year terms at the following rates.

1st	2nd	3rd	4th
\$ 21.50	\$ 23.50	\$ 25.50	\$ 27.50

SUPPLEMENTAL BENEFITS per hour:

1st year	\$ 12.53
2nd year	20.86
3rd year	22.05
4th year	23.24

6-60

Laborer - Building **02/01/2025**

JOB DESCRIPTION Laborer - Building

DISTRICT 2

ENTIRE COUNTIES

Cortland, Tompkins

PARTIAL COUNTIES

Schuyler: Only the Township of Catherine including the Village of Odessa.
 Tioga: Townships of Candor & Spencer

WAGES

Per hour:

GROUP #1: Basic Laborer - excavation, concrete vibrator, power-driven buggy, demolition (including acetylene torch work) that is customarily done by a laborer

GROUP #2: Air Tool Operators, Mason Tenders

GROUP #3: Blaster, Rock Drill (compressor driven)

GROUP #4: Asbestos, Hazardous, Toxic Waste, Lead and Mold Remediation

	07/01/2024	07/01/2025	07/01/2026
		Additional	Additional
GROUP #1	\$ 26.50	\$ 1.00*	\$ 1.25*

GROUP #2	27.50	1.00*	1.25*
GROUP #3	28.50	1.00*	1.25*
GROUP #4	28.50	1.00*	1.25*

*To be allocated at a later date.

IMPORTANT NOTES:

- Laborer tasks on Renewable Energy and Green Energy construction work shall be paid at the appropriate Heavy & Highway rates.
- Wage and supplement rates for the operation of forklift and skid steer may be found under the classification "Operating Engineer".

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 22.70

OVERTIME PAY

See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

When a holiday falls on Sunday, it shall be observed on the following Monday.

REGISTERED APPRENTICES

WAGES: 1000 hour terms at the following percentage of Journeyworker's wage.

1st	2nd	3rd	4th
70%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

1st term	\$ 15.35
2nd term	16.60
3rd term	17.48
4th term	18.35

2-785b

Laborer - Heavy&Highway

02/01/2025

JOB DESCRIPTION Laborer - Heavy&Highway

DISTRICT 2

ENTIRE COUNTIES

Broome, Chemung, Cortland, Schuyler, Steuben, Tioga, Tompkins

PARTIAL COUNTIES

Chenango: Entire County except the Townships of Sherburne, Columbus, and New Berlin.

Delaware: Only the Townships of Sidney, Masonville, Walton, Tompkins, Deposit, Hancock and Colchester.

WAGES

Per hour:

GROUP A: Drill Helper, Flagman, Outboard and Hand Boats.

GROUP B: Basic Rate, Bull Float (where used for strike off only), Chain Saw, Concrete Aggregate Bin, Concrete Bootmen, Gin Buggy, Hand or Machine Vibrator, Jack Hammer, Mason Tender, Mortar Mixer, Pavement Breaker, Handlers of Steel Mesh, Small Generators for Laborers Tools, Installation of Bridge Drainage Pipe, Pipe Layers, Vibrator Type Rollers, Tamper, Drill Doctor, Water Pump Operators (1-1/2" & Single Diaphragm), Nozzle (Asphalt, Gunite, Seeding, and Sand Blasting), Laborers on Chain Link Fence Erection, Rock Splitter and Power Unit, Pusher Type Concrete Saw and all other Gas, Electric, and Air Tool Operators, Wrecking Laborer.

GROUP C: Drilling equipment - only where a separate air compressor unit supplies power, Acetylene Torch Operators, Asphalt Raker, Powder Man, Tail or Screw Operator on Asphalt Paver.

GROUP D: Blasters, Form Setters (slab steel forms on highways, roads, streets & airport runways), Stone or Granite Curb Setters.

GROUP E: Hazardous Waste defined as when an employee performs hazardous waste removal, lead abatement and removal, asbestos abatement and removal work on State and/or Federally designated waste site and were relevant State and/or Federal regulations require employees to use or wear required forms of personal protection.

07/01/2024

GROUP A \$ 35.56

GROUP B	35.76
GROUP C	35.96
GROUP D	36.16
GROUP E	38.76

IMPORTANT NOTES:

- Laborer tasks on Renewable Energy and Green Energy construction work shall be paid at the appropriate Heavy & Highway rates.
- Wage and supplement rates for the operation of forklift and skid steer may be found under the classification "Operating Engineer".
- When an employee is required by the employer and/or by the material data safety sheets of a product, during its application, to wear a half or full-face replaceable cartridge respirator for more than (2) hours, then in such case said employee(s) will be paid the Group E rate for the shift.

SHIFT WORK

A single irregular work shift starting any time between 5:00 PM and 1:00 AM on governmental mandated night work shall be paid an additional \$3.00 per hour.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 25.85

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

- If Holiday falls on Sunday, it will be celebrated on Monday. If the Holiday falls on Saturday, it will be celebrated on Saturday.
- An Employee must work the scheduled working day before and the scheduled working day after a holiday to receive holiday pay.

REGISTERED APPRENTICES

WAGES: 1000 hour terms at the following percentage of Journeyworker's GROUP B wage:

1st	2nd	3rd	4th
70%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

1st term	\$ 23.60
2nd term	24.35
3rd term	24.73
4th term	25.10

2-785h

Laborer - Tunnel

02/01/2025

JOB DESCRIPTION Laborer - Tunnel

DISTRICT 2

ENTIRE COUNTIES

Broome, Chemung, Cortland, Schuyler, Steuben, Tioga, Tompkins

PARTIAL COUNTIES

Chenango: Entire County except the Townships of Sherburne, Columbus, and New Berlin.

Delaware: Only the Townships of Sidney, Masonville, Walton, Tompkins, Deposit, Hancock and Colchester.

WAGES

Per hour:

GROUP A: Change House Man

GROUP B: Miners and all Machine Men, Safety Miner, All Shaft work, Caisson work, Drilling, Blow Pipe, all Air Tools, Tugger, Scaling, Nipper, Guniting pot to nozzle, Bit Grinder, Signal Man (top and bottom), Concrete Man, Shield Driven Tunnels, mixed face and soft ground, liner plate tunnels in free air.

GROUP C: Blaster

GROUP D: Hazardous waste removal work on a State and/or Federally designated waste site where relevant State and/or Federal regulations require employees to use or wear required forms of personal protection.

07/01/2024

Group A	\$ 38.74
Group B	38.94

Group C	41.74
Group D	41.94

IMPORTANT NOTES:

- When an employee is required by the employer and/or by the material data safety sheets of a product, during its application, to wear a half or full face replaceable cartridge respirator for more then (2) hours, then in such case said employee(s) will be paid the Group D rate for the shift.

SHIFT WORK

A single irregular work shift starting any time between 5:00 PM and 1:00 AM on governmental mandated night work shall be paid an additional \$3.00 per hour.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker	\$ 25.85
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OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

- If Holiday falls on Sunday, it will be celebrated on Monday. If the Holiday falls on Saturday, it will be celebrated on Friday.

HOLIDAY

Paid: See (5, 6) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

If the holiday falls on Saturday, it will be celebrated on Friday. If the holiday falls on Sunday, it will be celebrated on Monday

REGISTERED APPRENTICES

WAGES: 1000 hour terms at the following percentage of Group B wage

1st	2nd	3rd	4th
70%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

1st Term	\$ 10.25
2nd Term	10.25
3rd Term	18.25
4th Term	25.85

2-785T

Lineman Electrician

02/01/2025

JOB DESCRIPTION Lineman Electrician

DISTRICT 6

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

WAGES

A Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors, assembly of all electrical materials, conduit, pipe, or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

Crane Operators: Operation of any type of crane on line projects.

Crawler Backhoe: Operation of tracked excavator/crawler backhoe with 1/2 yard bucket or larger on line projects.

Digging Machine Operator: All other digging equipment and augering on line projects.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

NOTE: Includes Teledata Work within ten (10) feet of High Voltage Transmission Lines. Also includes digging of holes for poles, anchors, footer, and foundations for electrical equipment.

Below rates applicable on all overhead and underground distribution and maintenance work, and all overhead and underground transmission line work and the installation of fiber optic cable where no other construction trades are or have been involved. Includes access matting for line work.

Per hour: 07/01/2024

Group A:	
Lineman, Technician	\$ 58.90
Crane, Crawler Backhoe	58.90
Welder, Cable Splicer	58.90

Group B:	
Digging Mach. Operator	53.01
Tractor Trailer Driver	50.07
Groundman, Truck Driver	47.12
Equipment Mechanic	47.12
Flagman	35.34

Additional \$1.00 per hour for entire crew when a helicopter is used.

Below rates applicable on all electrical sub-stations, switching structures, fiber optic cable and all other work not defined as "Utility outside electrical work." Includes access matting for line work.

Group A:	
Lineman, Technician	\$ 58.90
Crane, Crawler Backhoe	58.90
Cable Splicer	64.79
Certified Welder, Pipe Type Cable	61.85

Group B:	
Digging Mach. Operator	53.01
Tractor Trailer Driver	50.07
Groundman, Truck Driver	47.12
Equipment Mechanic	47.12
Flagman	35.34

Additional \$1.00 per hour for entire crew when a helicopter is used.

Below rates applicable on all switching structures, maintenance projects, railroad catenary install/maintenance third rail installation, bonding of rails and pipe type cable and installation of fiber optic cable. Includes access matting for line work.

Group A:	
Lineman, Tech, Welder	\$ 60.22
Crane, Crawler Backhoe	60.22
Cable Splicer	66.24
Certified Welder, Pipe Type Cable	63.23

Group B:	
Digging Mach. Operator	54.20
Tractor Trailer Driver	51.19
Groundman, Truck Driver	48.18
Equipment Mechanic	48.18
Flagman	36.13

Additional \$1.00 per hour for entire crew when a helicopter is used.

Below rates applicable on all overhead and underground transmission line work & fiber optic cable where other construction trades are or have been involved. This applies to transmission line work only, not other construction. Includes access matting for line work.

Group A:	
Lineman, Tech, Welder	\$ 61.41
Crane, Crawler Backhoe	61.41

Group B:	
Digging Mach. Operator	55.27
Tractor Trailer Driver	52.20
Groundman, Truck Driver	49.13
Equipment Mechanic	49.13

Flagman 36.85

Additional \$1.00 per hour for entire crew when a helicopter is used.

SHIFT WORK

THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM to 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM to 1:00 AM REGULAR RATE PLUS 17.3 %
3RD SHIFT	12:30 AM to 9:00 AM REGULAR RATE PLUS 31.4 %

SUPPLEMENTAL BENEFITS

Per hour:

07/01/2024

Group A \$ 30.90
*plus 7% of the hourly wage paid

Group B \$ 26.90
*plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE. NOTE: Double time for all emergency work designated by the Dept. of Jurisdiction. WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.
Overtime See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyworker's Lineman wage.

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

07/01/2024

\$ 26.90
*plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249a

Lineman Electrician - Teledata

02/01/2025

JOB DESCRIPTION Lineman Electrician - Teledata

DISTRICT 6

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

Per hour:

For outside work, stopping at first point of attachment (demarcation).

07/01/2024 01/01/2025

Cable Splicer	\$ 39.24	\$ 40.81
Installer, Repairman	\$ 37.24	\$ 38.73
Teledata Lineman	\$ 37.24	\$ 38.73
Tech., Equip. Operator	\$ 37.24	\$ 38.73
Groundman	\$ 19.74	\$ 20.53

NOTE: EXCLUDES Teledata work within ten (10) feet of High Voltage (600 volts and over) transmission lines. For this work please see LINEMAN.

SHIFT WORK

THE FOLLOWING RATES APPLY WHEN THE CONTRACTING AGENCY MANDATES MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION ARE WORKED. WHEN TWO (2) OR THREE (3) SHIFTS ARE WORKED THE FOLLOWING RATES APPLY:

1ST SHIFT	REGULAR RATE
2ND SHIFT	REGULAR RATE PLUS 10%
3RD SHIFT	REGULAR RATE PLUS 15%

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2024	01/01/2025
Journeyworker	\$ 5.70	\$ 5.70
	*plus 3% of the hour wage paid	*plus 3% of the hour wage paid

*The 3% is based on the hourly wage paid, straight time rate or premium rate.

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 16) on HOLIDAY PAGE

6-1249LT - Teledata

Lineman Electrician - Traffic Signal, Lighting **02/01/2025**

JOB DESCRIPTION Lineman Electrician - Traffic Signal, Lighting **DISTRICT 6**

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Cortland, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Warren, Washington, Wayne, Wyoming, Yates

WAGES

Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors which includes, but is not limited to road loop wires; conduit and plastic or other type pipes that carry conductors, flex cables and connectors, and to oversee the encasement or burial of such conduits or pipes.

Crane Operators: Operation of any type of crane on Traffic Signal/Lighting projects.

Crawler Backhoe: Operation of tracked excavator/crawler backhoe with 1/2 yard bucket or larger on Traffic Signal/Lighting projects.

Digging Machine Operator: All other digging equipment and augering on Traffic Signal/Lighting projects.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

A flagger's duties shall consist of traffic control only.

Per hour:	07/01/2024
Group A:	
Lineman, Technician	\$ 50.54
Crane, Crawler Backhoe	50.54

Certified Welder	53.07
Group B:	
Digging Machine	45.49
Tractor Trailer Driver	42.96
Groundman, Truck Driver	40.43
Equipment Mechanic	40.43
Flagman	30.32

Above rates are applicable for installation, testing, operation, maintenance and repair on all Traffic Control (Signal) and Illumination (Lighting) projects, Traffic Monitoring Systems, and Road Weather Information Systems. Includes digging of holes for poles, anchors, footer foundations for electrical equipment; assembly of all electrical materials or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

SHIFT WORK

THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM TO 4:30 PM	REGULAR RATE
2ND SHIFT	4:30 PM TO 1:00 AM	REGULAR RATE PLUS 17.3%
3RD SHIFT	12:30 AM TO 9:00 AM	REGULAR RATE PLUS 31.4%

SUPPLEMENTAL BENEFITS

Per hour worked:

07/01/2024

Group A \$ 30.90
 *plus 7% of the hourly wage paid

Group B \$ 26.90
 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE. NOTE: Double time for all emergency work designated by the Dept. of Jurisdiction. WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.
 Overtime: See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyworker's Lineman wage.

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

07/01/2024

\$ 26.90
 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249a-LT

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

WAGES

Applies to line clearance, tree work and right-of-way preparation on all new or existing energized overhead or underground electrical, telephone and CATV lines. This also includes stump removal near underground energized electrical lines including telephone and CATV lines.

Per hour:	07/01/2024
Tree Trimmer	\$ 31.44
Equipment Operator	27.80
Equipment Mechanic	27.80
Truck Driver	23.15
Groundman	19.07
Flag person	15.00*

*NOTE-Rate effective on 01/01/2025 - \$15.50 due to minimum wage increase.

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2024
Journeyworker	\$ 10.48 *plus 4.5% of the hourly wage paid

* The 4.5% is based on the hourly wage paid, straight time rate or premium rate.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE

WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (5, 6, 8, 15) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 15, 16, 25) on HOLIDAY PAGE

NOTE: All paid holidays falling on a Saturday shall be observed on the preceding Friday. All paid holidays falling on a Sunday shall be observed on the following Monday.

6-1249TT

Mason - Building **02/01/2025**

JOB DESCRIPTION Mason - Building **DISTRICT 5**

ENTIRE COUNTIES

Cortland, Tompkins

WAGES

Per hour:	07/01/2024
Building:	
Brick/Block layer, Cement Mason	\$ 33.68
Plasterer/EFIS, Stone Mason, Tuck Pointer	

SUPPLEMENTAL BENEFITS

Per hour:	
Journeyman	\$ 28.69

OVERTIME PAY

See (B,E,E2*,Q) on OVERTIME PAGE

*Note - Or other conditions beyond the employer's control such as fire or natural disaster.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

One year terms at the following wage:

1st	2nd	3rd	4th
\$ 21.52	\$ 26.58	\$ 27.69	\$ 30.31

Supplemental Benefits per hour:

1st	2nd	3rd	4th
\$ 23.74	\$ 24.38	\$ 27.07	\$ 28.26

5-3B lth - Z2

Mason - Heavy&Highway

02/01/2025

JOB DESCRIPTION Mason - Heavy&Highway

DISTRICT 5

ENTIRE COUNTIES

Allegany, Broome, Chautauqua, Chemung, Chenango, Cortland, Delaware, Genesee, Livingston, Monroe, Ontario, Orleans, Otsego, Schuyler, Seneca, Steuben, Tioga, Tompkins, Wayne, Wyoming, Yates

PARTIAL COUNTIES

Cattaraugus: Entire county except in the Township of Perrysburg and the Village of Gowanda only the Bricklayer classification applies.

Erie: Only the Bricklayer classification applies.

Niagara: Only the Bricklayer classification applies.

WAGES

Per hour:	07/01/2024
Heavy & Highway:	
Cement Mason	\$ 37.88
Bricklayer	37.88

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 24.53
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OVERTIME PAY

See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

1500 hour terms at the following percentage of Journeyman's wage:

1st	2nd	3rd	4th
50%	60%	70%	80%

Supplemental benefits per hour:

1st term	\$ 14.53
2nd term	\$ 23.57
3rd term	\$ 23.81
4th term	\$ 24.05

5-3h

Mason - Tile Finisher

02/01/2025

JOB DESCRIPTION Mason - Tile Finisher

DISTRICT 5

ENTIRE COUNTIES

Broome, Chenango, Cortland, Delaware, Otsego, Tioga, Tompkins

WAGES

Wages	
Per hour:	07/01/2024
Building:	
Marble, Slate, Terrazzo and Tile Finisher	\$ 32.00

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$ 21.47

OVERTIME PAY

See (B,E,E2*,Q) on OVERTIME PAGE

*Note - Or other conditions beyond the employer's control such as fire or natural disaster.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

One year terms at the following wage:

1st	2nd	3rd
\$ 19.20	\$ 22.40	\$ 25.60

Supplemental benefits per hour:

1st	2nd	3rd
\$ 13.89	\$ 14.28	\$ 18.73

5-3TF - Z4

Mason - Tile Setter

02/01/2025

JOB DESCRIPTION Mason - Tile Setter

DISTRICT 5

ENTIRE COUNTIES

Broome, Chemung, Chenango, Cortland, Delaware, Otsego, Schuylar, Steuben, Tioga, Tompkins

PARTIAL COUNTIES

Allegany: Towns of Alfred, Almond, Andover and Burns.

WAGES

Wages

Per Hour: 07/01/2024

Building:

Marble, Slate, Terrazzo and Tile Setter \$ 34.24

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$ 25.01

OVERTIME PAY

See (B,E,E2*,Q) on OVERTIME PAGE

*Note - Or other conditions beyond the employer's control such as fire or natural disaster.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

One year terms at the following wage:

1st	2nd	3rd	4th
\$ 20.54	\$ 23.97	\$ 27.39	\$ 30.82

Supplemental benefits per hour:

1st	2nd	3rd	4th
\$ 14.36	\$ 14.82	\$ 24.06	\$ 24.53

5-3TS - Z4

Millwright

02/01/2025

JOB DESCRIPTION Millwright

DISTRICT 6

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

WAGES

THE FOLLOWING RATE APPLIES TO ANY GAS/STEAM TURBINE AND OR RELATED COMPONENT WORK, INCLUDING NEW INSTALLATIONS OR MAINTENANCE AND ANY/ALL WORK PERFORMED WITHIN THE PROPERTY LIMITS OF A NUCLEAR FACILITY.

Per hour:	07/01/2024	07/01/2025
		Additional
Millwright - Power Generation	\$ 45.00	\$2.50*

* To be allocated at a later date.

NOTE: ADDITIONAL PREMIUMS PAID FOR THE FOLLOWING WORK LISTED BELOW (amount subject to any overtime premiums):

- Certified Welders shall receive an additional \$1.75 per hour provided they are directed to perform Certified Welding.
- If a work site has been declared a hazardous site by the Owner and the use of protective gear (including, as a minimum, air purifying canister-type chemical respirators) is required, then that employee shall receive an additional \$1.50 per hour.
- An employee performing the work of a machinist shall receive an additional \$2.00 per hour. For the purposes of this premium to apply, a "machinist" is a person who uses a lathe, Bridgeport, milling machine or similar type of tool to make or modify parts.
- When performing work underground at 500 feet and below, the employee shall receive an additional \$1.00 per hour.

SUPPLEMENTAL BENEFITS

Per hour paid:

Journeyworker	\$ 27.95*
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*NOTE: Subject to OT premium

OVERTIME PAY

See (B, E, E2, Q, V) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

NOTE: Any holiday that falls on Sunday shall be observed the following Monday. Any holiday that falls on Saturday shall be observed the preceding Friday.

REGISTERED APPRENTICES

WAGES per hour: One year terms at the following percentage of Journeyworker's wage:

Appr. 1st year	65 %*
Appr. 2nd year	75 %*
Appr. 3rd year	80 %*
Appr. 4th year	90 %*

*NOTE: Additional premium for the following work listed below:

Certified Welder	\$ 1.75
Hazardous Waste Work	1.50
Machinist	2.00
Underground (500' and below)	1.00

SUPPLEMENTAL BENEFITS per hour:

Appr. 1st year	\$ 11.89
Appr. 2nd year	23.14
Appr. 3rd year	24.74
Appr. 4th year	26.35

6-1163Power

Millwright

02/01/2025

JOB DESCRIPTION Millwright

DISTRICT 6

ENTIRE COUNTIES

Chemung, Cortland, Livingston, Monroe, Ontario, Orleans, Schuyler, Steuben, Tompkins, Wayne, Wyoming

WAGES

Per hour:	07/01/2024	07/01/2025
		Additional

Building	\$ 36.20	\$ 2.25*
Heavy & Highway	39.70	2.25*

* To be allocated at a later date.

NOTE: ADDITIONAL PREMIUMS PAID FOR THE FOLLOWING WORK LISTED BELOW (amount subject to any overtime premiums):

- Certified Welders shall receive an additional \$1.75 per hour provided they are directed to perform Certified Welding.
- On Building projects, If a work site has been declared a hazardous site by the Owner and the use of protective gear (including, as a minimum, air purifying canister-type chemical respirators) is required, then that employee shall receive an additional \$1.50 per hour.
- H/H work performed on hazardous waste sites where employees are required to wear protective gear shall receive an additional \$2.00 per hour over the Millwright H/H rate for all hours worked on the day protective gear was worn.
- An employee performing the work of a machinist shall receive an additional \$2.00 per hour. For the purposes of this premium to apply, a "machinist" is a person who uses a lathe, Bridgeport, milling machine or similar type of tool to make or modify parts.
- When performing work underground at 500 feet and below, the employee shall receive an additional \$1.00 per hour.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker	\$ 26.73
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OVERTIME PAY

See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6) on HOLIDAY PAGE

NOTE: Any holiday that falls on Sunday shall be observed the following Monday. Any holiday that falls on Saturday shall be observed the preceding Friday.

REGISTERED APPRENTICES

WAGES per hour: One year terms at the following percentage of Journeyworker's wage:

Appr. 1st year	65 %*
Appr. 2nd year	75 %*
Appr. 3rd year	80 %*
Appr. 4th year	90 %*

*NOTE: Additional premium for the following work listed below:

Certified Welder	\$ 1.75
Hazardous Waste (Bldg)	1.50
Hazardous Waste (H/H)	2.00
Machinist	2.00
Underground (500' and below)	1.00

SUPPLEMENTAL BENEFITS per hour:

Appr. 1st year	\$ 11.89
Appr. 2nd year	22.28
Appr. 3rd year	23.76
Appr. 4th year	25.25

6-1163

Operating Engineer - Building

02/01/2025

JOB DESCRIPTION Operating Engineer - Building

DISTRICT 6

ENTIRE COUNTIES

Cayuga, Cortland, Jefferson, Lewis, Madison, Oneida, Onondaga, Oswego, Seneca, St. Lawrence, Tompkins

WAGES

NOTE:

---If a prime contract is let for site work only, meaning no buildings are involved in their site contract, the Heavy/Highway rates would be applicable. When a prime contract is let for site work and building excavation is part of that contract, the Building rates would be applicable for the Operators classification.

---In the event that equipment listed below is operated by robotic control, the classification covering the operation will be the same as if manually operated.

---If a second employee is required by the employer for operation of any covered machine, they shall be an Engineer Class C.

CLASS A1*: All Cranes (A1 Includes Boom Trucks over 5 tons, Cableway, Cherry Picker, Derrick, Dragline, Dredge, Overhead Crane, Pile Driver, Tower Crane**, Truck Crane, Whirlies).

CLASS A: Air Plako, Asphalt & Blacktop Roller, Automated Concrete Spreader (CMI or equivalent), Automated Fine Grade Machine (CMI), Backhoe, Barrel Shredder, Belt Placer, Blacktop Spreader (such as Barber-Greene & Blaw Knox), Blacktop Plant (automated), Blast or Rotary Drill (Truck or Cat mounted), Boom Trucks 5 ton and under, Burning Plant Operator, Caisson Auger, Central Mix Plant (automated), Concrete Pump, Crusher (Rock), De-watering Press, Diesel Power Unit, Dirt Filter Press with Operation Equipment, Dredge, Dual Drum Paver, Elevating Grader (self-propelled or towed), Elevator Hoist - Two Cage, Excavator - all purpose hydraulically operated, Fork Lift (Loed/Lull and other rough terrain type), Front End Loader (4 c.y. and over), Gradall, Grader (Power), Head Tower (Saurman or equal), Hoist (2 or 3 Drum), Hydroblaster (Laser Pump), Light Plants - Compressors and Generators, Locomotive, Maintenance Engineer, Maintenance Welder, Mine Hoist, Mucking Machine or Mole, Quarry Master or Equivalent, Refrigeration Equipment (for soil stabilization), Scraper, Sea Mule, Shovel, Side Boom, Slip Form Paver, Straddle Buggy (Ross Carrier, Lumber Carrier), Tractor Drawn Belt Type Loader (Euclid Loader), Trenching Machine (digging capacity of over 4ft. depth), Truck or Trailer Mounted Log Chipper (self-feeder), Tug Operator (Manned, rented equipment excluded), Tunnel Shovel, Vibro or Sonic Hammer Controls (when not mounted in proximity to Rig Operator), Work Boat Operator including LCM's.

CLASS B: "A" Frame Truck, Back Dumps, Blacktop Plant (non-automatic), Boring Machine, Bulldozer, Cage-Hoist, Central Mix Plant (non-automated), Compressor, Pump, Generator or Welding machine (when used in battery of not more than five (5)), Concrete Paver (single drum over 16'), Core boring machine, Drill Rigs - tractor mounted, Elevator - as material hoist, Farm Tractor (with or without accessories), Fork Lift (over 10 ton with or without attachments), Front End Loader (under 4 c.y.), Grout Pump, Guniting Machine, High Pressure Boiler (15 lbs. & over), Hoist (one drum), Hydraulic Breaking Hammer (Drop Hammer), Kolman Plant Loader (screening gravel), Maintenance Grease Man, Mixer for stabilized base - self-propelled (Seaman Mixer), Monorail Machine, Parapet Concrete or Pavement Grinder, Parts Man, Post Driver (truck or tractor mounted), Post Hole Digger (truck or tractor mounted), Power Sweeper (Wayne or similar), Pump-Crete or Squeeze-Crete, Road Widener (front end of Grader or self-propelled), Roller, Self-contained hydraulic bench drill, Shell Winder (motorized), Skid steer (Bobcat type loader), Snorkel (overhead arms), Snowblower control man, Tractor (with or without accessories), Trenching Machine (digging capacity of 4 ft. or less), Tugger Hoist, Vacuum Machine (self-propelled or mounted), Vibro Tamp, Well Drill / Well Point System (Submersible pumps when used in lieu of Well Point System), Winch (Motor driven), Winch Cat, Winch Truck.

CLASS C: Compressor (up to 500 cfm), Concrete Paver or Mixer (under 16'), Concrete Pavement Spreaders & Finishers (not automated), Conveyor (over 12 ft), Electric Submersible Pump (4" and over), Fine Grade Machine (not automated), Fireman, Fork Lift ("with or without" attachments, 10 ton and under), Form Tamper, Generator (2,500 watts and over), Hydraulic Pump, Mechanical Heaters (More than two (2) Mechanical Heaters or any Mechanical Heater or Heaters whose combined output exceeds 640,000 BTU per hour (manufacturer's rating) plus one self-contained heating unit - i.e. Sundog or Air Heat type - New Holland Hay Dryer type excluded), Mulching Machine, Oiler, Power Driven Welding Machine (300 amp and over, other than all electric. One Welding Machine under 300 amp will not require an engineer unless in a battery), Power Heaterman (hay dryer), Pumps (water and trash), Revinus Widener (road widener), Single Light Plant, Steam Cleaner or Jenny.

Per hour: Building	07/01/2024	07/01/2025
Class A1*	\$ 47.62	\$ 49.61
Class A	46.12	48.11
Class B	44.00	45.99
Class C	39.78	41.77

Additional \$2.50 per hour if work requires Personal Protective Equipment for hazardous waste site activities with a level C or over rating.

(*) TONNAGE PREMIUMS:

- All cranes up to 64 ton capacity - A1 rate
- All cranes 65 ton to 110 ton capacity - A1 rate plus \$ 1.50
- All cranes 111 ton to 199 ton capacity - A1 rate plus \$ 2.00
- All cranes 200 ton to 399 ton capacity - A1 rate plus \$ 3.00
- All cranes 400 ton to 599 ton capacity - A1 rate plus \$ 4.00
- All cranes 600 ton to 799 ton capacity - A1 rate plus \$ 5.00
- All cranes 800 ton to 999 ton capacity - A1 rate plus \$ 6.00
- All cranes 1000 ton capacity and over - A1 rate plus \$ 7.00

(**) Tower Cranes - A1 rate plus \$2.50 (no tonnage premiums apply)

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker	\$ 31.02	\$ 32.12
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OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6) on HOLIDAY PAGE
 Overtime: See (5, 6) on HOLIDAY PAGE

NOTE: If the holiday falls on Sunday, it will be celebrated on Monday.

REGISTERED APPRENTICES

WAGES per hour: One thousand hour terms at the following percentage of Journeyworker's CLASS A wage:

1st year	60%
2nd year	65%
3rd year	70%
4th year	80%

Additional \$2.50 per hour if work requires Personal Protective Equipment for hazardous waste site activities with a level C or over rating.

SUPPLEMENTAL BENEFITS per hour:

	07/01/2024	07/01/2025
All Terms:	\$ 30.95	\$ 32.05

6-158-545b.s

Operating Engineer - Heavy&Highway

02/01/2025

JOB DESCRIPTION Operating Engineer - Heavy&Highway

DISTRICT 6

ENTIRE COUNTIES

Cayuga, Cortland, Jefferson, Lewis, Madison, Oneida, Onondaga, Oswego, Seneca, St. Lawrence, Tompkins

WAGES

NOTE:

---In the event that equipment listed below is operated by robotic control, the classification covering the operation will be the same as if manually operated.

---If a second employee is required by the employer for operation of any covered machine, they shall be an Engineer Class C.

CLASS A1*: All Cranes that require a NYS Crane License (Boom Truck, Cherry Picker, Derrick, Dragline, Overhead Crane (Gantry or Straddle Type), Pile Driver, Tower Cranes (including self erecting)**, Truck Crane).

CLASS A: Asphalt Curb Machine (self-propelled, slipform); Asphalt Paver; Automated Concrete Spreader (CMI type); Automatic Fine Grader; Backhoe (except tractor mounted, rubber tired); Backhoe Excavator, Full Swing (CAT 212 or similar type); Back Filling Machine; Belt Placer (CMI type); Blacktop Plant (automated);Blacktop Roller; Bull Dozer being operated with active GPS; Cableway; Caisson Auger; Central Mix Concrete Plant (automated); Concrete Curb Machine (self-propelled, slipform); Concrete Pump; Cranes - listed in A1 that do not require a NYS Crane License; Directional Boring/Drilling Machine; Dredge; Dual Drum Paver; Excavator (all purpose-hydraulic, Gradall or similar); Front End Loader (4 cu. yd. & over); Head Tower (Sauerman or equal); Hoist (two or three drum); Holland Loader; Maintenance Engineer; Mine Hoist; Mucking Machine or Mole; Pavement Breaker (SP Wertgen; PB-4 and similar type); Profiler/Milling Machine (over 105 h.p.); Power Grader; Quad 9; Quarry Master (or equivalent); Rotating Telehandler; Scraper (including challenger type); Shovel; Side Boom; Slip Form Paver; Tractor Drawn Belt-Type Loader; Truck or Trailer Mounted Chipper (self-feeder); Tug Operator (manned rented equipment excluded); Tunnel Shovel.

CLASS B: Backhoe (tractor mounted, rubber tired); Bituminous Recycler Machine; Bituminous Spreader and Mixer; Blacktop Plant (non-automated); Blast or Rotary Drill (truck or tractor mounted); Boring Machine; Bridge Deck Finishing Machine; Brokk; Cage Hoist; Central Mix Plant (non-automated) and All Concrete Batching Plants; Concrete Paver (over 16'); Crawler Drill (self-contained); Crusher; Diesel Power Unit; Drill Rigs (truck or tractor mounted); Front End Loader (under 4 cu. yd.); Greaseman - Lubrication Engineer; HiPressure Boiler (15 lbs & over); Hoist (one drum); Hydro-Axe; Kolman Plant Loader & similar type loaders; Locomotive; Material Handling Knuckle Boom; Mini Excavators (under 18,000 lbs.); Mixer (for stabilized base, self-propelled); Monorail Machine; Profiler/Milling Machine (105 h.p. and under); Plant Engineer; Prentice Loader; Pug Mill; Pump Crete; Ready Mix Concrete Plant; Refrigeration Equipment (for soil stabilization); Road Widener; Roller (all above subgrade, See Class A for Blacktop Roller); Sea Mule; Self-contained ride-on Rock Drill (excluding Air-Track type drill); Skidder; Tractor with Dozer and/or Pusher; Trencher; Tugger Hoist; Vacuum Machine (mounted or towed); Vermeer Saws (ride-on, any size or type); Welder; Winch and Winch Cat; Work Boat Operator including L.C.M.'s.

CLASS C: "A" Frame Winch Hoist (On Truck); Aggregate Plant; Articulated Heavy Hauler; Asphalt or Concrete Grooving Machine (ride-on); Ballast Regulator (ride-on); Bituminous Heater (self-propelled); Boat (powered); Boiler (used in conjunction with production); Cement & Bin Operator; Compressors***; Concrete Pavement Spreader and Finisher; Concrete Paver or Mixer (16' & under); Concrete Saw (self-propelled); Conveyor; Deck Hand; Directional Boring/Drilling Machine Locator; Drill (Core); Drill (Well); Dust Collectors***; Electric Pump When Used in Conjunction with Well Point System; Farm Tractor with accessories; Fine Grade Machine; Fireman; Fork Lift; Form Tamper; Generators***; Grout Pump; Gunite Machine; Hammers (hydraulic self-propelled); Heaters***; Hydra-Spiker (ride-on); Hydraulic Pump (jacking system); Hydro-Blaster (water); Light Plants***; Mulching Machine; Oiler; Parapet Concrete or Pavement Grinder; Post Hole Digger (excluding hand-held); Post Driver; Power Broom (towed); Power Heaterman; Power Sweeper; Pumps***; Revinius Widener; Roller (subgrade & fill); Scarifier (ride-on); Shell Winder; Skid Steer Loader (Bobcat or similar, including all attachments); Span Saw (ride-on); Steam Cleaner; Tamper (ride-on); Tie Extractor (ride-on); Tie Handlers (ride-on); Tie Inserters (ride-on); Tie Spacers (ride-on); Tire Repair; Track Liner (ride-on); Tractor; Tractor (with towed accessories); Vacuum Machine (self-propelled); Vibratory Compactor; Vibro Tamp; Welding Machines***; Well Point.

***CLASS C NOTE: Considered Hands-Off (unmanned). Includes only operation and maintenance of the equipment.

Per hour: H/H	07/01/2024	07/01/2025
CLASS A1*	\$ 56.51	\$ 58.85
CLASS A	53.51	55.85
CLASS B	52.63	54.97
CLASS C	49.35	51.69

(*) TONNAGE PREMIUMS:

- All cranes up to 64 ton capacity - A1 rate
- All cranes 65 ton to 110 ton capacity - A1 rate plus \$ 1.50
- All cranes 111 ton to 199 ton capacity- A1 rate plus \$ 2.00
- All cranes 200 ton to 399 ton capacity - A1 rate plus \$ 3.00
- All cranes 400 ton to 599 ton capacity - A1 rate plus \$ 4.00
- All cranes 600 ton to 799 ton capacity - A1 rate plus \$ 5.00
- All cranes 800 ton to 999 ton capacity - A1 rate plus \$ 6.00
- All cranes 1000 ton capacity and over - A1 rate plus \$ 7.00

(**) Tower Cranes - A1 rate plus \$3.00 (no tonnage premiums apply)

- Cranes in Luffer Configuration - A1 rate plus \$ 5.00
- Cranes with external ballast (Tray or Wagon) - A1 rate plus \$ 5.00

Additional \$2.50 per hour for hazardous waste removal work on a State and/or Federally designated waste site which requires employees to wear Level C or above forms of personal protection.

SHIFT WORK

SINGLE IRREGULAR WORK SHIFT: Additional \$2.50 per hour for all employees who work a single irregular work shift starting from 5:00 PM to 1:00 AM that is mandated by the Contracting Agency.

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2024	07/01/2025
Journeyworker	\$ 32.45	\$ 33.55

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6) on HOLIDAY PAGE
 Overtime: See (5, 6) on HOLIDAY PAGE

NOTE: If a holiday falls on Sunday, it will be celebrated on Monday. If an employee works on this Monday, they shall be compensated at double time plus the holiday pay (triple time). If a holiday falls on a Saturday, employees who work a Saturday Holiday shall be paid double time plus the holiday pay.

REGISTERED APPRENTICES

WAGES per hour: One thousand hour terms at the following percentage of Journeyworker's CLASS B wage.

1st term	60%
2nd term	70%
3rd term	80%
4th Term	90%

Additional \$2.50 per hour for hazardous waste removal work on a State and/or Federally designated waste site which requires employees to wear Level C or above forms of personal protection.

SUPPLEMENTAL BENEFITS per hour: Same as Journeyworker

6-158-545h

Operating Engineer - Survey Crew

02/01/2025

JOB DESCRIPTION Operating Engineer - Survey Crew

DISTRICT 12

ENTIRE COUNTIES

Albany, Allegany, Broome, Cayuga, Chemung, Chenango, Clinton, Columbia, Cortland, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Oneida, Onondaga, Ontario, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Warren, Washington, Wayne, Yates

PARTIAL COUNTIES

Dutchess: The northern portion of the county from the northern boundary line of the City of Poughkeepsie, north.
 Genesee: Only the portion of the county that lies east of a line down the center of Route 98 to include all area that lies within the City of Batavia.

WAGES

These rates apply to Building, Tunnel and Heavy Highway.

Per hour:

SURVEY CLASSIFICATIONS:

- Party Chief - One who directs a survey party.
- Instrument Person - One who operates the surveying instruments.
- Rod Person - One who holds the rods and assists the Instrument Person.

07/01/2024

Party Chief	\$ 50.65
Instrument Person	46.54
Rod Person	34.55
Additional \$3.00/hr. for Tunnel Work	
Additional \$2.50/hr. for Hazardous Work Site	

SUPPLEMENTAL BENEFITS

Per hour worked:

Journeyman	\$ 29.75
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OVERTIME PAY

See (B, E, P, *X) on OVERTIME PAGE

*Note: \$25.10/Hr. Only for "ALL" premium hours paid when worked.

HOLIDAY

Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

WAGES: 1000 hour terms based on the Percentage of Rod Persons Wage:

07/01/2024

0-1000	60%
1001-2000	70%
2001-3000	80%

SUPPLEMENTAL BENEFIT per hour worked:

0-1000	\$ 21.53 / PHP \$18.45
1001-2000	24.55 / " 20.45
2001-3000	27.58/ " 22.93

NOTE: PHP is premium hours paid when worked.

12-158-545 D.H.H.

Operating Engineer - Survey Crew - Consulting Engineer	02/01/2025
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JOB DESCRIPTION Operating Engineer - Survey Crew - Consulting Engineer

DISTRICT 12

ENTIRE COUNTIES

Albany, Allegany, Broome, Cayuga, Chemung, Chenango, Clinton, Columbia, Cortland, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Oneida, Onondaga, Ontario, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Warren, Washington, Wayne, Yates

PARTIAL COUNTIES

Dutchess: The northern portion of the county from the northern boundary line of the City of Poughkeepsie, north.
Genesee: Only the portion of the county that lies east of a line down the center of Route 98 to include all area that lies within the City of Batavia.

WAGES

These rates apply to feasibility and preliminary design surveying, line and grade surveying for inspection or supervision of construction when performed under a Consulting Engineer Agreement.

Per hour:

SURVEY CLASSIFICATIONS:

- Party Chief - One who directs a survey party.
- Instrument Person - One who operates the surveying instruments.
- Rod Person - One who holds the rods and assists the Instrument Person.

07/01/2024

Party Chief	\$ 50.65
Instrument Person	46.54
Rod Person	34.55

Additional \$3.00/hr. for Tunnel Work.
 Additional \$2.50/hr. for EPA or DEC certified toxic or hazardous waste work.

SUPPLEMENTAL BENEFITS

Per hour worked:

Journeyman	\$ 29.75
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OVERTIME PAY

See (B, E, Q, *X) on OVERTIME PAGE

*Note: \$25.10/Hr. Only for "ALL" premium hours paid when worked.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

WAGES: 1000 hour terms based on percentage of Rod Persons Wage:

07/01/2024

0-1000	60%
1001-2000	70%
2001-3000	80%

SUPPLEMENTAL BENEFIT per hour worked:

0-1000	\$ 21.53 / PHP \$18.45
1001-2000	\$ 24.55 / " 20.45
2001-3000	\$ 26.98 / " 22.93

NOTE: PHP is premium hours paid when worked.

12-158-545 DCE

Operating Engineer - Tunnel

02/01/2025

JOB DESCRIPTION Operating Engineer - Tunnel

DISTRICT 7

ENTIRE COUNTIES

Albany, Allegany, Broome, Cayuga, Chemung, Chenango, Clinton, Columbia, Cortland, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Oneida, Onondaga, Ontario, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Warren, Washington, Wayne, Yates

PARTIAL COUNTIES

Dutchess: Northern part of Dutchess, to the northern boundary line of the City of Poughkeepie, then due east to Route 115 to Bedell Road, then east along Bedell Road to VanWagner Road, then north along VanWagner Road to Bower Road, then east along Bower Road to Rte. 44 east to Rte. 343, then along Rte. 343 east to the northern boundary of the Town of Dover Plains and east along the northern boundary of the Town of Dover Plains, to the borderline of the State of Connecticut.

Genesee: Only that portion of the county that lies east of a line drawn down the center of Route 98 and the entirety of the City of Batavia.

WAGES

CLASS A: Automatic Concrete Spreader (CMI Type); Automatic Fine Grader; Backhoe (except tractor mounted, rubber tired); Belt Placer (CMI Type); Blacktop Plant (automated); Cableway; Caisson Auger; Central Mix Concrete Plant (automated); Concrete Curb Machine (self-propelled slipform); Concrete Pump (8" or over); Dredge; Dual Drum Paver; Excavator; Front End Loader (4 cu. yd & over); Gradall; Head Tower (Sauerman or Equal); Hoist (shaft); Hoist (two or three Drum); Log Chipper/Loader (self-feeder); Maintenance Engineer (shaft and tunnel); any Mechanical Shaft Drill; Mine Hoist; Mining Machine(Mole and similar types); Mucking Machine or Mole; Overhead Crane (Gantry or Straddle Type); Pile Driver; Power Grader; Remote Controlled Mole or Tunnel Machine; Scraper; Shovel; Side Boom; Slip Form Paver (If a second man is needed, they shall be an Oiler); Tripper/Maintenance Engineer (shaft & tunnel); Tractor Drawn Belt-Type Loader; Tug Operator (manned rented equipment excluded); Tunnel Shovel.

CLASS B: Automated Central Mix Concrete Plant; Backhoe (topside); Backhoe (track mounted, rubber tired); Backhoe (topside); Bituminous Spreader and Mixer, Blacktop Plant (non-automated); Blast or Rotary Drill (truck or tractor mounted); Boring Machine; Cage Hoist; Central Mix Plant(non-automated); all Concrete Batching Plants; Compressors (4 or less exceeding 2,000 c.f.m. combined capacity); Concrete Pump; Crusher; Diesel Power Unit; Drill Rigs (tractor mounted); Front End Loader (under 4 cu. yd.); Grayco Epoxy Machine; Hoist (One Drum); Hoist (2 or 3 drum topside); Knuckle Boom material handler; Kolman Plant Loader & similar type Loaders (if employer requires another person to clean the screen or to maintain the equipment, they shall be an Oiler); L.C.M. Work Boat Operator; Locomotive; Maintenance Engineer (topside); Maintenance Grease Man; Mixer (for stabilized base-self-propelled); Monorail Machine; Plant Engineer; Personnel Hoist; Pump Crete; Ready Mix Concrete Plant; Refrigeration Equipment (for soil stabilization); Road Widener; Roller (all above sub-grade); Sea Mule; Shotcrete Machine; Shovel (topside); Tractor with Dozer and/or Pusher; Trencher; Tugger Hoist; Tunnel Locomotive; Vacuum Machine (mounted or towed); Welder; Winch; Winch Cat.

CLASS C: A Frame Truck; All Terrain Telescoping Material Handler; Ballast Regulator (ride-on); Compressors (4 not to exceed 2,000 c.f.m. combined capacity; or 3 or less with more than 1200 c.f.m. but not to exceed 2,000 c.f.m.); Compressors ((any size, but subject to other provisions for compressors), Dust Collectors, Generators, Pumps, Welding Machines, Light Plants (4 or any type combination)); Concrete Pavement Spreaders and Finishers; Conveyor; Drill (core); Drill (well); Electric Pump used in conjunction with Well Point System; Farm Tractor with Accessories; Fine Grade Machine; Fork Lift; Grout Pump (over 5 cu. ft.); Gunite Machine; Hammers (hydraulic-self-propelled); Hydra-Spiker (ride-on); Hydra-Blaster (water); Hydro-Blaster; Motorized Form Carrier; Post Hole Digger and Post Driver; Power Sweeper; Roller grade & fill); Scarifer (ride-on); Span-Saw (ride-on); Submersible Electric Pump (when used in lieu of well points); Tamper (ride-on); Tie-Extractor (ride-on), Tie Handler (ride-on), Tie Inserter (ride-on), Tie Spacer (ride-on); Track Liner (ride-on); Tractor with towed accessories; Vibratory Compactor; Vibro Tamp, Well Point.

CLASS D: Aggregate Plant; Cement & Bin Operator; Compressors (3 or less not to exceed 1,200 c.f.m. combined capacity); Compressors ((any size, but subject to other provisions for compressors), Dust Collectors, Generators, Pumps, Welding Machines, Light Plants (3 or less or any type or combination)); Concrete Saw (self-propelled); Form Tamper; Greaseman; Hydraulic Pump (jacking system); Junior Engineer; Light Plants; Mulching Machine; Oiler; Parapet Concrete or Pavement Grinder; Power Broom (towed); Power Heaterman (when used for production); Revinius Widener; Shell Winder; Steam Cleaner; Tractor.

Per hour:	07/01/2024	07/01/2025
CLASS A	\$ 55.91	\$ 58.44
CLASS B	54.69	57.22
CLASS C	51.90	54.43
CLASS D	48.89	51.42

Additional \$5.00 per hour for Hazardous Waste Work on a state or federally designated hazardous waste site where the Operating Engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin and eye protection.

CRANES:

Crane 1: All cranes, including self-erecting.

Crane 2: All Lattice Boom Cranes and all cranes with a manufacturer's rating of fifty (50) ton and over.

Crane 3: All hydraulic cranes and derricks with a manufacturer's rating of forty nine (49) ton and below, including boom trucks.

Crane 1	\$ 59.91	\$ 62.44
Crane 2	58.91	61.44
Crane 3	57.91	60.44

SUPPLEMENTAL BENEFITS

Per hour:		
	\$ 25.05	\$ 25.90
	+ 9.85*	+ 10.10*

* This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY

See (B, B2, E, Q, X) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

NOTE: If a holiday falls on Sunday, it shall be observed on Monday.

REGISTERED APPRENTICES

WAGES:(1000) hours terms at the following percentage of Journeyworker's Class B wage.

1st term	60%
2nd term	65%
3rd term	70%
4th term	75%

SUPPLEMENTAL BENEFITS per hour: Same as Journeyworker

Painter **02/01/2025**

JOB DESCRIPTION Painter

DISTRICT 2

ENTIRE COUNTIES

Cortland, Tompkins

WAGES

Per hour:

	07/01/2024	05/01/2025	05/01/2026
Painter	\$ 27.50	Additional \$ 1.60*	Additional \$ 1.85*
Taper, Paperhangers, and Vinyl hangers	28.88	1.64*	1.90*

*To be allocated at a later date.

ADDITIONAL AMOUNTS FOR SPECIFIC TYPES OF JOBSITE CONDITIONS (amount subject to any overtime premiums):

- Additional \$ 1.10 per hour for Brush and Roll Epoxy (Solvent Base Only)
- Additional \$ 0.60 per hour for Swing Scaffold, Boatswain chair, Spray helper, Steam cleaning acid and high pressure water, Power grinders with respirator
- Additional \$ 0.60 per hour for Structural steel (buildings) defined as new or old construction where ceilings, walls or the steel itself is to be painted from open trusses which require climbing or crawling without the support of solid scaffolding or scaffolding starting at the floor or ground level.
- Additional \$ 1.00 per hour for Spray Painting
- Additional \$ 1.00 per hour for Steeple Jack (Over 100 feet)
- Additional \$ 1.50 per hour for Spray Epoxy (Solvent Based)
- Additional \$ 0.90 per hour for Sandblasting

NOTE - SEE BRIDGE PAINTER RATES FOR BRIDGES & TANKS

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 24.08

OVERTIME PAY

See (B, E2, F, R) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

A Holiday that falls on a Sunday will be celebrated on Monday, a holiday that falls on a Saturday will be celebrated on Friday.

REGISTERED APPRENTICES

WAGES:

Painter: 750 hour terms at the Painter Apprentice wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th
\$ 18.00	\$ 19.00	\$ 20.00	\$ 21.00	\$ 22.00	\$ 23.00	\$ 24.00	\$ 25.00

Taper: 750 hour terms at the following Journeyworker Taper Apprentice wage rate:

1st	2nd	3rd	4th	5th	6th
\$ 20.00	\$ 21.00	\$ 22.00	\$ 23.00	\$ 24.00	\$ 25.00

ADDITIONAL AMOUNTS FOR SPECIFIC TYPES OF JOBSITE CONDITIONS (amount subject to any overtime premiums):

- Additional \$ 1.10 per hour for Brush and Roll Epoxy (Solvent Base Only)
- Additional \$ 0.60 per hour for Swing Scaffold, Boatswain chair, Spray helper, Steam cleaning acid and high pressure water, Power grinders with respirator
- Additional \$ 0.60 per hour for Structural steel (buildings) defined as new or old construction where ceilings, walls or the steel itself is to be painted from open trusses which require climbing or crawling without the support of solid scaffolding or scaffolding starting at the floor or ground level.
- Additional \$ 1.00 per hour for Spray Painting
- Additional \$ 1.00 per hour for Steeple Jack (Over 100 feet)
- Additional \$ 1.50 per hour for Spray Epoxy (Solvent Based)
- Additional \$ 0.90 per hour for Sandblasting

SUPPLEMENTAL BENEFITS per hour:

Painter/Decorator:

1st	2nd	3rd	4th	5th	6th	7th	8th
\$ 6.00	\$ 7.00	\$ 8.00	\$ 9.10	\$ 11.00	\$ 11.00	\$ 13.00	\$ 14.00

Taper/Drywall Finisher:

1st	2nd	3rd	4th	5th	6th
\$ 6.00	\$ 7.00	\$ 8.00	\$ 10.00	\$ 13.00	\$ 14.00

2-178 I

Painter **02/01/2025**

JOB DESCRIPTION Painter

DISTRICT 3

ENTIRE COUNTIES

Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Cortland, Delaware, Erie, Genesee, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Wayne, Wyoming, Yates

WAGES

Per hour: 07/01/2024

Bridge	\$ 43.81
Tunnel	43.81
Tank*	41.81

For Bridge Painting Contracts, ALL WORKERS on and off the bridge (including Flagmen) are to be paid Painter's Rate; the contract must be ONLY for Bridge Painting.

Tank rate applies to indoor and outdoor tanks, tank towers, standpipes, digesters, waste water treatment tanks, chlorinator tanks, etc. Covers all types of tanks including but not limited to steel tanks, concrete tanks, fiberglass tanks, etc.

SHIFT WORK

Note an additional \$1.50 per hour is required when the contracting agency or project specification requires any shift to start prior to 6:00am or after 12:00 noon.

SUPPLEMENTAL BENEFITS

Per hour: \$ 31.39

OVERTIME PAY

Exterior work only See (B, E4, F*, R) on OVERTIME PAGE.

All other work See (B, F*, R) on OVERTIME PAGE.

*Note - Saturday is payable at straight time if the employee misses work, except where a doctor's or hospital verification of illness is produced Monday through Friday when work was available to the employee.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

750 hour terms at the following wage:

1st	2nd	3rd	4th	5th	6th
\$ 24.00	\$ 26.00	\$ 28.00	\$ 30.00	\$ 34.00	\$ 38.00

Supplemental benefits per hour:

1st	2nd	3rd	4th	5th	6th
\$ 6.60	\$ 6.95	\$ 7.30	\$ 7.65	\$ 8.00	\$ 8.35

3-4-Bridge, Tunnel, Tank

Painter - Metal Polisher **02/01/2025**

JOB DESCRIPTION Painter - Metal Polisher

DISTRICT 8

ENTIRE COUNTIES

Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

07/01/2024

Metal Polisher	\$ 39.33
Metal Polisher*	40.43
Metal Polisher**	43.33

*Note: Applies on New Construction & complete renovation

** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2024

Journeyworker:

All classification \$ 12.79

OVERTIME PAY

See (B, E, P, T) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

One (1) year term at the following wage rates:

07/01/2024

1st year \$ 19.67
 2nd year 21.63
 3rd year 23.60

1st year* \$ 22.06
 2nd year* 22.07
 3rd year* 24.14

1st year** \$ 22.17
 2nd year** 24.13
 3rd year** 26.10

*Note: Applies on New Construction & complete renovation

** Note: Applies when working on scaffolds over 34 feet.

Supplemental benefits:

Per hour:

1st year \$ 8.69
 2nd year 8.69
 3rd year 8.69

8-8A/28A-MP

Plumber

02/01/2025

JOB DESCRIPTION Plumber

DISTRICT 6

ENTIRE COUNTIES

Chemung, Cortland, Onondaga, Schuyler, Tompkins

PARTIAL COUNTIES

Madison: Only the Townships of Sullivan, Cazenovia and DeRuyter.

Seneca: Only the Townships of Covert and Lodi.

Steuben: Only the Townships of Addison, Bath, Bradford, Campbell, Caton, Corning, Erwin, Hornby, Lindley, Pulteney, Rathbone, Thurston, Tuscarora, Urbana and Wayne.

Tioga: Only the Townships of Barton, Berkshire, Candor, Nichols, Richford, Spencer and Tioga.

WAGES

Per hour:	07/01/2024	05/01/2025	05/01/2026
		Additional	Additional
Plumber, Steamfitter, Pipefitter, Welder, HVAC, Refrigeration.	\$ 45.11	\$ 4.25*	\$ 4.50*

*To be allocated at a later date.

SHIFT WORK

SINGLE IRREGULAR WORK SHIFT: Additional 15% premium added to the wages above for a single irregular work shift outside of normal working hours.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 27.05*

*NOTE: \$10.27 of the supplemental benefits are paid at the same premium as shown for overtime work performed at semi-conductor manufacturer and/or fabrication plants.

OVERTIME PAY

Time and one half for the 9th & 10th hours Monday thru Friday and first 10 hours on Saturday. All other overtime hours are double-time.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6) on HOLIDAY PAGE

NOTE: If a holiday falls on Saturday, the holiday will be observed on the preceding Friday. If a holiday falls on Sunday, it will be observed on the following Monday.

REGISTERED APPRENTICES

WAGES per hour: One year terms at the following percentage of the Journeyworker's wage:

1st	2nd	3rd	4th	5th
55%	60%	70%	75%	85%

SUPPLEMENTAL BENEFITS per hour*:

1st	\$ 15.13
2nd	23.89
3rd	24.44
4th	24.99
5th	25.92

*NOTE: Below is the portion of supplemental benefits paid at overtime premiums for work performed at semi-conductor manufacturer and/or fabrication plants:

1st	n/a
2nd	\$ 8.58
3rd	\$ 8.77
4th	\$ 9.14
5th	\$ 9.71

6-81-SF

Roofer

02/01/2025

JOB DESCRIPTION Roofer

DISTRICT 2

ENTIRE COUNTIES

Broome, Chemung, Chenango, Delaware, Otsego, Schoharie, Schuyler, Steuben, Tioga, Tompkins

WAGES

Per hour:	07/01/2024	06/01/2025
		Additional
Roofer, Waterproofer	\$ 29.61	\$ 2.50**
	+ 0.99*	

*This amount is paid for all hours worked, whether regular or premium hours.

**To be allocated at a later date

NOTE ADDITIONAL PREMIUMS PAID FOR THE FOLLOWING WORK LISTED BELOW (amount not subject to overtime premiums):

- On days where more than one shift is worked on the job, the hours worked after 4:30 PM and before 6:30 AM will be paid an additional \$1.90 per hour premium. This premium is not for use in emergency repair situations.
- Premium of \$1.25 per hour will be paid for the application, rip-off or handling of pitch products. The premium will be paid for pitch that is showing, covered or buried on the roof.
- Premium of \$1.25 per hour will be paid for asbestos abatement requiring a half face respirator.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker	\$ 22.24
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OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages:
 Hours per term

0-667 Hrs.	\$ 20.73 + 0.69*
668-1335 Hrs.	22.21 + 0.74*
1336-2002 Hrs.	23.69 + 0.79*
2003-2669 Hrs.	25.17 + 0.84*
2670-3336 Hrs.	26.65 + 0.89*
3337-4000 Hrs.	28.13 + 0.94*

*This amount is paid for all hours worked, whether regular or premium hours.

NOTE ADDITIONAL PREMIUMS PAID FOR THE FOLLOWING WORK LISTED BELOW (amount not subject to overtime premiums):

- On days where more than one shift is worked on the job, the hours worked after 4:30 PM and before 6:30 AM will be paid an additional \$1.90 per hour premium. This premium is not for use in emergency repair situations.
- Premium of \$1.25 per hour will be paid for the application, rip-off or handling of pitch products. The premium will be paid for pitch that is showing, covered or buried on the roof.
- Premium of \$1.25 per hour will be paid for asbestos abatement requiring a half face respirator.

Supplemental Benefits:

0-667 Hrs.	\$ 18.56
668-1335 Hrs.	19.18
1336-2002 Hrs.	19.79
2003-2669 Hrs.	20.40
2670-3336 Hrs.	21.02
3337-4000 Hrs.	21.63

2-203elmi

Sheetmetal Worker

02/01/2025

JOB DESCRIPTION Sheetmetal Worker

DISTRICT 2

ENTIRE COUNTIES

Allegany, Broome, Chemung, Delaware, Otsego, Schuyler, Steuben, Tioga, Tompkins

WAGES

Per hour:

07/01/2024

Sheetmetal Worker	\$ 37.09
	+ 0.93*
Polyresin Fiberglass	37.19
	+ 0.93*
CAD Operator	38.09
	+0.95*

*Amount is paid for every hour worked (amount not subject to overtime premium)

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker: \$ 22.06

OVERTIME PAY

See (*B1, Q) on OVERTIME PAGE

*On Saturday, time and one half of the hourly rate for the first ten (10) hours, then two (2) times the hourly wage rate for all hours after ten (10) hours worked.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

Note: Holidays are observed on the Holiday, not on the day that it is locally observed.

REGISTERED APPRENTICES

WAGES per hour:

Half Year Terms

	1st	2nd	3rd	4th	5th	6th	7th	8th
07/01/2024	22.25	22.25	24.11	25.96	27.82	29.67	31.53	33.38
	+0.56*	+0.56*	+0.60*	+0.65*	+0.70*	+0.74*	+0.79*	+0.83*

*Amount is paid for every hour worked (amount not subject to overtime premium)

SUPPLEMENTAL BENEFITS per hour:

	1st	2nd	3rd	4th	5th	6th	7th	8th
07/01/2024	1.78	1.78	18.30	18.38	18.46	18.54	18.62	18.70

2-112

Sprinkler Fitter **02/01/2025**

JOB DESCRIPTION Sprinkler Fitter **DISTRICT 1**

ENTIRE COUNTIES

Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Washington, Wayne, Wyoming, Yates

WAGES

Per hour 07/01/2024

Sprinkler Fitter \$ 42.00

SUPPLEMENTAL BENEFITS

Per hour

Journeyworker \$ 28.82

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

Note: When a holiday falls on Sunday, the following Monday shall be considered a holiday and all work performed on either day shall be at the double time rate. When a holiday falls on Saturday, the preceding Friday shall be considered a holiday and all work performed on either day shall be at the double time rate.

REGISTERED APPRENTICES

Wages per hour

One Half Year terms at the following wage.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 20.03	\$ 22.26	\$ 24.24	\$ 26.46	\$ 28.69	\$ 30.91	\$ 33.14	\$ 35.37	\$ 37.59	\$ 39.82

Supplemental Benefits per hour

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 9.18	\$ 9.18	\$ 20.90	\$ 20.90	\$ 21.15	\$ 21.15	\$ 21.15	\$ 21.15	\$ 21.15	\$ 21.15

1-669

Teamster - Building **02/01/2025**

JOB DESCRIPTION Teamster - Building **DISTRICT 6**

ENTIRE COUNTIES

Broome, Cayuga, Cortland, Delaware, Onondaga, Seneca, Tompkins, Yates

PARTIAL COUNTIES

Allegany: Only the Townships of Almond, Burns, and Alfred.

Chenango: Only the Townships of Afton, Bainbridge, Coventry, Greene, Guilford, Oxford and Smithville.

Madison: Only the Townships of Cazenovia, DeRuyter, Fenner, Georgetown, Lenox, Nelson and Sullivan.

Oswego: All Townships except Redfield, Boylston and Sandy Creek.

Otsego: Only the Townships of Butternuts, Laurens, Maryland, Millford, Morris, Oneonta, Otego, Unadilla, and Worchester.

Steuben: Only the Townships of Prattsburg, Canisteo, Fremont, Cohoctan, Dansville, Hornell, Hartsville, Greenwood, West Union, Troupsburg, and Jasper.

Tioga: Only the Townships of Berkshire, Candor, Newark Valley, Nichols, Owego, Richford, and Tioga. All territory east of Nichols/Smithboro to Broome County, within State of New York.

WAGES

GROUP A: Straight Trucks.

GROUP B: Tractor Trailer, Farm Tractor, Fuel Truck.

GROUP C: Euclid.

GROUP D: On site Mechanic.

Per hour: 07/01/2024 06/01/2025

Building: (under \$ 5 million*)
 GROUP A,B,C,D \$ 31.43 \$ 34.43

Building: (over \$ 5 million*)
 GROUP A,B \$ 32.48 \$ 35.48

GROUP C	32.83	35.83
GROUP D	32.63	35.63

* Total project cost including General Construction, Plumbing, HVAC and Electrical

SUPPLEMENTAL BENEFITS

Per hour:

(under \$5 million*)	\$ 30.02	\$ 30.87
(over \$5 million*)	30.80	31.67

* Total project cost including General Construction, Plumbing, HVAC and Electrical

OVERTIME PAY

(D, O) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6) on HOLIDAY PAGE

6-317

Teamster - Heavy&Highway **02/01/2025**

JOB DESCRIPTION Teamster - Heavy&Highway

DISTRICT 6

ENTIRE COUNTIES

Cayuga, Cortland, Seneca, Tompkins, Yates

PARTIAL COUNTIES

Allegany: Only the Townships of Almond, Alfred, Burns and West Almond.

Steuben: Only the Townships of Canisteo, Cohocton, Dansville, Fremont, Greenwood, Hartsville, Hornell, Jasper, Prattsburg, Troupsburg, and West Union.

WAGES

GROUP 1: Warehousemen*, Yardmen*, Truck Helpers, Pickups, Panel Trucks, Flatboy Material Trucks (straight jobs), Single Axle Dump Trucks, Dumpsters, Material Checkers & Receivers*, Greasers, Truck Tiremen, Mechanics Helpers and Parts Chasers, Tandems & Batch Trucks, Mechanics, Semi-Trailers, Low-boy Trucks, Asphalt Distributor Trucks and Agitator, Mixer Trucks and Dumpcrete type vehicles, Truck Mechanic, Fuel Trucks.

*NOTE: Applies when a temporary warehouse structure is built/utilized specifically for a public work project.

GROUP 2: Specialized Earth Moving Equipment-Euclid type, or similar off-highway equipment, where not self-loading, Straddle (Ross) Carrier, and self-contained concrete mobile truck, Off-highway Tandem Back-Dump, Twin Engine Equipment and Double-Hitched Equipment where not self-loading.

Per hour: 07/01/2024

GROUP 1	\$ 34.21
GROUP 2	34.41

SUPPLEMENTAL BENEFITS

Per hour: 07/01/2024

Journeyworker \$ 28.85

OVERTIME PAY

See (*B, B2, J) on OVERTIME PAGE

*Time and one half also applicable after the 5th day worked.

HOLIDAY

Paid: See (5, 6) on HOLIDAY PAGE
 Overtime: See (5, 6) on HOLIDAY PAGE

6-317(Syr)

Welder **02/01/2025**

JOB DESCRIPTION Welder

DISTRICT 1

ENTIRE COUNTIES

Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

Per hour 07/01/2024

Welder: To be paid the same rate of the mechanic performing the work.*

*EXCEPTION: If a specific welder certification is required, then the 'Certified Welder' rate in that trade tag will be paid.

OVERTIME PAY
HOLIDAY

1-As Per Trade

Overtime Codes

Following is an explanation of the code(s) listed in the OVERTIME section of each classification contained in the attached schedule. Additional requirements may also be listed in the HOLIDAY section.

NOTE: Supplemental Benefits are 'Per hour worked' (for each hour worked) unless otherwise noted

- (AA) Time and one half of the hourly rate after 7 and one half hours per day
- (A) Time and one half of the hourly rate after 7 hours per day
- (B) Time and one half of the hourly rate after 8 hours per day
- (B1) Time and one half of the hourly rate for the 9th & 10th hours week days and the 1st 8 hours on Saturday.
Double the hourly rate for all additional hours
- (B2) Time and one half of the hourly rate after 40 hours per week
- (B3) Time and one half of the hourly rate after 40 straight hours per week
- (C) Double the hourly rate after 7 hours per day
- (C1) Double the hourly rate after 7 and one half hours per day
- (D) Double the hourly rate after 8 hours per day
- (D1) Double the hourly rate after 9 hours per day
- (E) Time and one half of the hourly rate on Saturday
- (E1) Time and one half 1st 4 hours on Saturday; Double the hourly rate all additional Saturday hours
- (E2) Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
- (E3) Between November 1st and March 3rd Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather, provided a given employee has worked between 16 and 32 hours that week
- (E4) Saturday and Sunday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
- (E5) Double time after 8 hours on Saturdays
- (F) Time and one half of the hourly rate on Saturday and Sunday
- (G) Time and one half of the hourly rate on Saturday and Holidays
- (H) Time and one half of the hourly rate on Saturday, Sunday, and Holidays
- (I) Time and one half of the hourly rate on Sunday
- (J) Time and one half of the hourly rate on Sunday and Holidays
- (K) Time and one half of the hourly rate on Holidays
- (L) Double the hourly rate on Saturday
- (M) Double the hourly rate on Saturday and Sunday
- (N) Double the hourly rate on Saturday and Holidays
- (O) Double the hourly rate on Saturday, Sunday, and Holidays
- (P) Double the hourly rate on Sunday
- (Q) Double the hourly rate on Sunday and Holidays
- (R) Double the hourly rate on Holidays

- (S) Two and one half times the hourly rate for Holidays
- (S1) Two and one half times the hourly rate the first 8 hours on Sunday or Holidays One and one half times the hourly rate all additional hours.
- (T) Triple the hourly rate for Holidays
- (U) Four times the hourly rate for Holidays
- (V) Including benefits at SAME PREMIUM as shown for overtime
- (W) Time and one half for benefits on all overtime hours.
- (X) Benefits payable on Paid Holiday at straight time. If worked, additional benefit amount will be required for worked hours. (Refer to other codes listed.)

Holiday Codes

PAID Holidays:

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

OVERTIME Holiday Pay:

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays. The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Following is an explanation of the code(s) listed in the HOLIDAY section of each classification contained in the attached schedule. The Holidays as listed below are to be paid at the wage rates at which the employee is normally classified.

- (1) None
- (2) Labor Day
- (3) Memorial Day and Labor Day
- (4) Memorial Day and July 4th
- (5) Memorial Day, July 4th, and Labor Day
- (6) New Year's, Thanksgiving, and Christmas
- (7) Lincoln's Birthday, Washington's Birthday, and Veterans Day
- (8) Good Friday
- (9) Lincoln's Birthday
- (10) Washington's Birthday
- (11) Columbus Day
- (12) Election Day
- (13) Presidential Election Day
- (14) 1/2 Day on Presidential Election Day
- (15) Veterans Day
- (16) Day after Thanksgiving
- (17) July 4th
- (18) 1/2 Day before Christmas
- (19) 1/2 Day before New Years
- (20) Thanksgiving
- (21) New Year's Day
- (22) Christmas
- (23) Day before Christmas
- (24) Day before New Year's
- (25) Presidents' Day
- (26) Martin Luther King, Jr. Day
- (27) Memorial Day
- (28) Easter Sunday

(29) Juneteenth

**New York State Department of Labor - Bureau of Public Work
State Office Building Campus
Building 12 - Room 130
Albany, New York 12226**

REQUEST FOR WAGE AND SUPPLEMENT INFORMATION

As Required by Articles 8 and 9 of the NYS Labor Law

Fax (518) 485-1870 or mail this form for new schedules or for determination for additional occupations.

This Form Must Be Typed

Submitted By:

(Check Only One)

Contracting Agency

Architect or Engineering Firm

Public Work District Office

Date:

A. Public Work Contract to be let by: (Enter Data Pertaining to Contracting/Public Agency)

1. Name and complete address (Check if new or change)

Telephone

Fax

E-Mail:

2. NY State Units (see Item 5).

01 DOT

02 OGS

03 Dormitory Authority

04 State University
Construction Fund

05 Mental Hygiene
Facilities Corp.

06 OTHER N.Y. STATE UNIT

07 City

08 Local School District

09 Special Local District, i.e.,
Fire, Sewer, Water District

10 Village

11 Town

12 County

13 Other Non-N.Y. State
(Describe)

3. SEND REPLY TO (check if new or change)
Name and complete address:

Telephone

Fax

E-Mail:

4. SERVICE REQUIRED. Check appropriate box and provide project information.

New Schedule of Wages and Supplements.

APPROXIMATE BID DATE :

Additional Occupation and/or Redetermination

PRC NUMBER ISSUED PREVIOUSLY FOR
THIS PROJECT :

OFFICE USE ONLY

B. PROJECT PARTICULARS

5. Project Title _____

Description of Work _____

Contract Identification Number _____

Note: For NYS units, the OSC Contract No. _____

6. Location of Project:

Location on Site _____

Route No/Street Address _____

Village or City _____

Town _____

County _____

7. Nature of Project - Check One:

1. New Building

2. Addition to Existing Structure

3. Heavy and Highway Construction (New and Repair)

4. New Sewer or Waterline

5. Other New Construction (Explain)

6. Other Reconstruction, Maintenance, Repair or Alteration

7. Demolition

8. Building Service Contract

8. OCCUPATION FOR PROJECT :

Construction (Building, Heavy
Highway/Sewer/Water)

Tunnel

Residential

Landscape Maintenance

Elevator maintenance

Exterminators, Fumigators

Fire Safety Director, NYC Only

Fuel Delivery

Guards, Watchmen

Janitors, Porters, Cleaners,
Elevator Operators

Moving furniture and
equipment

Trash and refuse removal

Window cleaners

Other (Describe)

9. Does this project comply with the Wicks Law involving separate bidding? YES NO

10. Name and Title of Requester

Signature



NEW YORK STATE DEPARTMENT OF LABOR
Bureau of Public Work - Debarment List

**LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE
AWARDED ANY PUBLIC WORK CONTRACT**

Under Article 8 and Article 9 of the NYS Labor Law, a contractor, sub-contractor and/or its successor shall be debarred and ineligible to submit a bid on or be awarded any public work or public building service contract/sub-contract with the state, any municipal corporation or public body for a period of five (5) years from the date of debarment when:

- Two (2) final determinations have been rendered within any consecutive six-year (6) period determining that such contractor, sub-contractor and/or its successor has WILLFULLY failed to pay the prevailing wage and/or supplements;
- One (1) final determination involves falsification of payroll records or the kickback of wages and/or supplements.

The agency issuing the determination and providing the information, is denoted under the heading 'Fiscal Officer'. DOL = New York State Department of Labor; NYC = New York City Comptroller's Office; AG = New York State Attorney General's Office; DA = County District Attorney's Office.

Debarment Database: To search for contractors, sub-contractors and/or their successors debarred from bidding or being awarded any public work contract or subcontract under NYS Labor Law Articles 8 and 9, or under NYS Workers' Compensation Law Section 141-b, access the database at this link: <https://apps.labor.ny.gov/EDList/searchPage.do>

For inquiries please call 518-457-5589.

NYS DOL Bureau of Public Work Debarment List 02/18/2025

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AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
DOL	DOL	****5754	0369 CONTRACTORS, LLC		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL	****5784	A.J.M. TRUCKING, INC.		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	DOL		AKHLAQ OULAKH		4307 28TH AVE ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	NYC		ALL COUNTY SEWER & DRAIN, INC.		7 GREENFIELD DR WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL	****8387	AMERICAN PAVING & MASONRY, CORP.		8 FOREST AVE GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL	****8654	AMERICAN PAVING, INC.		8 FORREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	NYC		AMJED PARVEZ		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DOL		ANGELO F COKER		2610 SOUTH SALINA STREET SUITE 14SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL		ANGELO GARCIA		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL		ANGELO STANCO		8 FOREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL		ANGELO TONDO		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	****4231	ANKER'S ELECTRIC SERVICE, INC.		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL		ANTHONY MONGELLI		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	NYC		ARADCO CONSTRUCTION CORP		115-46 132RD ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	NYC		AVM CONSTRUCTION CORP		117-72 123RD ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	NYC		AZIDABEGUM		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	DOL	****8421	B & B DRYWALL, INC		206 WARREN AVE APT 1WHITE PLAINS NY 10603	12/14/2021	12/14/2026
DOL	DOL		B&L RENOVATION CO.		618 OCEAN PARKWAY APT A6BROOKLYN NY 11230	09/17/2020	09/17/2025
DOL	NYC	****2113	BHW CONTRACTING, INC.		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DOL	****5078	BLACK RIVER TREE REMOVAL, LLC		29807 ANDREWS ROAD BLACK RIVER NY 13032	10/17/2023	10/17/2028
DOL	DOL		BRADLEY J SCHUKA		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	DOL	****9383	C.C. PAVING AND EXCAVATING, INC.		2610 SOUTH SALINA ST SUITE 12SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL	****4083	C.P.D. ENTERPRISES, INC		P.O BOX 281 WALDEN NY 12586	03/03/2020	03/03/2025
DOL	DOL	****5161	CALADRI DEVELOPMENT CORP.		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	****3391	CALI ENTERPRISES, INC.		1223 PARK STREET PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	****4155	CASA BUILDERS, INC.	FRIEDLANDER CONSTRUCTI ON	64 N PUTT CONNERS ROAD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	AG	****7247	CENTURY CONCRETE CORP		2375 RAYNOR ST RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	****0026	CHANTICLEER CONSTRUCTION LLC		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	NYC	****2117	CHARAN ELECTRICAL ENTERPRISES		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	NYC		CHARLES ZAHRADKA		863 WASHINGTON STREET FRANKLIN SQUARE NY 11010	03/10/2020	03/10/2025
DOL	DOL		CHRISTOPHER GRECO		26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026
DOL	DOL	****2281	CORRAO TRUCKING, INC.		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL		CRAIG JOHANSEN		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL	****3228	CROSS-COUNTY LANDSCAPING AND TREE SERVICE, INC.	ROCKLAND TREE SERVICE	26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026

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DOL	DOL	****7619	DANCO CONSTRUCTION UNLIMITED INC.		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL		DANIEL ROBERT MCNALLY		7 GREENFIELD DRIVE WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL		DARIAN L COKER		2610 SOUTH SALINA ST SUITE 2CSYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL		DARWIN PEGUESE		6400 BALTIMORE NATIONAL SUITE 602CANTONSVILLE NY 21228	10/24/2024	10/24/2029
DOL	DOL		DAVID FRIEDLANDER		64 NORTH PUTT CORNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL		DINA TAYLOR		64 N PUTT CONNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	AG		EDWIN HUTZLER		23 NORTH HOWELLS RD BELLPORT NY 11713	08/04/2021	08/04/2026
DOL	DA		EDWIN HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	****0780	EMES HEATING & PLUMBING CONTR		5 EMES LANE MONSEY NY 10952	01/20/2002	01/20/3002
DOL	DOL		EMIL KISZKO		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	****3298	EMJACK CONSTRUCTION CORP.		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	****3298	EMJACK CONSTRUCTION LLC		4192 SIR ANDREW CIRCLE DOYLESTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL		EUGENIUSZ "GINO" KUCHAR		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	DA		FREDERICK HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	****2998	G.E.M. AMERICAN CONSTRUCTION CORP.		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	NYC		GAYATRI MANGRU		21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	DA		GEORGE LUCEY		150 KINGS STREET BROOKLYN NY 11231	01/19/1998	01/19/2998
DOL	DA		GIOVANNA TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DA		GIOVANNI NAPOLITANO		2501 BAYVIEW AVENUE WANTAGH NY 11793	02/21/2024	02/21/2029
DOL	DA	****0213	GORILLA CONTRACTING GROUP, LLC		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DA	****4760	GTX CONSTRUCTION ASSOCIATES, CORP		2501 BAYVIEW AVE WANTAGH NY 11793	02/21/2024	02/21/2029
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	****2397	ISLAND BREEZE MARINE, INC.		6400 BALTIMORE NATIONAL CANTONSVILLE MD 21228	10/24/2024	10/24/2029
DOL	DOL	****9211	J. WASE CONSTRUCTION CORP.		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
DOL	DOL		J.M.J CONSTRUCTION		151 OSTRANDER AVENUE SYRACUSE NY 13205	11/21/2022	11/21/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	12/12/2022	12/12/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL	****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027

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DOL	DOL	****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JAMES J. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	****7993	JBS DIRT, INC.		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL	****2435	JEFFEL D. JOHNSON	JMJ7 AND SON	5553 CAIRNSTRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JEFFEL JOHNSON ELITE CARPENTER REMODEL AND CONSTRUCTION		C2 EVERGREEN CIRCLE LIVERPOOL NY 13090	11/21/2022	11/21/2027
DOL	DOL	****2435	JEFFREY M. JOHNSON	JMJ7 AND SON	5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JIM PLAUGHER		17613 SANTE FE LINE ROAD WAYNEFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL		JMJ7 & SON CONSTRUCTION, LLC		5553 CAIRNS TRAIL LIVERPOOL NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 AND SONS CONTRACTORS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS		7014 13TH AVENUE BROOKLYN NY 11228	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS AND SONS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS, LLC		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JOHN MARKOVIC		47 MANDON TERRACE HAWTHORN NJ 07506	03/29/2021	03/29/2026
DOL	DOL		JOHN WASE		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
DOL	DOL		JORGE RAMOS		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	DOL		JOSEPH K. SALERNO		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL		JOSEPH K. SALERNO II		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL	****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL	****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL	****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		JRN CONSTRUCTION CO, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028
DOL	DOL	****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		JULIUS AND GITA BEHREND		5 EMES LANE MONSEY NY 10952	11/20/2002	11/20/3002
DOL	DOL		KARIN MANGIN		796 PHELPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	DOL		KATE E. CONNOR		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026

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DOL	DOL		KEAN INDUSTRIES, LLC		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL	****2959	KELC DEVELOPMENT, INC		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026
DOL	DOL		KIMBERLY F. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL		KMA GROUP II, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL	****1833	KMA GROUP INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KMA INSULATION, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KRIN HEINEMANN		2345 ROUTE 52, SUITE 2N HOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	NYC		KULWANT S. DEOL		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DA	****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028
DOL	AG	****3291	LINTECH ELECTRIC, INC.		3006 TILDEN AVE BROOKLYN NY 11226	02/16/2022	02/16/2027
DOL	DOL		LOUIS A. CALICCHIA		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	****2196	MAINSTREAM SPECIALTIES, INC.		11 OLD TOWN RD SELKIRK NY 12158	02/02/2021	02/02/2026
DOL	DA		MANUEL P TOBIO		150 KINGS STREET BROOKLYN NY 14444	08/19/1998	08/19/2998
DOL	DA		MANUEL TOBIO		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		MAQSOOD AHMAD		618 OCEAN PKWY BROOKLYN NY 11230	09/17/2020	09/17/2025
DOL	NYC		MARIA NUBILE		84-22 GRAND AVENUE ELMHURST NY 11373	03/10/2020	03/10/2025
DOL	DOL	****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	NYC		MUHAMMED A. HASHEM		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	NYC		NAMOW, INC.		84-22 GRAND AVENUE ELMHURST NY 11373	03/10/2020	03/10/2025
DOL	DOL	****7790	NATIONAL BUILDING & RESTORATION CORP		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	****1797	NATIONAL CONSTRUCTION SERVICES, INC		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	NYC		NAVIT SINGH		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		NELCO CONTRACTING, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028
DOL	DA		NICHOLAS T. ANALITIS		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL	****7429	NICOLAE I. BARBIR	BESTUCCO CONSTRUCTI ON, INC.	444 SCHANTZ ROAD ALLEN TOWN PA 18104	09/17/2020	09/17/2025
DOL	NYC	****5643	NYC LINE CONTRACTORS, INC.		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028

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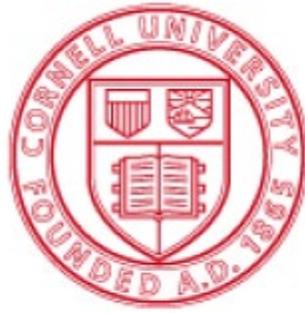
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DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL		PAULINE CHAHALES		935 S LAKE BLVD MAHOPAC NY 10541	03/02/2021	03/02/2026
DOL	DOL		PETER STEVENS		11 OLD TOWN ROAD SELKIRK NY 12158	02/02/2021	02/02/2026
DOL	DOL		PETER STEVENS		8269 21ST ST BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	DOL	****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	07/12/2024	07/12/2029
DOL	DOL	****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029
DOL	DOL	****0466	PRECISION BUILT FENCES, INC.		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	NYC		RASHEL CONSTRUCTION CORP		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	DOL	****2633	RAW POWER ELECTRIC CORP.		3 PARK CIRCLE MIDDLETOWN NY 10940	07/11/2022	07/11/2027
DOL	DA	****7559	REGAL CONTRACTING INC.		24 WOODBINE AVE NORTHPORT NY 11768	10/01/2020	10/01/2025
DOL	DOL		RICHARD REGGIO		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	DOL		ROBBYE BISSEAR		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	01/11/2003	01/11/3003
DOL	DOL		ROMEO WARREN		161 ROBYN RD MONROE NY 10950	07/11/2022	07/11/2027
DOL	DOL	****7172	RZ & AL INC.		198 RIDGE AVENUE VALLEY STREAM NY 11581	06/06/2022	06/06/2027
DOL	DOL		SAL FRESINA MASONRY CONTRACTORS, INC.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL		SAL MASONRY CONTRACTORS, INC.		(SEE COMMENTS) SYRACUSE NY 13202	07/16/2021	07/16/2026
DOL	DOL	****9874	SALFREE ENTERPRISES INC		P.O BOX 14 2821 GARDNER RD POMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		SALVATORE A FRESINA A/K/A SAM FRESINA		107 FACTORY AVE P.O BOX 11070 SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	DOL		SAM FRESINA		107 FACTORY AVE P.O BOX 11070 SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	DA	****0476	SAMCO ELECTRIC CORP.		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	NYC	****1130	SCANA CONSTRUCTION CORP.		863 WASHINGTON STREET FRANKLIN SQUARE NY 11010	03/10/2020	03/10/2025
DOL	DOL	****2045	SCOTT DUFFIE	DUFFIE'S ELECTRIC, INC.	P.O BOX 111 CORNWALL NY 12518	03/03/2020	03/03/2025
DOL	DOL		SCOTT DUFFIE		P.O BOX 111 CORNWALL NY 12518	03/03/2020	03/03/2025
DOL	DA		SILVANO TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DOL	****0440	SOLAR GUYS INC.		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	NYC		SOMATIE RAMSUNAHAI		115-46 132ND ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	NYC	****3661	SPANIER BUILDING MAINTENANCE CORP		200 OAK DRIVE SYOSSET NY 11791	03/14/2022	03/14/2027
DOL	DOL		STANADOS KALOGELAS		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL	****3496	STAR INTERNATIONAL INC		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	08/11/2003	08/11/3003
DOL	DOL	****9528	STEEL-IT, LLC.		17613 SANTE FE LINE ROAD WAYNESFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL	****3800	SUBURBAN RESTORATION CO. INC.		5-10 BANTA PLACE FAIR LAWN PLACE NJ 07410	03/29/2021	03/29/2026
DOL	DOL	****9150	SURGE INC.		8269 21ST STREET BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	DOL		SYED MUHAMMAD S. JAFRI A/K/A SHARRUKH JAFRI		4307 28TH AVE ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		SYED RAZA		198 RIDGE AVENUE NY 11581	06/06/2022	06/06/2027
DOL	DOL		TARLOK SINGH		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029

NYSDOL Bureau of Public Work Debarment List 02/18/2025

Article 8

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DOL	DOL		TERSAL CONTRACTORS, INC.		221 GARDNER RD P.O BOX 14POMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		TERSAL DEVELOPMENT CORP.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL	****5766	THE COKER CORPORATION	COKER CORPORATIO N	2610 SOUTH SALINA ST SUITE 14SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL	****2426	THE MATRUKH GROUP, INC.		4307 28TH AVE PO BOX 9082ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		TIMOTHY PERCY		29807 ANDREWS ROAD BLACK RIVER NY 13612	10/17/2023	10/17/2028
DOL	DA	****1050	TRI STATE CONSTRUCTION OF NY CORP.		50-39 175TH PLACE FRESH MEADOWS NY 11365	03/28/2022	03/28/2027
DOL	DA	****4106	TRIPLE H CONCRETE CORP		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	****8210	UPSTATE CONCRETE & MASONRY CONTRACTING CO INC		449 WEST MOMBASHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	****6418	VALHALLA CONSTRUCTION, LLC.		796 PHLEPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	NYC	****2426	VICKRAM MANGRU	VICK CONSTRUCTI ON	21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	NYC		VICKRAM MANGRU		21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	DOL		VINCENT CORRAO		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL	****8266	WILLIAM CHRIS MCCLENDON	MCCLENDON ASPHALT PAVING	1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM CHRIS MCCLENDON		1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM G. PROERFRIEDT		85 SPRUCEWOOD ROAD WEST BABYLON NY 11704	01/19/2021	01/19/2026
DOL	DOL	****5924	WILLIAM G. PROPHY, LLC	WGP CONTRACTIN G, INC.	54 PENTAQUIT AVE BAYSHORE NY 11706	01/19/2021	01/19/2026
DOL	DOL		WILLIAM SCRIVENS		4192 SIR ANDREW CIRCLE DOYELSTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL		XENOFON EFTHIMIADIS		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028



GENERAL REQUIREMENTS

FOR

RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

**CORNELL UNIVERSITY
ITHACA, NEW YORK**

JANUARY 31, 2025

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SECTION 01 11 00 SUMMARY OF WORK

1.0 GENERAL

1.1 DESCRIPTION

A. Work to be Done

1. Reconfigure and repurpose the floors of King-Shaw Hall from a Conference Center and events space to a vibrant hub for ILR (Industrial Labor & Relations) student services on the second level, and a new administrative space for students and visitors to the Brooks School. The new configuration will continue to serve as a connection between adjacent ILR spaces located north and south of King Shaw Hall – Dolgen Hall and ILR Research Building.
2. Alternate work is included to provide restoration of the building's existing cupola.

B. The Scope of the Work

1. The scope of the Work in all SECTIONS of this Specification shall consist of the furnishing of all labor, materials, equipment and appliances and the performance of the Work required by the Contract Documents and/or by the conditions at the site, joining all parts of this Work with itself and the Work of others to form a complete, functioning entity.
2. Items not specifically mentioned in the Specifications or shown on the drawings, but which are inherently necessary to make a complete working installation, shall be included.
3. It is the intent and purpose of the Contract Documents to cover and include under each item all materials, machinery, apparatus, and labor necessary to properly install materials and equipment, adjust and put into perfect operation the respective portions of the installation specified and to so interconnect the various items or sections of the Work as to form a complete and operating whole. Any equipment, apparatus, machinery, material and small items not mentioned in detail, and labor not hereinafter specifically mentioned, which may be found necessary to complete or perfect any portion of the installation in a substantial manner, and in compliance with the requirements stated, implied, or intended in the Contract Documents, shall be furnished without extra cost to the Owner. The Contractor shall provide the greatest quantity, highest quality, highest degree of safety, and most stringent material, equipment or work. Should the Drawings or the Specifications disagree in themselves or with each other, the Contractor shall provide the better quality or greater quantity of work and/or materials unless otherwise directed by written addendum to the Contract.

1.2 WORK UNDER OTHER CONTRACTS

- A. The Contractor shall cooperate with other contracts performing related work, including providing labor, materials and other costs necessary to satisfactorily coordinate the Contract Work with work performed under others contracts.
- B. New York State Electric & Gas (NYSEG):
 - 1. Contractor shall be responsible for the project management of NYSEG work including coordinating any scheduling associated with the Project.
 - 2. The Owner shall be responsible for the cost associated with the work to be performed by NYSEG. No NYSEG costs shall be carried in the Contractor's bid.

1.3 SCHEDULE OF OWNER FURNISHED ITEMS

- A. Refer to Appendix E, "Owner Furnished Contractor Installed Items"
- B. The Contractor shall receive, unload, store and install Owner furnished equipment as shown on the plans and called for in the Specifications.
- C. Storage
 - 1. Upon written acknowledgment by Contractor of receipt in proper condition, the Contractor shall maintain responsibility for proper storage and protection of the equipment. Provide insurance for the Owner-furnished products up to the time of Final Acceptance by the Owner.
- D. Receiving and Unloading
 - 1. The Contractor shall be responsible for logging in, checking and verifying receipt of items and shall be responsible for confirming that the quantities and condition of the materials are appropriate for installation and the completion of the Work of the project.
 - 2. The Contractor shall note any damage and/or short count on the Bill of Loading for any Owner Furnished Equipment received at the storage facility, such listing of damages or short count being required to establish the Owner's potential claim against the carrier. The Contractor shall also notify the Owner directly on any such damage and/or short count.
 - 3. Unload Owner Furnished Equipment at the job site using necessary care and equipment as required to handle the equipment in a safe manner.
 - 4. Use adequate numbers of skilled workers necessary to handle, receive and install Owner Furnished Equipment.
 - 5. Install Owner Furnished Equipment as called for in the Drawings or in these Specifications.

E. Installation

1. Install products in conformance with manufacturer's installation instructions.
2. Provide interconnecting structures, equipment, piping, electrical and instrumentation work, finish painting, and appurtenances to achieve a complete and functional system.

F. Use of Materials

1. The Contractor shall be responsible for the use of Owner provide materials in an efficient manner in accordance with industry standards and best practices to reduce waste materials.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 11 00*****

SECTION 01 14 00 WORK RESTRICTIONS

1.0 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 CONTRACTOR USE OF PREMISES

- A. All traffic and pedestrian control measures shall be compliant with the **National Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)** and **17 NYCRR Chapter V** (New York Supplement), (<https://www.dot.ny.gov/mutcd>) and all other local laws and regulations.
- B. The Contractor shall carry on the Work in the manner which will cause the least interruption to pedestrian and vehicular traffic and permit access of emergency vehicles at all times.
- C. The Work shall be scheduled and performed in such a manner that at least one lane of traffic will be maintained on all public streets. Two flag persons, equipped with adequate means of communication, must be provided for any activity blocking a traffic lane. One lane of traffic must be maintained at all times. Where traffic must cross open trenches, the Contractor shall provide suitable bridges and railings; including pedestrian bridges.
- D. The Contractor shall maintain 20' minimum fire lane access to all facilities in the area, unless pre-approved by the University Fire Marshall office and local fire official.
- E. The Contractor shall post and maintain flag persons and suitable signs indicating that construction operations are under way and other warning signs as may be required.
- F. The Contractor shall safeguard the use by the public and Owner of all adjacent highways, roadways and footpaths, outside the Contract Limit Lines (work area), and shall conform to all laws and regulations concerning the use thereof, especially limitations on traffic and the movement of heavy equipment. Access to the site for delivery of construction materials and/or equipment shall be made only at the locations shown in the Contract Documents or approved by the Owner's Representative.
- G. The Contractor shall make every effort to keep dirt and debris from making its way to roadways. The Contractor shall immediately remove dirt and debris which may collect on permanent roadways due to the Work.
- H. The Contractor shall limit the extent of its activities to that area of the site defined on the Contract Drawings as being within the Contract Limit Lines.

- I. For that portion of the Work required under this Contract which must be performed in other than the defined areas both on-site and off, including operations involving delivery and removal of materials, the Contractor shall schedule and coordinate its activities through the Owner's Representative, to meet the approval of the Owner and minimize disruption of the normal scheduled activities of the occupants of adjacent spaces.
- J. It is the Owner's expectation that the Contractor will take protective measures to minimize damage caused by construction activities including, but not limited to, the use of personnel lifts, material handling equipment, on-site material storage, etc. All portions of the site, including the staging area and those areas affected by the Work, shall be returned to their original condition after completion of Work. Such repair work shall include lawn restoration and reseeding, if required, and shall be included in the Contractor's Guarantee of Work.
- K. Routes to and from the location of the Work shall be as indicated in the Contract or as directed by the Owner's Representative. Temporary roadways shall be closed only with prior approval of the Owner's Representative.
- L. Parking may be made available for staging at Bookbank Drive. The Contractor will be responsible for fencing, securing and maintaining the designated area. All vehicles at Bookbank Drive, or other predetermined areas, must be registered with Transportation Services.

1.3 UNIVERSITY CLOSURES

- A. In the event of University closure, the Contractor should use their judgement, follow their internal guidance on continuity of operations, and the direction of law enforcement, as to whether or not they will maintain operations on construction sites on campus. They should make this decision with the awareness that Cornell response to any project needs (shutdowns, emergencies) will not be possible and the maintenance of roads and walks will not be to normal operating standards.
- B. With your safety as a top priority, the Cornell University Police allows you the ability to take advantage of our Emergency Mass Notification System that enables your cellphone to become a personal safety device for you. Contractor's wishing to participate may text the following: **CornellAlert** to **67283** and you will be set up to receive alert messages. Be advised that you may stop receiving messages at any time by sending "stop" to **CornellAlert**. There will also be a system generated "stop" every year on August 1st at which point you will need to send the text **CornellAlert** to re-enlist.

1.4 WATER USE RESTRICTION

- A. The Contractor shall adhere to any University issued Water Use Restrictions in place at the time of construction.

1.5 PARKING

- A. There is no Contractor parking, including for the site Superintendent and/or the Project Manager, available adjacent to the project site.
- B. The Contractor shall make all arrangements, and bear the cost, for transportation of all trade persons from the designated parking area to the construction site as necessary.

- C. It should be noted that there is a fee for all parking on the Cornell University campus. The Contractor is responsible for the payment for all parking costs imposed by the Owner. The Contractor should contact the Project Manager Frank Parish for additional information. The Contractor will be required to complete a “New Construction Employee Form” for each permit requested. This form may be found at <https://fcs.cornell.edu/forms-templates>.
- D. Contractor shall cooperate with Transportation Services and/or other authorities having jurisdiction, as follows:
 - 1. Ensure parking by all employees of the Contractor, Subcontractors, material suppliers, and others connected with this project only within construction fence or the designated parking area.
 - 2. Prohibit employees from parking in any other areas, roads, streets, grounds, etc.
 - 3. Discharge any employee refusing to comply with these requirements.
 - 4. Ensure proper transportation of personnel between the designated parking area and the construction site.
- E. The Contractor shall remove from the parking area and staging area all temporary trailers, rubbish, unused materials, and other materials belonging to the Contractor or used under the Contractor’s direction during construction or impairing the use or appearance of the property and shall restore such areas affected by the Work to their original condition, and, in the event of its failure to do so, the same shall be removed by the Owner at the expense of the Contractor, and the Contractor shall be liable therefore.

1.6 CHANGEOVERS AND CONTINUITY OF SERVICES

- A. Make all changeovers, tie-ins and removals, etc., of any part of the Work that would affect the continuity of operation of the adjacent services at approved times that will not interfere with the Owner's operations. Secure approval of Owner before proceeding.
- B. Make all necessary temporary connections required to permit operation of the building services and/or equipment. Remove the connections after need has ceased.
- C. The Contractor may be permitted to make changeovers during normal working hours at the Owner’s discretion. Should the Contractor perform this Work outside of normal working hours, no extra payment will be made for resulting overtime expenses.
- D. When connecting new facilities do not shut off any existing Mechanical/Electrical facilities or services without prior written approval of Owner's Representative.
- E. The Contractor shall not, except in an emergency condition, shutdown any utility without the express permission of the Owner's Representative. Major shutdowns of utilities, affecting life safety or outside contract limit lines, will be performed by Cornell University to enable Contractor to perform required Work. Major shutdowns shall be defined as those affecting life safety or which are outside the project site limits.

- F. Maintain domestic water and firewater in service at all times. No service may be out for more than twenty-four (24) hours. Maintain firewater flow capability (hose, if necessary) to all buildings and coordinate with Cornell Utilities, Cornell Environment, Health and Safety (EHS), and Authority Having Jurisdiction (AHJ).
- G. All shutdowns to be scheduled a minimum of seven (7) calendar days in advance and requests shall be submitted via ePM system to the Owner's Representative.
- H. IN THE EVENT OF AN EMERGENCY WHERE THE OWNER'S REPRESENTATIVE IS NOT AVAILABLE, THE CONTRACTOR SHALL DIAL 911 IMMEDIATELY.

1.7 OBSTACLES, INTERFERENCE AND COORDINATION

A. General

- 1. Plans show general design arrangement. Install Work substantially as indicated and verify exact location and elevations; DO NOT SCALE PLANS.
- 2. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevations, interferences, etc. Make necessary changes in the Work, equipment locations, etc., after notification to the Owner's Representative and Architect. Obtain approval from same, as part of Contract, to accommodate work to obstacles and interferences encountered.
- 3. Obtain written approval for all major changes before installing. If requested, submit drawings, detailing all such deviations or changes.
- 4. Exposed to view mechanical units, ductwork, conduit, pipes or other building equipment are essential parts of the artistic effect of the building design and shall be installed in locations as shown on the drawings. Conformance to given dimensions and alignments with the structural system, walls, openings, indicated centerlines are a requirement of the Contract and the Contractor shall familiarize himself with the critical nature of proper placement of these items. The Contractor shall notify the Architect of conflicts which would cause such equipment to be installed in locations other than as indicated on the Drawings. The Contractor shall not proceed with the installation of exposed to view mechanical units, ductwork, conduit, pipes, etc. until all conflicts have been identified by the Contractor and resolutions to conflicts approved by the Architect.

B. Interference

- 1. Install Work so that all items are operable and serviceable and avoid interfering with removal of rails, filters, belt guards and/or operation of doors, etc. Provide easy and safe access to valves, controllers, motor starters and other equipment requiring frequent attention.

1.8 EQUIPMENT ARRANGEMENTS

- A. Since all equipment of equal capacity is not necessarily of same arrangement, size of construction, these Plans are prepared on basis of one manufacturer as "basis-of-design equipment", even though other manufacturers' names are mentioned.

- B. If Contractor elects to use specified equipment other than "design equipment" which differs in arrangement, size, etc., the Contractor does so subject to following conditions:
1. Submit detailed drawings indicating proposed installations of equipment and showing maintenance and service space required.
 2. If revised arrangement meets approval, make all required changes in the work of all trades, including but not limited to louvers, panels, structural supports, pads, etc. at no increase in Contract. Provide larger motors and any additional control devices, valves, fittings and other miscellaneous equipment required for proper operation of revised layout, and assumes responsibility for proper location of roughing in and connections by other trades.
 3. If revised arrangement does not meet approval because of increase in pressure loss, possibility of increase in noise, lack of space or headroom, insufficient clearance for removal of parts, or for any other reason, provide equipment which conforms to Contract Drawings and Specifications.

1.9 EXISTING EQUIPMENT, MATERIALS, FIXTURES, ETC.

- A. Where existing equipment, piping, fittings, etc. are to be removed, Contractor shall submit complete list to Owner. All items that Owner wishes to retain shall be carefully removed and salvaged and delivered to building storage where directed by Owner. Items that Owner does not wish to retain shall be removed from the site and legally disposed.

1.10 EXAMINATION OF PREMISES, DRAWINGS, ETC.

- A. Before Submitting Proposal
1. Examine all Drawings and Specifications relating to work of all trades to determine scope and relation to other work.
 2. Examine all existing conditions affecting compliance with Plans and Specifications, by visiting site and/or building.
 3. Ascertain access to site, available storage and delivery facilities.
- B. Before Commencing Work on Any Phase or in any Area
1. Verify all governing dimensions at site and/or building.
 2. Inspect all adjacent work.

3. All work is to be conducted in such a manner as to cause a minimum degree of interference with the Campus' operation and academic schedule. Prior to the commencement of each phase, submit Shutdown / Demo action plans that clearly describe the steps required to safely shut down utilities, systems and infrastructure that are within the work area (or effecting the work area); and those outside the work area and within approximately 25 feet of the work area limits, as approved by the Owner. The Shutdown / Demo action plan shall identify the shut off point(s) for each utility, system and infrastructure as well as the secondary shut off point(s) to account if the primary points fail or are otherwise inaccessible. To identify shutoff points, trace each utility, system and infrastructure in the presence of the campus representative from the work area to the shutoff points and place clear label on same indicating what the shutoff point is and what it effects and whether it is the primary or secondary shut off. The Shutdown / Demo action plan shall describe the shutdown procedure, identify tools and material required for shutdown, sequence of activities required for proper shutdown, the name of the person(s) or trade(s) deemed competent to perform each activity in the shutdown sequence and names and telephone numbers of the campus staff required to provide access to shut off points, assist in the shut off or perform portions of the shutdown activities. Additionally, the plan will address the Contractor's plan for maintaining MEP to adjacent occupied areas, inclusive of planned tie-in points for any and all necessary, temporary infrastructure, alarming, monitoring etc. Submit the Shutdown / Demo action plan for review and approval at least two weeks prior to fieldwork in the work area. Fieldwork shall not begin until the Shutdown / Demo action plan is reviewed. Contractor is to assign and include a competent crew, knowledgeable of each unique system involved (i.e. Mechanic, Electrician, Sheet metal, Plumber, Controls, IT, etc.). Field investigation is to include any and all necessary ladders, scaffold, temp lighting, cutting tools, photos, labels, PPE, etc. needed to properly locate, access and label shut off points. The University is explicitly requesting heightened awareness and an earnest mitigation of impact. This requirement supplements all other contractual obligations, and requires the dedication of *no less than* an aggregate 40 hours.

C. Tender of Proposal Confirms Agreement

1. All items and conditions referred to herein and/or indicated on accompanying Drawings.
2. No consideration, additional monies or time extensions will be granted for alleged misunderstanding.

D. Existing or Archived Drawings

1. Existing or Archived drawings of impacted buildings are appended in electronic format only for reference and informational purposes. These historic drawings are not to be considered contract drawings and are provided "FOR INFORMATION ONLY". The Owner makes no representation as to the accuracy of the drawings as representing current conditions.

1.11 STAND DOWN DATES

A. Strict and effective enforcement by Contractor's management and supervision of the following dates and hours is required.

1. **Stand-Down Dates** (No construction work and no deliveries on site):

- a. Commencement Weekend
 - Friday, May 23, 2025
 - Saturday, May 24, 2025
 - Sunday, May 25, 2025

 - Friday, May 22, 2026
 - Saturday, May 23, 2026
 - Sunday, May 24, 2026
- b. Reunion Weekend
 - Thursday, June 5, 2025
 - Friday, June 6, 2025
 - Saturday, June 7, 2025
 - Sunday, June 8, 2025

 - Thursday, June 4, 2026
 - Friday, June 5, 2026
 - Saturday, June 6, 2026
 - Sunday, June 7, 2026

2. **Restricted Work Dates** (delivery & demolition restrictions but otherwise work as usual):

Friday, May 23, 2025	Commencement weekend- deliveries and work outside fence stop at noon
Thursday, Friday June 5 - 6, 2025	Reunion guest arrivals- no work outside fence; no demo or utility work inside fence
Friday, June 6, 2025	Reunion weekend- deliveries and work outside fence stop at noon
Friday, May 22, 2026	Commencement weekend- deliveries and work outside fence stop at noon
Thursday, Friday June 4 - 5, 2026	Reunion guest arrivals- no work outside fence; no demo or utility work inside fence
Friday, June 5, 2026	Reunion weekend- deliveries and work outside fence stop at noon

3. Student and Campus Life

Residence Halls Open

August 22, 2025

- ❖ No deliveries, no hauling materials into or out of the project site.
- ❖ All work to be contained to the fenced area of the project site.
- ❖ No deliveries, no hauling materials into or out of the project site.

1.12 WORKING HOURS

- A. Normal work hours are 7AM-dusk Monday-Saturday except during above noted restrictions. This means that Contractor shall not permit any noise generating activities that could disturb campus occupants or residents to take place outside of these hours. Should any conditions necessitate work to extend beyond these hours – Contractor may submit a detailed request with reasonable advance notice to Cornell. Cornell (at its sole discretion) may issue a written relaxation of the above but Contractor is advised never to assume that it will be granted.
- B. During Construction periods, no work shall take place prior to 9AM in a Residence Hall, Fraternity, Co-Op, Sorority, or any type of Housing Unit. Residence Halls require 72 hours notification to the Student & Academic Services representative prior to entering a Residence Hall or Student Room. This does not apply to Fraternity, Co-Op or Sorority House which require 24 hours notification to the Facilities Manager.
- C. Contractor shall be responsible to complete and submit a Dispensation of Hours to the Department of Labor for overtime or extended hours desired to be worked on the project as needed.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 14 00*****

SECTION 01 21 00 ALLOWANCES

1.0 GENERAL

1.1 RELATED DOCUMENTS

- A. This Section describes Allowances to be carried in the Base Bid by the Contractor.
- B. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.
- C. The Specification Section containing the pertinent requirements of materials and methods to achieve the Work described herein. Selected materials and equipment are specified in the Contract Documents by allowances.

1.2 SUMMARY

- A. Definition: An allowance is an amount determined by the Owner or calculated by the Contractor based on given quantities and stated on the Bid Proposal Submission Form.
- B. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the Contractor. Items covered by these allowances shall be supplied for such amounts and by such persons as the Owner may direct. All uses of the allowances will require the prior written approval of the Owner via a Field Change Authorization.
- C. Types of Allowances may include:
 - 1. Lump Sum Allowance
 - 2. Unit Price Allowance

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise the Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work. The Contractor shall provide the Owner fourteen (14) calendar days minimum notification of date.
- B. At the Owner's request, the Contractor shall obtain proposals for each allowance for use in making final selections. The Contractor shall include recommendations that are relevant to performing the Work.
- C. The Contractor shall purchase products and systems selected by the Architect and Owner from the designated supplier.

1.4 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- C. Submit time sheets and other documentation to show labor hours and cost for installation of allowance items that include installation as part of the allowance.
- D. Coordinate and process submittals for allowance items in the same manner as for other portions of the Work.

1.5 COORDINATION

- A. Coordinate related work and modify or adjust adjacent work as necessary to ensure that Work affected by each accepted allowance is complete and fully integrated into the Project.
- B. The Contractor shall include the dollar value of each scheduled allowance number as a separate line item in the Schedule of Values and identify each allowance with Section number 01 21 00.
- C. The Owner shall provide the Contractor with a Field Change Authorization prior to proceeding with the Work of an allowance.

1.6 LUMP SUM AND UNIT PRICE ALLOWANCES

- A. Allowances shall include cost to the Contractor of specific products and materials ordered by the Owner or selected by the Architect under allowance and shall include applicable taxes, freight, and delivery to the Project site.
- B. Included as part of each allowance are miscellaneous devices, accessory objects or similar items incidental to or required for a complete installation whether or not mentioned as part of the allowance.
- C. Unless otherwise indicated, Contractor's cost for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by the Owner or selected by the Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- D. Unused Materials: Return unused materials purchased under an allowance to the manufacturer or supplier for credit to the Owner, after installation has been completed and accepted.
 - 1. If requested by the Owner, retain and prepare unused materials for storage by the Owner. Deliver unused material to Owner's storage space as directed.

1.7 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts and scope of work, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. Prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 3. Submit substantiation of a change in scope of work, if any, claimed in Change Order related to unit-cost allowance.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, or overhead and profit. Submit claims in accordance with General Conditions, Article 4, Section 4.02 - Claims for Extra Work – Changes in Work within twenty-one (21) days of receipt of Field Change Authorization authorizing Work to proceed. The Owner will reject claims submitted later than twenty-one (21) days after such authorization.
1. Do not include Contractor's or Subcontractor's indirect expenses in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expenses is permitted for selection of higher or lower priced materials or systems of the same scope and nature as originally indicated.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Field Order Allowance No. 1

Lump Sum Allowance: Include the sum of **\$250,000** which shall cover the cost of additional labor, materials, and time for contingent activities within the scope of work as directed by the University in writing in a Field Order. The Field Order will include a description of the work and the method for determining the value of the work. The value of the work directed under this allowance will be determined by one or more of the provisions of Article 4 in the General Conditions. If the net cost of all Field Orders issued are more or less than the specified amount of the allowance, the Contract amount will be adjusted by Change Order. Overhead and profit is included in this amount.

B. Allowance No. 2

Lump Sum Allowance: Include the sum of **\$10,000** for tracing fire alarm circuits prior to demolition of existing infrastructure in King Shaw Hall to separate it from the rest of the ILR complex, which includes both Dolgen Hall and ILR Research.

*****END OF SECTION 01 21 00*****

SECTION 01 23 00 ALTERNATES

1.0 GENERAL

1.1 RELATED DOCUMENTS

- A. This Section describes the changes to be made under each Alternative.
- B. The Specification Section containing the pertinent requirements of materials and methods to achieve the Work described herein.

1.2 DESCRIPTION OF REQUIREMENTS

- A. Definition: An alternate is an amount proposed by Bidders and stated on the Bid Proposal Submission Form and in the electronic Bid Module for certain items that may be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the product, materials, equipment, systems or installation methods described in the Contract Documents. Alternates shall include all overhead, profit and other expenses, including bond costs, in connection therewith.
- B. Coordination: Coordinate related Work and modify or adjust adjacent Work as necessary to ensure that Work affected by each accepted alternate is complete and fully integrated into the Project.
- C. Notification: Immediately following Contract award, prepare and distribute to each party involved, notification of the status of each alternate. Indicate whether alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to alternates.
- D. Schedule: A "Schedule of Alternates" is included at the end of this Section. Include as part of each alternate, miscellaneous devices, accessory objects or similar items incidental to or required for a complete installation whether or not mentioned as part of the alternate.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. ALTERNATE NO. 1
Provide amount to restore the cupola as shown on Drawings A305, A306, and A307.
- B. ALTERNATE NO. 2
Provide amount for a 2 hour rated glass wall and door assembly on both Stair A and B on levels 3 and 4 (Per Drawing 10/A704).

END OF SECTION 01 23 00

SECTION 01 25 00 SUBSTITUTIONS AND PRODUCT OPTIONS

1.0 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall furnish and install the products specified, under the options and conditions for substitutions stated in this Section.

1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions that are beyond the Contractor's control, such as unavailability of product, or regulatory changes.
 - a. Products that are not available from Contractor's preferred suppliers does not constitute unavailability of product.
 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.
- B. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 2. New Products: Items that have not previously been incorporated into another project or facility. Items salvaged from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

- C. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. In addition to submission of Substitution Request Form, substitutions shall be listed on the Bid Proposal Submission Form with description, specification references, and corresponding change in base bid

1.4 PRODUCTS LIST

- A. Within thirty (30) days after the award of Contract, submit to the Architect a complete list of products which are proposed for installation.
- B. Tabulate the products by listing under each specification section title and number.
- C. For products specified only by reference standards, list for each such product:
 - 1. Name and address of the manufacturer.
 - 2. Trade name.
 - 3. Model or catalog designation.
 - 4. Manufacturer's data:
 - a. Reference standards.
 - b. Performance test data.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.
- B. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Contractor is responsible for providing products and construction methods compatible with other products and construction methods.
 - 2. If a dispute or compatibility issue arises over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PROCEDURES

- A. Coordination: Modify or adjust affected Work as necessary to integrate Work of accepted substitutions and approved comparable products.

1.7 EQUIVALENTS – APPROVED EQUAL

A. Equivalents or Approvals - General

1. The words “similar and equal to”, or “or equal”, “equivalent” and such other words of similar content and meaning shall for the purposes of this Contract be deemed to mean similar or equivalent to one of the named products. For the purposes of Paragraph A and B of this Section 1.4 and for the purposes of Bidding Documents, the word “products” shall be deemed to include the words “articles”, “materials”, “items”, “equipment” and “methods”. Whenever in the Contract documents one or more products are specified, the words “similar and equal to” shall be deemed inserted.
2. Whenever any product is specified in the Contract documents by a reference to the name, trade name, make or catalog number of any manufacturer or supplier, the intent is not to limit competition, but to establish a standard of quality which the Architect has determined is necessary for the Project. The Contractor may at its option use any product other than that specified in the Contract Documents provided the same is approved by the Architect in accordance with the procedures set forth in Paragraph B of this Section 1.4. In all cases the Architect shall be the sole judge as to whether a proposed product is to be approved and the Contractor shall have the burden of proving, at its own cost and expense, to the satisfaction of the Architect, that the proposed product is similar and equal to the named product. In making such determination the Architect may establish such objective and appearance criteria as it may deem proper that the proposed product must meet in order for it to be approved.
3. Nothing in the Contract Documents shall be construed as representing, expressly or implied, that the named product is available or that there is or there is not a product similar and equal to any of the named products and the Contractor shall have and make no claim by reason of the availability or lack of availability of the named product or of a product similar and equal to any named product.
4. The Contractor shall have and make no claim for an extension of time or for damages by reason of the time taken by the Architect or by reason of the failure of the Architect to approve a product proposed by the Contractor.
5. Request for approval of proposed equivalents will be received by the Architect only from the Contractor.

- B. **Equivalents or Approvals After Bidding**
1. Request for approval of proposed equivalents will be considered by the Architect after bidding only in the following cases: (a) the named product cannot be obtained by the Contractor because of strikes, lockouts, bankruptcies or discontinuance of manufacturer and the Contractor makes a written request to the Architect for consideration of the proposed equivalent within ten (10) calendar days of the date it ascertains it cannot obtain the named product; or (b) the proposed equivalent is superior, in the opinion of the Architect, to the named product; or (c) the proposed equivalent, in the opinion of the Architect, is equal to the named product and its use is to the advantage of the Owner, e.g., the Owner receives an equitable credit, acceptable to it, as a result of the estimated cost savings to the Contractor from the use of the proposed equivalent or the Owner determines that the Contractor has not failed to act diligently in placing the necessary purchase orders and a savings in the time required for the completion of the construction of the Project should result from the use of the proposed equivalent; or (d) the proposed equivalent, in the opinion of the Architect, is equal to the named product and less than ninety (90) calendar days have elapsed since the Notice of Award of the Contract.
 2. Where the Architect pursuant to the provisions of this Section 1.4 approves a product proposed by the Contractor and such proposed product requires a revision or redesign of any part of the Work covered by this Contract, all such revision and redesign and all new Drawings and details required therefore shall be subject to approval of the Architect and shall be provided by the Contractor at its own cost and expense.
 3. Where the Architect pursuant to the provisions of this Section approves a product proposed by the Contractor and such proposed product requires a different quantity and/or arrangement of ductwork, piping, wiring, conduit or any other part of the Work from that specified, detailed or indicated in the Contract Documents, the contractor shall provide the same at its own cost and expense.

1.8 CONTRACTOR'S OPTIONS

- A. For products specified only by reference standard, select any product meeting that standard, by any manufacturer.
- B. For products specified by naming several products or manufacturers, select any one of products and manufacturers named.
1. **Products:**
 - a. **Restricted List (Products):** Where Specifications include paragraphs or subparagraphs titled "Products" or that include the phrase "provide one of the following", and include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products for Contractor's convenience will not be considered.
 - Substitutions may be considered, unless otherwise indicated.

- b. Non-restricted List (Available Products): Where Specifications include paragraphs or subparagraphs titled “Available Products” or that include the phrase “include, but are not limited to, the following”, and include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
2. Manufacturers:
 - a. Restricted List (Manufacturers): Where Specifications include paragraphs or subparagraphs titled “Manufacturers” or that include the phrase “provide products by one of the following”, and include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products for Contractor's convenience will not be considered.
 - Substitutions may be considered, unless otherwise indicated.
 - b. Non-restricted List (Available Manufacturers): Where Specifications include paragraphs or subparagraphs titled “Available Manufacturers” or that include the phrase “include, but are not limited to, the following”, and include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Contractors shall be responsible for accommodating differences in dimensions, connection locations, and other information in order to effect a complete functioning system should a component other than basis of design be submitted.
 - a. Restricted List (List of Manufacturers): Where Specifications include paragraphs or subparagraphs titled “Basis-of-Design Product”, and include a list of other manufacturers' names, provide the specified or indicated product or a comparable product by one of the other named manufacturers that complies with requirements.
 - Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - Substitutions may be considered, unless otherwise indicated.
 - b. Non-restricted List (No List of Manufacturers): Where Specifications include paragraphs or subparagraphs titled “Basis-of-Design Product”, and do not include a list of other manufacturers’ names, provide the specified or indicated product or a comparable product by another manufacturer that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

- C. For products specified by naming one or more products or manufacturers and stating "or equal", the Contractor shall submit a request as for substitutions, for any product or manufacturer not specifically named. Such substitution shall have been listed on Bid Proposal Submission Form as required in Instructions to Bidders. If not so listed, no substitution will be allowed.
- D. For products specified by naming only one product and manufacturer, no option and no substitution will be considered unless listed on the Bid Proposal Submission Form as provided in the Instructions to Bidders. Base Bid must include the specified product or manufacturer. Substitutions will be at the sole discretion of the Owner.

1.9 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 21 days prior to time required for preparation and review of related submittals.
- B. Substitutions for Convenience: Submit requests for substitution within thirty (30) days of contract award.
- C. Submit a separate request for each substitution. Support each request with:
 - 1. Completed "Request for Substitution" form in the ePM system. A request for substitution of a product, material, or process for that specified in the Contract Documents must be formally submitted as such accompanied by evidence that the proposed substitution {1} is equal in quality and serviceability to the specified item; {2} will not entail changes in detail and construction of other work; {3} will be acceptable to the Architect and Owner's Design Consultant's in achieving design and artistic intent; and {4} will not result in a cost and/or schedule disadvantage.
 - 2. Complete data substantiating compliance of the proposed substitution with requirements stated in Contract Documents:
 - a. Product identification, including manufacturer's name and address.
 - b. Manufacturer's literature; identify:
 - Product description.
 - Reference standards.
 - Performance and test data.
 - c. Samples, as applicable.
 - d. Name and address of similar projects on which product has been used, and the date of each installation.
 - 3. An itemized comparison of the proposed substitution with the product specified listing any variations.
 - 4. Data relating to any changes in the construction schedule.

5. The effect of the substitution on each separate contract of the Project.
 6. List any changes required in other work or projects.
 7. Designate any required license fees or royalties.
 8. Designate availability of maintenance services, and source of replacement materials.
- D. Substitutions shall not result in additions to the Contract Sum.
- E. Substitutions will not be considered as having been accepted when:
1. They are indicated or implied on shop drawings or product data submittals without a formal request from the Contractor.
 2. They are requested by a Subcontractor or supplier.
 3. The acceptance will require substantial revision of Contract Documents.
- F. Substitute products shall not be ordered or installed without written acceptance of the Owner.
- G. The Owner and the Architect shall be the sole judges of the acceptability of a proposed substitution.

1.10 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Contractor's request for approval of comparable product will be considered when the following conditions are satisfied. If the following conditions are not satisfied, Architect may reject or return requests without action, except to record noncompliance with these requirements. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product or manufacturer:
1. Evidence that the proposed product does not require revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the product specified.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

1.11 CONTRACTOR'S REPRESENTATION

- A. In making a formal request for a substitution the Contractor represents that:
1. By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor thereby represents that he has determined and verified all dimensions, quantities, field dimensions, relations to existing work, coordination with work to be installed later, coordination with information on previous Shop Drawings, Product Data, or Samples and compliance with all the requirements of the Contract Documents. The accuracy of all such information is the responsibility of the Contractor.
 2. The Contractor has personally investigated the proposed product and has determined that it is equal to or superior in all respects to that specified.
 3. The Contractor will provide the same warranties or bonds for the substitution as for the product specified.
 4. The Contractor will coordinate the installation of an accepted substitution into the Work, and will make such changes as may be required for the Work to be complete in all respects.
 5. The Contractor waives all claims for additional costs related to the substitution which may subsequently become apparent.

1.12 ARCHITECT'S DUTIES

- A. Review Contractor's requests for substitutions with reasonable promptness.
- B. Transmit evaluations and recommendations to the Owner, so that the Owner can notify the Contractor of the decision for acceptance or rejection of the request for substitution.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 25 00*****

SECTION 01 31 19 PROJECT MEETINGS

1.0 GENERAL

1.1 DESCRIPTION

- A. The Owner will schedule and administer pre-construction meeting, periodic progress meetings, and specially called meetings throughout the progress of the Work.
1. Prepare agenda for meetings.
 2. Distribute notice of each meeting no less than four calendar days in advance
 3. Make physical arrangements for meetings.
 4. Preside at meetings.
 5. Record the minutes; include all significant proceedings and decisions.
 6. Upload copies of minutes after each meeting to all participants in the meeting.
- B. Representatives of Contractor, Subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.2 PRE-CONSTRUCTION MEETING

- A. Schedule at least fifteen (15) days after date of Notice to Proceed.
- B. Location: A central site, convenient for all parties.
- C. Attendance:
1. Owner's Representative(s)
 2. Contractor(s)
 3. Architect and its professional consultants
 4. Major Subcontractors
 5. Major suppliers
 6. Safety Representatives for the Owner and Contractor
 7. Commissioning Agent

- D. Minimum Agenda:
1. Distribution and discussion of:
 - a. List of major Subcontractors and suppliers
 - b. Projected Construction Schedules
 2. Critical work sequencing
 - a. Identification of major shutdowns and approximate schedule
 3. Major equipment deliveries and priorities
 4. Project Coordination
 - a. Designation of responsible personnel
 5. Procedures and processing of:
 - a. Field decisions
 - b. Proposal requests
 - c. Submittals
 - d. Change Orders
 - e. Applications for Payment
 - f. Requests for Information
 - g. Daily Reports
 6. Adequacy of distribution of Contract Documents
 7. Procedures for maintaining Record Documents
 8. Use of premises:
 - a. Office, work and storage areas
 - b. Owner's requirements
 - c. Job site personnel conduct
 - d. Building access and security
 9. Temporary facilities, controls and construction aids
 10. Temporary utilities

11. Safety and first-aid procedures
 - a. Contractor's Project Site Specific Plan
 - b. Plan as applicable to high impact respiratory pathogen pandemics and contagions (HIRPP)
12. Security procedures
13. Housekeeping procedures

1.3 PROGRESS MEETINGS

- A. Schedule regular periodic meetings on the site, not less than once every two weeks throughout the Construction period.
- B. Attendance:
 1. Architect
 2. Architect's professional consultants when, in the opinion of the Owner, needed
 3. General Contractor, including Site Superintendent
 4. Owner's Representatives
 5. Commissioning Agent, as appropriate to agenda
 6. Subcontractors as appropriate to the agenda
 7. Suppliers as appropriate to the agenda
 8. Safety Representative
- C. Minimum Agenda:
 1. Review, approval of minutes of previous meeting
 2. Review percentage of work to be in place by next meeting by individual trades
 3. Review of work progress since previous meeting
 4. Field observations, problems, and conflicts
 5. Problems which impede Construction Schedule
 6. Review of off-site fabrication, delivery schedules
 7. Corrective measures and procedures to regain projected schedule
 8. Revisions to Construction Schedule
 9. Planned progress and schedule, during succeeding work period

10. Coordination of schedules
 11. Review submittal schedules; expedite as required
 12. Maintenance of quality standards
 13. Building Commissioning
 14. Review status of all issued proposal requests and change orders
 15. Review proposed changes for:
 - a. Effect on Construction Schedule and on completion date
 - b. Effect on other contracts of the Project
 16. Other business
- D. All decisions, instructions, and interpretations given by the Architect/Engineer or its representative at these meetings shall be binding and conclusive on the Contractor.

1.4 LEED MEETINGS

- A. Owner will schedule an initial LEED coordination conference within twenty-one (21) days after date of Notice to Proceed, and Owner will schedule periodic LEED meetings on the site at not less than intervals required for LEED compliance.
1. Attendance:
 - a. Architect
 - b. Architect's professional consultants when, in the opinion of the Owner, needed
 - c. General Contractor, including Site Superintendent
 - d. Owner's Representatives, including Owner's LEED Project Coordinator, and Owner's Commissioning Agent.
 - e. Subcontractors as appropriate to the agenda
 - f. Suppliers as appropriate to the agenda
 2. Minimum Agenda:
 - a. Review, approval of minutes of previous LEED meetings
 - b. LEED Project Checklist
 - c. General requirements for LEED-related procurement and documentation
 - d. Project closeout requirements and LEED certification procedures

- e. Roles of Contractor's LEED Coordinator and Owner's LEED Project Coordinator
 - f. Construction waste management
 - g. Construction operations and LEED requirements and restrictions
 - h. Other business of significance that affects Owner's sustainable design goals and that could affect meeting requirements for LEED certification
- B. All decisions, instructions, and interpretations given by the Owner's LEED Project Coordinator or its representative at these meetings shall be binding and conclusive on the Contractor.

1.5 PRE-INSTALLATION MEETING(S)

- A. The Contractor to hold pre-installation meetings where required by individual specification sections or others at the discretion of the Owner. Minimum attendees would be Architect and/or their specific sub-consultant, Owner, Contractor, Subcontractor, key Suppliers, testing & inspection firm, Facilities Engineering subject matter expert, etc. Minimum agenda would include review of key submittals, RFI's, safety, logistics, material procurement, quality control, etc. Contractor to assemble and distribute the Agenda minimum 48 hours prior to meeting as well as distribute meeting minutes a minimum of seven (7) calendar days after the meeting.
- B. Submit a list of pre-installation meetings with preliminary dates within fifteen (15) days of issuance of the Notice to Proceed.

1.6 COMMISSIONING MEETINGS

- A. The Commissioning (Cx) Agent will schedule and conduct Cx coordination meetings as noted below.
- 1. Kick-off Meeting near the beginning of construction
 - 2. TAB/ATC coordination meeting prior to commencement of TAB services
 - 3. Routine commissioning meetings during the Acceptance Phase on a not less than bi-weekly basis.
- B. Attendance:
- 1. Architect's professional consultants when, in the opinion of the Owner, needed
 - 2. General Contractor, including Site Superintendent
 - 3. Owner's Representative
 - 4. Commissioning Agent

5. Subcontractors involved in the Cx process
 - a. Mechanical Contractor
 - b. Electrical Contractor
 - c. ATC Contractor
 - d. TAB Contractor
 - e. Fire Alarm Contractor
 - f. Suppliers as appropriate to the agenda
- C. Minimum Agenda:
 1. Review, approval of minutes of previous Commissioning Meetings
 2. Schedule update
 3. Action items
 4. Update Cx Record
 5. New Issues
 6. Coordination and look ahead until next meeting
 7. Other business of significance that affects commissioning goals
- D. All decisions, instructions, and interpretations given by the Owner's Commissioning Agent or its representative at these meetings shall be binding and conclusive on the Contractor.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

******END OF SECTION 01 31 19******

SECTION 01 31 50 ELECTRONIC PROJECT MANAGEMENT

1.0 GENERAL

1.1 SUMMARY

- A. Owner Provided System: The Contractor will utilize the Owner's electronic Project Management (ePM) system on this project.
 - 1. The Owner shall manage the day to day use of the Owner provided ePM system and organize the training, support and maintenance of the ePM Website System for the entire project team for the period of its use on the Project.
- B. There are no fees to utilize this system.

1.2 RELATED SECTIONS

- A. General Conditions Article 9 – Coordination and Cooperation.
- B. Section 01 33 00 – Submittal Procedures

1.3 DEFINITIONS

- A. ePM: defined as an internet-based information and project communication system that allows the entire project team to collaborate in a centralized and secured repository. All project-specific correspondence, workflow processes, and documentation will be stored and routed within the ePM system.

1.4 PROCEDURES

- A. Users will be provided a username and password. The Contractor shall log into the ePM system to enter the Project Documentation listed in section 2.0. All correspondence should be communicated through the e-PM system.
- B. Training
 - 1. The Owner will hold training sessions to familiarize team members with the system, and all Contractor staff are expected to attend one of these sessions or otherwise receive proper training on the system's use. All cost for personnel time and travel to attend the training as needed shall be included in the Contractor's proposal.
- C. The Contractor shall provide on-site personnel with personal computer(s) and personal computer equipment that will allow the Contractor's personnel to access and use the ePM Website System in a timely and efficient manner. At a minimum the Contractor is to provide the following equipment and software:
 - 1. Web Browser: with high-speed connection, up/downloading capability
 - 2. Device that is able to scan documents and take photographs

3. Portable Document Format (PDF) Reader/writer software
- D. Contractor shall log on to the ePM Website System on a daily basis, and as necessary to be kept fully appraised of the project developments, correspondence, assigned tasks and other matters that occur on the site. These may include but are not limited to RFI's, action items, meeting minutes, discussion threads, schedule updates, submittals, submittal log, punch list items, daily reports, site photos and/or videos and pre-construction surveys.

1.5 PROCESS OVERVIEW

- A. The Contractor is required to timely and accurately post, review, respond, and collaborate with other team members using the following features and/or workflow processes within the ePM system.
- B. Project Team Directory – Contractor shall provide an updated directory of contact information for all companies, Subcontractors and project team members who are engaged on this project.
- C. Request for Information (RFI): All project RFI's will be submitted using the ePM Website System. The submission of a Request for Information (RFI) is the Contractor's exclusive means of requesting information from the Owner and/or Architect. Attachments to RFI's (which may include sketches, photographs, documentation, and the like, will be uploaded to the ePM Website System and attached to the RFI electronically.
- D. Meeting Minutes: Contractor and/or Owner shall enter meeting agendas, records and minutes in the ePM system for all applicable meetings as designated by the Owner.
- E. General Communications, memorandums and Letters (Project Correspondence): Shall be created in or posted to the ePM Website System in PDF format electronically linked to action items. These action items shall include names of party (ies) required to respond, time frame within which action is to be taken and any solutions the Contractor recommends.
- F. Drawings and Specifications: The Contract Documents will be posted to the ePM Website System as directed by the Owner. The Owner shall retain the right to assign download rights to active CAD or model files. CAD or model files, in any format, posted to the ePM Website System are for viewing and printing only and cannot be edited.
- G. Submittals: All submittals shall be fully electronic. Reference Section 01 33 00.
- H. Submittal Schedule and Log: Contractor shall post and/or update on a daily basis.
- I. Field Reporting: The Contractor shall post and/or update on a daily basis all reports required by other specification sections. These reports include, but are not limited to, daily construction reports, material location reports, unusual event reports, safety and accident reports.
- J. Project Photographs: Contractor shall upload project photographs to the ePM system, field by date and type including but not limited to:
 1. General Progress Photographs

2. RFI Issues
 3. Non-Conforming Work
 4. Special Events
 5. As required by individual Specification Sections
- K. Project Schedule: The contractor shall post, distribute, review, and/or respond to the project schedule, monthly updates, and any other schedule submittals onto the ePM in both native and PDF formats.
- L. Permits & Approvals: Contractor shall upload and maintain current copies of all permits and agency approvals that relate to the project.
- M. Issue Tracking: Contractor to log and respond to issues that are related and affect other stakeholders within the project team.
- N. Quality Assurance: The Owner and/or Architect will issue reports on conforming items in the ePM system. The Contractor is required to review and respond with corrective actions in the system.
- O. Change Management – Cost Events and Change Orders will be managed by the e-PM system and the Contractor shall be responsible for reporting potential changes and logging Requests for Change Orders in the system. The Contractor shall also upload and manage all documentation supporting Requested Change Orders.
- P. Pay Applications Requests (Invoices) – The Contractor shall create and submit invoices for review by the Owner. Once the invoices are agreed to by the Owner then the invoices should be submitted electronically per the instructions for the ePM system.
- Q. Budget and Cost Management – Contractor to provide estimates and Work Breakdown Structure (WBS) to provide Owner with accurate budget/cost analysis.

1.6 ADDITIONAL INFORMATION

- A. The Owner may change the standards for distribution and process prescribed above as required to suit the project.
- B. The Owner shall retain ownership of all data entered into either system and shall administrate and distribute all information contained therein.
- C. The Contractor shall make certain that all Subcontractors performing significant Work on the Project shall actively participate in the ePM system. Requirements for participation in the ePM system shall be made part of each bid document and final contract.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

******END OF SECTION 01 31 50******

SECTION 01 32 16 CONSTRUCTION SCHEDULE

1.0 GENERAL

1.1 SUMMARY

- A. This Section establishes the Contractor's obligation to prepare, use and update a Critical Path Method ("CPM") network plan for the entire Work and related activities which are essential to the progress of the Work to be designated as the Project Schedule. This Section describes the requirements for development, approval, utilization, and updating of the Project Schedule.
- B. Submit monthly Project Schedule updates.
- C. Submit to Owner and Architect a cash flow projection in accordance with Schedule of Values.
- D. Submit electronic versions of all schedules, including updates, as well as all back-up to the submitted schedules.

1.2 RELATED SECTIONS

- A. General Conditions Article 5 – Time of Completion.
- B. General Conditions Article 9 – Coordination and Cooperation.
- C. Section 01 33 00 – Submittal Procedures.

1.3 DEFINITIONS

- A. Critical Path Method (CPM): A method of planning and scheduling a construction project where activities are arranged based on activity relationships and network calculations determine when activities can be performed and the critical path of the Project.
- B. Critical Path: The longest continuous chain of activities through the network at a given data date for the Schedule to a Contract Milestone or Contract Completion. Where the path to a specific Milestone has become negative, the Critical Path shall be the longest continuous chain of activities with the greatest amount of negative float.
- C. Near Critical Path: Any continuous series of activities through the network to the Contract Milestone or the Contract Completion Date where the Total Float of the activity at the data date along that path is within 10 days of the Total Float possessed by the activity at the data date along the Critical Path.

- D. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path.
 - 2. Predecessor activity is an activity that must be completed before a given activity can be started.
- E. Milestone: A key or critical point in time for reference or measurement.
- F. Float is the measure of flexibility in an activity. Float time belongs to the Project.
 - 1. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
 - 2. Total float is the amount of time in starting or completing an activity without adversely affecting the planned project completion date, or an interim milestone that has a constraint.
- G. Fragnet: The sequence of new activitie(s) and/or activity revisions, logic or resource changes that are proposed to be added to the existing schedule to demonstrate the influence of impacts to the schedule. The Fragnet shall identify the predecessors to the new activities and demonstrate the impacts to successor activities.

2.0 PRODUCTS

2.1 SCHEDULING SOFTWARE

- A. The Contractor shall use the current version of Primavera Project Planner, Microsoft Projects, or other software approved in writing by the Owner to develop and update the Project Schedule, and all submissions of Project Schedule data in electronic form required in this Section shall be in Primavera Project Planner format. An alternate program may be proposed as a substitute “or equal” program to the Owner for review.
- B. In order to be acceptable as a substitute for the use of Primavera Project Planner, the Contractor's software must be capable of exporting all Project Schedule data in a format that may be opened, read, and modified using the current version of Primavera Project Planner without loss of functionality or information.
- C. Terms used herein with reference to the Project Schedule shall have the same definitions as those used within the Primavera Project Planner software.

3.0 EXECUTION

3.1 PROJECT SCHEDULE REQUIREMENTS MEETING

- A. The Contractor shall meet with the Owner within five (5) workdays after notice to proceed to conduct a joint review of the Project Schedule requirements in this section.

3.2 SCHEDULE SUBMISSIONS

A. General Requirements:

1. Prepare a Critical Path Method (CPM) Project Schedule
2. Activity durations shall be in units of whole workdays. Unless a longer duration is approved by the Owner, durations for activities other than submittal and procurement activities shall not exceed fifteen (15) workdays.
3. Except for the first and last activities in the Project Schedule, each activity shall have at least one predecessor and one successor relationship to form a logically connected network plan from Notice to Proceed (NTP) to the Contract completion date.
4. Each activity shall be cost and resource loaded. Labor, material and equipment shall be clearly identified and valued.
5. The Contractor shall provide the native electronic files of the CPM schedule, graphics, cost and resource reports required under this Section and/or as requested by the Owner at no additional cost throughout the entire project performance period until Project completion is achieved. Contractor shall also provide all documents in PDF electronically created from the native files to PDFs (not scans).

B. Preliminary Schedule:

1. Within twenty one (21) calendar days of Notice to Proceed ("NTP"), the Contractor shall submit a Preliminary Schedule in the form and requirements specified in 3.4 with respect to the planned work activities to be performed during the first one hundred twenty (120) calendar days following NTP. Activities beyond the first one hundred twenty (120) calendar days may be depicted in summary form.
2. The Owner will review schedules and return review copy within ten (10) days after receipt.
3. If required, resubmit within seven (7) days after return of review copy.

C. Baseline Project Schedule:

1. Within sixty (60) calendar days following NTP, the Contractor shall submit a proposed Project Schedule in the form specified in 3.4.
2. The Owner will review schedules and return review copy within ten (10) days after receipt.
3. If required, resubmit within seven (7) days after return of review copy.

D. Technical Requirements:

1. Show the complete sequence of construction by activity.

2. At a minimum show the dates for the beginning, and completion of, each major element of construction. Specifically list:
 - a. All submittal and review activities, including preparation of shop drawings, calculations, samples, and mockups, testing of mockups, and Owner review of submittals;
 - b. All procurement activities, including awarding of subcontracts and fabrication, testing, and delivery of materials and equipment;
 - c. All field activities, including mobilization, demobilization, construction, site clearing, site utilities, foundation work, structural framing, Subcontractor work, equipment installations, finishes, pre-installation meetings, start-up, testing, balancing, commissioning, and punchlist.
 3. Show projected percentages of completion for each item, as of the first day of each month.
 4. Show estimated dates for the beginning and completion of work which must be completed by or coordinated with the Owner such as hazardous materials abatement, moving, training and other such items as they are identified.
- E. Submittals Schedule for Shop Drawings, Product Data and Samples: Submit Submittals Schedule within thirty (30) calendar days after date of commencement of work. Confer with the Architect and agree on all elements of the Submittals Schedule. The schedule will be based on the understanding that minimum turn-around time in the Architect's office is ten (10) working days. Some submittals or groups of submittals may take longer to review. Submittals which do not conform to the agreed schedule may be subject to delays in processing. Show:
1. The dates for Contractor's submittals.
 2. The dates reviewed submittals will be required from the Architect.
 3. Confirmed lead time for manufacturing, production, fabrication and shipment to the project site of all materials which have an impact on the critical path of the Project's construction schedule.

3.3 SCHEDULE UPDATES

- A. Submit progress update schedules to accompany each application for payment.
- B. Indicate progress of each activity to date of submission.
- C. Show changes occurring since previous submission of schedule:
 1. Major changes in scope
 2. Activities modified since previous submission
 3. Revised projections of progress and completion
 4. Other identifiable changes

- D. When change orders are proposed, potential delays are anticipated, or delays are experienced, the Contractor shall submit a written Time Impact Analysis (TIA) describing the effect of each potential change order, potential delay, delay, or Contractor request on the Substantial Completion Date:
1. The TIA shall meet the requirements for submittal of a Schedule Revision with sufficient supporting documentation to enable the Owner to make a determination on the Contractor's request for time extension.
 2. The TIA shall be performed by inserting a fragnet into a copy of the current schedule at the time the impact was identified or occurred.
 3. All TIAs shall be incorporated into the current schedule and not prior schedules. Thus, the current schedule shall be updated, accepted, and TIAs incorporated each month.
- E. All approved change orders must be incorporated in the following month's schedule update.

3.4 FORM OF SUBMISSION OF PROJECT SCHEDULE AND UPDATES

- A. All proposed versions of the Project Schedule shall be submitted as follows.
1. The Contractor shall submit an electronic copy of native file and PDF versions of all generated reports.
 2. The Preliminary Schedule and proposed Project Schedules shall have the NTP date as the data date, and shall reflect no progress of work activities;
 3. Format of column listings: The chronological order of the start of each item of work, activity ID, activity description, early start, late start, early finish, late finish, original duration, remaining duration, percent completion, area code, responsibility code, total float, budgeted cost, budgeted quantity, and calendar ID.
 4. Narrative: The Contractor shall submit a narrative including explanation of the following:
 - a. The contract substantial completion date;
 - b. The approach used to plan and sequence the Work, including considerations of site logistics, Contract Milestones, and where applicable, phasing and coordination with other contractors;
 - c. Steps taken to address exceptions to prior submissions; and
 - d. Identification of all intentional deviations from the specific requirements of this Section, together with a justification for approval of the deviation.
 - e. Description of the activities on the primary and secondary critical paths.

- B. Project Schedule Updates shall be submitted as follows:
1. The Contractor shall submit an electronic copy of the Project Schedule Update
 2. The Contractor shall submit all proposed revisions after the initial Project Baseline Schedule submission in fragnet form.
 3. The Contractor shall submit with all Preliminary Schedule and Project Schedule Updates a narrative addressing the following:
 - a. Current projected substantial completion date and the number of days ahead/behind the contract substantial completion date;
 - b. Variance from prior schedule forecasted (substantial) completion date
 - c. Progress achieved against the planned critical path during the period;
 - d. Description of major work activities performed during the month prior to the Update;
 - e. Description of major work activities anticipated to be performed during the month following the Update;
 - f. The approach used to plan and sequence the Work, including considerations of site logistics, Contract milestones, and where applicable, phasing and coordination with other contractors;
 - g. Description of the activities on the primary and secondary critical paths during the month prior to the Update. Any changes to the primary Critical Path since the prior month's update with reason as to why it is now the critical path;
 - h. Sources of potential Project delay, including activities or groups of activities whose float has diminished over the course of prior Updates and their potential impact on the schedule;
 - i. Pending items (submittal reviews, answers to requests for information, change orders, requests for time-extensions, etc.) affecting critical path activities and activities with limited or diminishing available float;
 - j. All revisions introduced into the Project Schedule since the prior Update, the reason for the revision, the Activity ID of all activities affected by the revision, and the impact, if any, to the float for each such activity, as well as the Project completion date; and
 - k. All exceptions taken by the Owner to the Contractor's prior Update and whether they were resolved or not.
 - l. Identification of all intentional deviations from the specific requirements of this Section, together with a justification for approval of the deviation
 - m. Steps taken to address exceptions to prior submissions;
 - n. The effect of new changes on schedule.

3.5 DISTRIBUTION

- A. Distribute copies of the reviewed schedules to:
 - 1. Owner Job Site personnel
 - 2. Subcontractors
 - 3. Other concerned parties
- B. Instruct recipients to report to the Contractor, in writing, any problems anticipated by the projections of the schedule.

*****END OF SECTION 01 32 16*****

SECTION 01 32 33 PHOTOGRAPHIC DOCUMENTATION

1.0 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall provide existing condition photographs taken before commencement of Work, progress photographs taken periodically during progress of the Work, and final photographs upon completion and full occupancy of the building.

1.2 SUBMITTALS

- A. Progress Submittals
1. Key Plan: Submit key plan of Project area and building with notation of vantage points marked for location and direction of each photograph.
 2. Upload digital photograph electronic files, organizationally filed by week, to the ePM system within five (5) days of taking photographs.
 3. Each photograph shall be identified with project title, date, and a description of the view.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION

3.1 EXISTING CONDITION PHOTOGRAPHS

- A. Before commencement of selective demolition, take photographs of Project area and surrounding areas, including existing items to remain during construction.

3.2 PROGRESS PHOTOGRAPHS

- A. Photographs shall be taken weekly in a manner which completely documents the Work.
- B. The photographs shall be submitted to the Owner at the end of the first week for review.
- C. Provide photographs of any wall, ceiling or floor assembly containing MEP, A/V or any infrastructure that will thereafter become concealed-prior to closure. Note location on Key Plan.

3.3 FINAL COMPLETION PHOTOGRAPHS

- A. Photographs shall be taken in a manner which completely documents the completed Work, for submission as project record documents.

*****END OF SECTION 01 32 33*****

SECTION 01 33 00 SUBMITTAL PROCEDURES

1.0 GENERAL

1.1 DESCRIPTION

- A. Section includes administrative and procedural requirements for submittals, including the following:
 - 1. Shop Drawings
 - 2. LEED Submittals
 - 3. Product Data
 - 4. Samples and Mock-ups
 - 5. Quality Assurance and Quality Control Submittals
 - 6. Coordination Drawings
 - 7. Certification of Asbestos free products
 - 8. Post-Construction or Post-Renovation Asbestos survey, reference Section 01 35 29.
 - 9. Owner audio/visual
 - 10. Owner furnishings and fixed equipment
- B. Designate in the construction schedule, and/or in a separate Submittals Schedule, the dates for submission and the dates reviewed Shop Drawings, Product Data and Samples will be needed.
- C. With the exception of physical samples and color charts, or as otherwise approved by the Owner, all submittals shall be electronic images in PDF format created electronically (saved with commenting allowed) which shall be submitted for review and approval via the ePM web site. PDFs shall be created directly from the native file format electronically. Scanning of paper to PDF shall be used minimally. Any non-electronic submittals shall be approved on a case by case basis and logged into the electronic management system as directed by a Cornell representative.

1.2 SUBMITTAL REGISTRY AND SCHEDULE

- A. The Architect shall provide a draft submittal registry in the template needed to import into the ePM system. It will be part of the contract documents and turned over to the Contractor in native format for their use. The Contractor shall be responsible for review and completion of the registry including addition of dates identified below and other information as deemed necessary by the Owner.

- B. The submittal registry and schedule shall list all submittals required by the specifications, listed in order by the specification section in which they are required. Coordinate the Submittal Schedule with the Contractor's Critical Path Method Construction Schedule and other related documents.
- C. The Submittal Registry shall include the following information:
1. Title (*by Architect for Contractor review*)
 2. Related specification section and paragraph numbers (*by Architect for Contractor review*)
 3. Subsection (*by Architect for Contractor review*)
 4. Category of Submittal (Certification, Mock-Up, Operations/Maintenance Manual, Product Data, Sample, Shop Drawing, Test Report, As Built, etc.) (*by Architect for Contractor review*)
 5. Submittal Description including description of the part of the Work covered by the submittal (*by Architect for Contractor review*)
 6. Name of Subcontractor, if applicable (*Contractor provided, optional*)
 7. Date due from Subcontractor (*Contractor provided, optional*)
 8. Date due to be submitted for review (*Contractor provided, required*)
 9. Date due for submittal review to be completed (*Contractor provided, required*)
 10. Date for transmittal to Subcontractor (*Contractor provided, optional*)
 11. Date for material or product delivery to project (*Contractor provided, required*)
 12. Priority. Low, normal or high (*Contractor provided, required*)
- D. Schedule a resubmittal for each major submittal. Except where specified otherwise in the contract documents, provide review times for submittals in accordance with Submittal Procedures and Architect's Duties below.
- E. Distribution: Initially submit the Submittal Schedule to the Owner for review via the ePM system. A submittal schedule compliant with the requirements of this section showing all submittals for the preliminary schedule submission duration shall be submitted with the Contractor's preliminary schedule submittal described in Section 01 32 16. The schedule shall also enumerate all submittals to be processed after the initial preliminary schedule submission duration period, although the date for these submittals does not have to be indicated. A final baseline submittal schedule showing all submittals for the entire project shall be included in the baseline schedule submittal described in section 01 32 16.
- F. Updating: The Submittal Schedule shall be kept up-to-date by the Contractor until all submittals are approved. Failure to provide the requested information, or delay in submitting required submittals may result in the payment request being returned to the Contractor until the required schedule or submittals are received.

1.3 SHOP DRAWINGS

- A. Drawings shall be newly prepared information drawn accurately to scale by skilled draftsman and presented in a clear and thorough manner.
 - 1. Highlight, encircle, or otherwise indicate deviations from Contract Documents.
 - 2. Do not reproduce Contract Documents or copy standard information as basis of Shop Drawings.
 - 3. Standard information prepared without specific reference to Project is not Shop Drawing.
- B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:
 - 1. Dimensions.
 - 2. Identification of products and materials included by sheet and detail number.
 - 3. Compliance with specified standards.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurements.
 - 6. Submittal:
 - a. For electronic transmittal, submittals shall be distributed electronically via the ePM system and will be reviewed and returned electronically marked with action taken.
 - b. Maintain returned document as a “Record Document”.

1.4 PRODUCT DATA

- A. Product Data includes brochures, diagrams, standard schedules, performance charts, and instructions that illustrate physical size, appearance and other characteristics of materials and equipment. All submittals shall identify all products as asbestos free, see Section 01 35 29.
- B. Collect Product Data into a single submittal for each element of construction or system.
 - 1. Clearly mark each copy to show applicable choices and options. Failure to do so will result in rejection of the submission.
 - 2. Show performance characteristics and capacities.
 - 3. Show dimensions and clearances required.
 - 4. Show wiring or piping diagrams and controls.

5. Where Product Data includes information on products that are not required, eliminate or mark through information that does not apply.
6. Supplement standard information to provide information specifically applicable to the Work.
7. Preliminary Submittal: Submit single copy of Product Data where selection of options by Architect is required.
8. Submittals:
 - a. For electronic transmittal, submittals shall be distributed electronically via the ePM system and will be reviewed and returned electronically marked with action taken.

1.5 SAMPLES AND MOCK-UPS

- A. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
- B. Office samples shall be of sufficient size and quantity to clearly illustrate:
 1. Functional characteristics of the product, with integrally related parts and attachment devices.
 2. Full range of color, texture and pattern.
- C. Field samples and mock-ups:
 1. Contractor shall erect, at the Project site, at a location acceptable to the Architect.
 2. Size or area: that specified in the respective specification section.
 3. Fabricate each sample and mock-up complete and finished.
 4. Remove mock-ups and turn over to the Owner when directed by the Architect/Owner.
 5. Perform necessary work to bring any area disturbed by mock-ups to the areas original condition.
- D. Submit fully fabricated Samples cured and finished as specified and physically identical with material or product proposed.
 1. Mount or display Samples in manner to facilitate review of qualities indicated.
 2. Identify Samples with generic description, product name, and name of manufacturer.
 3. Submit Samples for review and verification of size, kind, color, pattern, and texture.
 4. Where variation in color, pattern, texture, or similar characteristics is inherent in material or product represented, submit at least three (3) multiple units that show approximate limits of variations.

5. Preliminary Submittals: Submit one (1) full set of choices where Samples are submitted for Architect's selection of color, pattern, texture, or similar characteristics from a range of standard choices.
6. Submittals:
 - a. Submit electronic transmittal, photograph sample and its label and attached to the submittal item electronically via the ePM system. For physical samples, submit four (4) sets for Architect's review. Architect will return at least one (1) set marked with action taken. Maintain sets of Samples, as returned, at Project Site, for quality comparisons throughout course of construction.

1.6 QUALITY ASSURANCE AND QUALITY CONTROL SUBMITTALS

- A. Quality assurance and quality control submittals include design data, test reports, certifications, manufacturer's instructions, and manufacturer's field reports.
- B. Professional design services or certifications: Where Contract Documents require professional design services or certifications by a design professional, Contractor shall cause such services or certifications to be provided by a qualified design professional, whose registration seal shall appear on drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Architect shall be entitled to rely upon adequacy, accuracy, and completeness of services, certifications, or approvals performed by such design professionals.
- C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies as specified in the Contract Documents.
- D. Manufacturer's instruction: Preprinted instructions concerning proper application or installation of system or product.
- E. Manufacturer's field reports: Reports documenting testing and verification by manufacturer's field representative to verify compliance with manufacturer's standards or instructions.
- F. Submittals:
 1. For electronic transmittal, submittals shall be distributed electronically via the ePM system and will be reviewed and returned electronically marked with action taken.

1.7 COORDINATION DRAWINGS

- A. The Contractor shall coordinate and manage the preparation and submittal of coordinated layouts of the mechanical, electrical and fire protection systems and equipment for all areas; drawn at a scale not less than 1/4" per foot showing on both plan and elevation including but not limited to all equipment, ducts, pipe sleeves, piping including plumbing and, sprinkler system, lighting, special supports and other items contained within the space. Show mechanical and electrical services as well as architectural and structural features drawn to scale. Provide electronic record of each coordination drawing submitted in TIFF and PDF formats to the Owner. Provide coordination drawings for all corridors, laboratories, offices, mechanical rooms, boiler room, shafts, tunnels, and all congested areas. Copies of coordination drawings shall be distributed to all trades to assure a complete, coordinated installation of work within the space available.
- B. Submittal and review of coordination drawings will be required thirty (30) days prior to commencement of fabrication and/or installation of any work item.
- C. Prepare and submit coordinated layouts of the mechanical and electrical systems and equipment for all areas; drawn at a scale not less than 3/8 inch = 1 foot (1:32) showing on both plan and elevation including but not limited to all equipment, ducts, pipe sleeves, piping including plumbing and, sprinkler system, lighting, special supports and other items contained within the space. Show mechanical and electrical services as well as architectural and structural features drawn to scale. Provide copies of each coordination drawing submitted. Provide coordination drawings for all spaces, including but not limited to, corridors, laboratories, offices, mechanical rooms, boiler room, shafts, tunnels, and other areas. Copies of coordination drawings shall be distributed to all trades to assure a complete, coordinated installation of work within the space available.
 - 1. Show architectural, structural and other adjacent work requiring coordination with services. Show items, including but not limited to, access doors, ceiling grids, ceiling construction, structural decks and framing, fixtures, devices, and other adjacent work coordinated with services and architectural layouts shown on Drawings.
 - 2. Prepare plans, sections, elevations, and details as needed to describe relationship of various systems and components. Supplement plan drawings with section drawings where required to adequately represent the Work.
 - 3. Include room names and numbers of each space.
 - 4. Coordinate the addition of trade-specific information to the coordination drawings by multiple entities in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - 5. Contract drawings are diagrammatic. Exact location of receptacles, light fixtures, exit signs, fire alarm devices, and other devices shall be coordinated with the Architectural Drawings and shall not be scaled from locations indicated on the Mechanical and Electrical Drawings. Coordinate modifications in layout as necessary to complete the Work in accordance with the design intent.
 - 6. Coordinate modifications in layout and components necessary to ensure maintenance accessibility and prevent conflict between each portion of the Work.

7. Maintain maximum headroom at all locations. Unless indicated otherwise, all mechanical and electrical systems and associated components are to be installed as tight to underside of structure as possible.
8. Indicate functional and spatial relationships of components of architectural, structural, mechanical, plumbing, fire protection, electrical systems, communications systems, security systems, and other portions of the Work. Drawings shall indicate dimensions, to avoid interference with existing conditions, structural frame, ceilings, partitions, services, and other portions of the Work. Where conflicts occur with placement of materials of various portions of the Work, Contractor shall be responsible to resolve conflicts and coordinate the available space to accommodate each portion of the Work. Adjustments resulting from coordination shall be initialed and dated by the entity(s) affected by the adjustments.
9. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
10. Show location and size of access doors and access panels required for access to concealed dampers, valves, and other controls.
11. Indicate required installation sequences.
12. Indicate dimensions, elevations, and alignments shown on the Drawings. Specifically note dimensions, elevations, and alignments that appear to be in conflict with submitted equipment and minimum clearance requirements and notify Architect. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
13. Indicate suspended ceiling heights and show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
14. Indicate locations of fire-rated partitions, smoke partitions, and other required barriers.
15. Plenum Space: Indicate sub-framing for support of ceiling and wall systems, mechanical and electrical equipment, toilet partitions, overhead-mounted equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components and notify Architect.
16. Exposed Ceiling Construction: In addition to other indicated information, show fully-dimensioned locations of all items exposed at ceiling space. Indicate alignment requirements and centerline locations of light fixtures, ducts, piping, conduit, and other services. Show dashed outline locations of laboratory casework, shelving, and other items that extend 7 feet or more above the floor.
17. Mechanical and Electrical Rooms: Provide coordination drawings for mechanical and electrical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment. Indicate paths of egress from rooms. Indicate paths for equipment removal from rooms. Indicate clear areas required for access and maintenance.

18. Structural Penetrations: Indicate scheduled and requested penetrations and openings required for all disciplines. Request un-scheduled penetrations and openings where Contractor has reviewed, analyzed, and coordinated all possible routing options and structural penetrations are only feasible option to accommodate indicated ceiling heights. Refer to the drawings for general guidelines and request confirmation by Architect for structural penetrations.
 19. Mechanical and Plumbing Work: Show dimensioned locations, sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, accessories, and support systems. Show locations of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 20. Electrical Work: Show electrical distribution, systems, equipment, and runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger. Show light fixture, exit light, emergency battery pack, smoke detector, fire alarm, and other device locations. Show panel board, switch board, switchgear, transformer, bus way, generator, and motor control center locations. Show location of pull boxes and junction boxes, dimensioned from column center lines. Show lighting control systems. Show cable tray layouts including vertical and horizontal offsets and transitions, clearances for access above and to side of cable trays, and vertical elevation of cable trays above the floor or bottom of ceiling structure.
 21. Fire Suppression System: Show locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 22. Refer to individual Sections for additional Coordination Drawing requirements for work in those Sections.
 23. Contractor Sign-Off: Contractor and each entity performing portions of the Work shall sign and date coordination drawings.
 24. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit. Review of coordination drawings shall not reduce Contractor's responsibility for final coordination of installation and maintenance clearances of systems and equipment with existing conditions and each portion of the Work.
- D. Submittal and review of coordination drawings will be required before work can start in any given area of the building.

1.8 CONTRACTOR RESPONSIBILITIES

- A. Review submittals for compliance with Contract Documents and approve submittals prior to transmitting to the Architect.

- B. Specifically record deviations from Contract Document requirements, including minor variations and limitation. Comply with requirements of Section 01 25 00 Substitutions and Product Options.
- C. Contractor's approval of submittals shall indicate that the Contractor has determined and verified materials, field measurements and field construction criteria, and has checked and coordinated information within each submittal with requirement of the Work and Contract Documents. Field conflicts which arise from the contractor's failure to fully review and approve submittals before ordering equipment, will result in the contractor being burdened with all costs to remediate the situation.
- D. Contractor shall be responsible for:
 - 1. Compliance with the Contract Documents
 - 2. Confirming and correlating quantities and dimensions
 - 3. Selecting fabrication processes and techniques of construction.
 - 4. Coordination of the work represented by each submittal with other trades.
 - 5. Performing the Work in a safe and satisfactory manner.
 - 6. Compliance with the approved Construction Schedule.
 - 7. All other provisions of the agreements.
- E. It is understood that the Architect's notation on the submittals is not to be construed as an authorization for additional work or additional cost.
- F. If any notations represent a change to the Contract Sum, submit a cost proposal for the change in accordance with procedures specified before proceeding with the Work.
- G. It is understood that the Architect's notation on the submittal is not to be construed as approval of colors. Make all color-related submittals at one time.
- H. Notify the Architect by letter of any notations made by the Architect which the Contractor finds unacceptable. Resolve such issues prior to proceeding with the Work.
- I. Begin no fabrication of work until all specified submittal procedures have been fulfilled.
- J. Do not submit shop drawings, product data or samples representing work for which such submittals are not specified. The Architect shall not be responsible for consequences of inadvertent review of unspecified submittals.
- K. The review of shop drawings shall not relieve the Contractor of the responsibility for proper construction and the furnishing of materials and labor required even though the same may not be indicated on the review shop drawings.
- L. Survey and report to designated Owner Representatives that only asbestos free material is used in the execution of Work. Reference Sections 01 35 29.

1.9 SUBMITTAL PROCEDURES

A. Coordination

1. Coordinate submittals with performance of construction activities in accordance with the Submittal Schedule approved by the Architect and Owner.
2. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
3. Prepare and transmit each submittal in accordance with the Submittals Schedule, agreed to by all entities involved.
4. Prepare, review, approve and transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
5. Architect's Review: Allow ten (10) working days for Architect's initial processing of each submittal requiring the Architect's review and response, except for longer periods required as noted below, and where processing must be delayed for coordination with subsequent submittals. The Architect will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination. Allow ten (10) working days for Architect's reprocessing of each submittal. Notify the Architect when processing time for a submittal is critical to the progress of the Work, and the work would be expedited if its processing time could be shortened.

An additional five (5) working days will be required for items specified in Divisions 2, 3, 5, 23 and 26, and for Architectural Woodwork, Hollow Metal Work and Hardware Schedules.

6. Allow time for delivery in addition to review.
7. Allow time for reprocessing each submittal.
8. No extension of Contract Time will be authorized because of failure to prepare submittals sufficiently in advance of Work to permit processing.
9. Submittals made which do not conform to the schedule are subject to delays in processing by the Architect.
10. Refer to Section 01 32 16 Construction Schedules for requirements of the Submittals Schedule.
11. Failure of the Contractor to obtain approval of Shop Drawings shall render all work thereafter performed to be at Contractor's sole risk, cost and expense.

B. Submittal Preparation

1. Place permanent label or title block on each submittal for identification.
2. Indicate name of entity that prepared each submittal on label or title block.

3. Provide space on label or beside title block on Shop Drawings to record Contractor's stamp, initialed or signed, certifying to review of submittal, action taken, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents.
 4. Complete all fields on submittal item details in ePM system including meaningful description.
 5. Include the following information on submittal documentation:
 - a. Drawing, detail or specification references, including section number, as appropriate to clearly identify intended use of product.
 - b. Field dimensions, clearly identified as such.
 - c. Relation to adjacent or critical features of the work or materials.
 - d. Applicable standards, such as ASTM or Federal Specification numbers.
 - e. Provide a blank space for the Architect's stamps
 - f. On transmittal, record relevant information including deviations from Contract Document requirements, including minor variations and limitations.
 6. Identification of revisions on re-submittals, other than those noted by the Architect on previous submittals.
 7. Shop drawings with the comment "by others" are not acceptable. All such work must specifically identify the related responsible Subcontractor.
- C. Submittal Transmittal:
1. Transmit submittals via the ePM system to Architect unless otherwise noted or directed.
 2. Prepare and generate transmittal in ePM system for submission of samples. Package sample and other each submittal appropriately for transmittal and handling.

1.10 RECORD SUBMITTALS

- A. Provide a record copy of the submittal to the Commissioning Agent in electronic format. Record copy shall be a clean copy (free of notes from the design professional) which has been updated to reflect the "as-installed" system. Provide document in PDF format.
- B. Record copy of the submittal must be forwarded to the Commissioning Agent within fourteen (14) calendar days of the final approved submittal.
- C. Provide a record copy of the submittal (electronic format) for the O&M Manual.

1.11 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes noted on previous submittals.
- B. Shop Drawings and Product Data:
 - 1. Revise initial drawings or data, and resubmit as specified for the initial submittal.
 - 2. Indicate any changes which have been made other than those noted by the Architect.
- C. Samples: Submit new samples as required for initial submittal.

1.12 ARCHITECT'S DUTIES

- A. Review submittals with reasonable promptness as identified in 1.9, paragraph 5 of this Section.
- B. Notations on the Submittal Review Stamp or ePM file mean the following:
 - 1. "Approved (APP)" indicates that no deviations from the design concept have been found and Work may proceed.
 - 2. "Approved as Noted (AAN)" indicates that deviations from the design concept which have been found are noted, and the Contractor may proceed accordingly.
 - 3. "Revise and Resubmit (RAR)" indicates that Work covered by submittal, including purchasing, fabrication, delivery, or other activity may not proceed. Revise or prepare new submittal according to Architect's notations; resubmit without delay. Repeat if necessary to obtain different action mark.
 - 4. "Rejected (REJ)" indicates that Work covered by submittal, including purchasing, fabrication, delivery, or other activity may not proceed. Revise or prepare new submittal according to Architect's notations; resubmit without delay. Repeat if necessary to obtain different action mark.
 - 5. "On Hold (ONH)" is used in a very limited capacity and means that the Contractor should not take action until the reason for hold has been cleared and may be required to revise and resubmit.
 - 6. "Not Reviewed (NRV)" is used for submittals that were submitted in error, duplicate, or other reason that does not require review by the Architect but need to be closed by the Contractor upon return to them.
 - 7. "For Record Only (FRO)": Submittals for information or record purposes, including Quality Assurance and Quality Control Submittals, and Material Safety Data Sheets (MSDS), will not require responsive action by the Architect.
 - a. Architect will forward informational submittals without action.
 - b. Architect will reject and return informational submittals not in compliance with Contract Documents.

- C. Incomplete Submittals: Architect will return incomplete submittals without action.
- D. Unsolicited Submittals: Architect will return unsolicited submittals to sender without action.
- E. Return submittals to Contractor for distribution, or for resubmission.

1.13 DISTRIBUTION

- A. Distribute reviewed Shop Drawings and copies of Product Data when possible via the ePM system to:
 - 1. Job site file
 - 2. Record Documents file
 - 3. Subcontractors
 - 4. Installers
 - 5. Suppliers
 - 6. Manufacturers
 - 7. Fabricators
 - 8. Architect
 - 9. Owner
- B. Do not permit use of unmarked copies or rejected copies of submittals in connection with construction at Project Site or elsewhere where Work is in progress.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 33 00*****

SECTION 01 35 29 GENERAL HEALTH & SAFETY

1.0 GENERAL

1.1 DESCRIPTION

- A. This Section provides requirements for general health and safety during the project. The requirements of this Section shall apply to both Contractor and all tiers of Subcontractors involved in the project.
1. General Emergency Information – It is recommended that both Contractor and all sub-tiers:
 - a. Sign up for Cornell Emergency Alerts. The instructions can be found at (use the visitors section): <https://emergency.cornell.edu/alert/>
 - b. Signup for Tompkins County Emergency alerts at: <https://www2.tompkinscountyny.gov/doer/swift911alerts>
 - c. Cornell EHS has brief guidance on some emergency scenarios at: <https://emergency.cornell.edu/eag/>
 - B. In addition to the requirements of this Section, all laws and regulations by applicable local, state, and federal agencies shall apply to the Work of this contract. In some cases, the requirements of these Specifications may by intention exceed such legal requirements, but in no case shall this Specification be interpreted or understood to reduce or eliminate such requirements.

1.2 CONTRACTOR’S PROJECT SITE SPECIFIC PLAN

- A. Contractors are required to submit a Project Site Specific Plan (PSSP) for review by Cornell University representatives before commencement of work on the site. The PSSP should address site specific information, controls and or requirements as it relates to the entire scope of work for the Project. All contractors shall use the Project Site Specific Plan Template below to develop their Project’s PSSP. The template may be downloaded at:
- <https://ehs.cornell.edu/campus-health-safety/occupational-safety/contractor-safety>
1. Within the PSSP template are example(s) to use as reference. The provided examples demonstrate Cornell University’s expectations for providing detailed site-specific information, controls and requirements.
 2. Project Site Specific Plan’s that inadequately address site specific operations will be returned with comments for resubmission. Failure to submit a PSSP may result in delay of project and/or denial of the payment.
 3. All projects must have the PSSP submitted via ePM for review and comment.

- B. PSSP submittal should be submitted a minimum of ten (10) days prior to the commencement of work on site. The Contractor may opt to submit their PSSP in phases. The Contractor must submit a phase submission plan using the PSSP Submission table included in the PSSP template for approval by Owner's Representative with initial submission. Submit remaining phases no later than ten (10) days prior to the start of a new, predetermined project phase or milestone.
1. Projects having less than a ten (10) day turn-around shall coordinate their submittal with the Owner's Representative, who should coordinate with Occupational Health, Safety and Injury Prevention (OHSIP), the University Fire Marshall's Office (UFMO), applicable Authority Having Jurisdiction (AHJ) and Contract College's Codes Enforcement Official, if applicable.
- C. The Contractor is responsible for its employees and its Subcontractors. Subcontractors are required to submit their PSSP to the General Contractor. The General Contractor is responsible to ensure all Subcontractor(s) PSSP's are adequate per their scope of work.
- D. The General Contractor is required to ensure their project's PSSP is accurately maintained throughout the duration of the contract. Resubmission is required for any new scope elements not previously addressed by the Contractor's original PSSP.
- E. Definitions:
1. Project Site Specific Plan (PSSP): A structured document that details the scope of the Contract Work and related site-specific controls, requirements and information for University and Contractor personnel. This document is not intended to be all inclusive of all applicable local, state and federal laws and regulations for which the General Contractor and its Subcontractor(s) are expected to comply.
 2. Authority Having Jurisdiction (AHJ):
 - The organization, office or individual responsible for approving equipment, an installation or a procedure (NYS Fire Code).
 - The local government, county government or state agency responsible for the administration and enforcement of an applicable regulation or law (NYS Building Code-§202.2).
 3. Occupational Health, Safety and Injury Prevention (OHSIP): A division of Cornell University's Environment, Health and Safety Department. The OHSIP division can be contacted at (607)-255-8200 or by email at askEHS@cornell.edu
 4. SME: The University's subject matter expert.

1.3 AERIAL WORK PLATFORMS

- A. The preferred method for Aerial Work Platforms (AWPs) boom storage is fully retracted and fully lowered to the ground.

- B. In some circumstances booms may need to be stored in the air because of vandalism concerns, minimal size of storage location, etc.
 - 1. If this is case, the area under the elevated boom must be blocked or arranged such that prevents people from walking, standing, working or parking vehicles underneath.
 - 2. When booms are stored in the air consult the extended weather forecast. Booms should not be stored in the air during predicted high winds, or severe storms. AWP's become unstable at winds or gusts greater than 25 mph and must be fully lowered to prevent a tip-over.

1.4 ASBESTOS

- A. All building materials and products provided for use in construction at Cornell University are to be free of asbestos. Materials must be surveyed by a certified environmental consultant and analyzed by an accredited laboratory either prior to installation or post installation. The results of the survey are to be reported to Cornell University Facilities Management Asbestos Coordinator. The Contractor must attach applicable Safety Data Sheets / Material Safety Data Sheets for each product documenting a 100% asbestos free status. The University may provide random testing of products for asbestos content. Any Contractor installed building materials or products found to contain asbestos shall be classified as defective work. Defective work shall be corrected by the Contractor as specified in the General Conditions.
- B. Attached for the Contractor's information are asbestos reports which represent samples taken within the building.
- C. Based on the above, disposal of asbestos containing material is not anticipated

1.5 LEAD

- A. Building may contain lead-based paint. The Contractor shall protect workers in accordance with OSHA regulations. The Contractor selects the means and/or methods to address the presence of lead-based paint, and must concurrently protect its workers based on the Contractor's means and/or methods. The Contractor is required to submit a lead plan that is site specific, indicating that the protective measures the Contractor proposes meet the OSHA standard 1926.62 "Lead in Construction Standards". This site-specific plan should address the particular methods the Contractor intends to protect its workers, the building occupants and the building structure based on its selection of addressing the presence of lead-based paint. The site-specific plan should be attached or written into the Lead Work Plan section of the Contractor's Project Site Specific Plan.

1.6 SITE VISITS

- A. The undertaking of periodic Site Visits by Architects, Engineers or the Owner shall not be construed as supervision of actual construction, or make them responsible for the safety of any persons; or make them responsible for means, methods, techniques, sequences or procedures of construction selected by the Contractor or its Subcontractors; or make them responsible for safety programs and precautions incident to the Work, or for the safe access, visit, use, work, travel or occupancy of any person.

1.7 CONFINED SPACE

- A. The Contractor shall be responsible for the identification of confined space in accordance with OSHA requirements. It is the Contractor's responsibility to engage the Project Manager who will collaborate with Environment, Health and Safety regarding questions or concerns on the confined space.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 35 29*****

PRE-RENOVATION SURVEY
FOR
ASBESTOS-CONTAINING MATERIALS
FOR THE
KING-SHAW HALL RENOVATION PROJECT
AT
CORNELL UNIVERSITY
KING-SHAW HALL – FACILITY CODE 1007A
140 GARDEN AVENUE
ITHACA, NEW YORK 14853



MAY 2024

PREPARED FOR:

Mitchell Giurgola Architects LLP
630 9th Avenue, Suite 711
New York, New York 10036

PREPARED BY:

Watts
Architects
&Engineers

95 Perry Street
Suite 300
Buffalo, NY 14203



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1.0 – EXECUTIVE SUMMARY

1.0 EXECUTIVE SUMMARY

Watts Architects & Engineers (Watts) was retained by Mitchell Giurgola Architects, LLP (Mitchell Giurgola) to perform a pre-renovation survey for asbestos-containing materials (ACM) for the renovation project at King-Shaw Hall on the Cornell University campus in Ithaca, New York. The project involves renovations on the second through fifth floors. Generally, the project limits include all floor spaces except stairwells, bathrooms, mechanical rooms and the elevator.

The field work was conducted on April 1 and May 7, 2024, and included the following:

- Review of previous asbestos testing reports issued for King-Shaw Hall. The following reports were reviewed:
 - “Limited Pre-Renovation Asbestos Survey Report for the Energy Conservation Initiative Project” issued by Delta Engineers, Architects and Land Surveyors (Delta) in December 2012.
 - “Asbestos Survey Report Performed at ILR Conference Center/King-Shaw Hall (1007A) for the Ceiling Systems Asbestos Survey” issued by Delta in July 2022.Applicable laboratory analytical reports and chain-of-custody forms from prior testing are included in Section 6.0 of this report.
- A visual inspection of the areas within the project limits at King-Shaw Hall to identify suspect ACM that are anticipated to be disturbed by the scope of work.
- Collection and laboratory analysis of bulk material samples for asbestos. Watts collected samples of suspect asbestos-containing materials that may be disturbed by the project and have not previously been tested.
- Documentation of asbestos bulk sample locations on drawings and chain-of-custody forms.
- Inspection photographs.

ASBESTOS-CONTAINING MATERIALS

The inspection included the collection of forty-one (41) bulk samples from sixteen (16) homogeneous materials identified to be suspect asbestos-containing materials (ACM). ACM is defined as any material containing more than one percent (1%) of asbestos. Based on the laboratory analysis of bulk samples collected as part of this investigation, bulk samples collected as part of previous investigations, and visual observations, **no materials were determined to be ACM.**

NON-ASBESTOS-CONTAINING MATERIALS

Based on visual observations, laboratory analysis of samples collected as part of this inspection and bulk samples collected as part of previous investigations, the following materials within the project limits have been determined to be non-ACM:

- Wall plaster skim coat (white)
- Wall plaster base coat (grey) ³
- Slate floor tile grout
- Slate floor tile set

- Quarry tile grout
- Quarry tile set
- Quarry tile covebase set
- Grey/green 12" x 12" floor tile
- 12" x 12" floor tile mastic (black)
- Floor leveling compound & thin yellow floor tile mastic
- Carpet mastic (yellow)
- Carpet square mastic (yellow/green)
- Carpet square mastic with residual mastic (yellow/green/black)
- Vestibule carpet mastic (tan)
- Terrazzo sink basin
- Duct sealant (grey)
- White top coat (ceiling) plaster ¹
- Brown base coat (ceiling) plaster ¹
- White top coat (wall) plaster ¹
- Gray base coat (wall) plaster ¹
- Brown spray-on fireproofing ¹
- Gray spray-on fireproofing ¹
- Spray-on fireproofing ^{1,2}
- White fireproofing patch material ¹
- Green with black specks 12" x 12" floor tiles ¹
- Yellow mastic from green with black specks 12" x 12" floor tiles ¹
- Grey floor leveler ¹
- White 2' x 2' textured ceiling tiles ¹
- White fissured 2' x 2' ceiling tiles ¹
- Light grey wallpaper covering ¹
- Tan wallpaper covering ¹
- Orange speed block ¹
- White sheetrock (wall) ¹
- White joint compound (wall) ¹
- Mastic from 4" non-suspect white vinyl cove base ¹
- Mastic from 6" non-suspect wood cove base ¹
- Grout/mud set, 2" x 2" grey ceramic wall tiles ¹
- Grout/mud set, 6" x 6" green ceramic wall tiles ¹
- Tan vinyl wall covering ¹
- 2' x 2' vinyl covered ceiling tile ¹
- Red fire stop ¹

¹ This material was sampled and determined to be non-ACM as part of a previous asbestos investigation. The applicable laboratory analytical reports and chain-of-custody forms are included in Section 6.0 of this report.

² During 198.1 analysis this material was determined to contain vermiculite, requiring it to be analyzed by a different analytical method. A composite sample of the fireproofing was submitted

for ELAP 198.8 (surfacing materials with vermiculite) analysis. ELAP 198.8 analysis determined that the fireproofing is non-ACM.

³ During 198.1 analysis this material was determined to contain vermiculite, requiring it to be analyzed by a different analytical method. Additional samples of the base coat wall plaster were collected and submitted for ELAP 198.8 (surfacing materials with vermiculite) analysis. ELAP 198.8 analysis determined that the plaster is non-ACM.

OBSERVATIONS

During the survey, Watts' personnel investigated suspect ACMs that may be affected by the proposed scope of work at Cornell University King-Shaw Hall. The scope of the investigation was limited to materials that are anticipated to be disturbed by the renovation project, which includes work on the second through fifth floors.

No asbestos-containing materials were identified within the project limits.

King-Shaw Hall was originally built in 1912 with a gross building area of 30,466 square feet. The building envelope consists of a brick façade on speed tile or CMU block. Original walls are plaster and there are newer-vintage drywall partition walls. The building underwent an extensive full building renovation between 2002 - 2004 and so most existing finishes are not original.

Wall finishes consist of non-ACM drywall and plaster. Flooring finishes consist of non-ACM carpet squares, low-pile carpets, high-pile carpets, slate floor tiles, quarry tile flooring and various colors of 12" x 12" floor tile. There are suspended acoustical ceilings in most spaces and metal pan ceilings in some conference rooms.

Base coat wall plaster was determined to contain vermiculite during lab analysis. Additional samples of the material were collected and submitted for 198.8 SM-V analysis, which determined that the material is non-ACM.

Pipes and HVAC ducts observed in the basement, above suspended ceilings, and in mechanical spaces are all insulated with non-ACM fiberglass.

There are two types of spray-on fireproofing in the building, which have both previously been sampled and determined to be non-ACM.

No suspect materials were identified to be associated with the copula, however an exterior evaluation was not conducted due to access issues. If suspect materials are observed to be associated with the exterior of the copula, then they should be sampled and analyzed for asbestos-content prior to disturbing them.

It is the belief of Watts that this investigation has identified all suspect ACM that may be disturbed by the proposed scope of the work as it was defined at the time this report was issued. However, if the scope of the proposed project is expanded, additional field investigation and sampling may be necessary. If additional suspect building materials are to be disturbed that have not been sampled as part of this investigation, or part of a previous investigation, samples of each material should be collected and analyzed for asbestos content.

2.0 – ASBESTOS-CONTAINING MATERIALS

2.0 ASBESTOS-CONTAINING MATERIALS

This section includes information on all suspect ACM sampled. This section contains the following: Homogeneous Materials List containing the homogeneous materials identified, their corresponding sample numbers and whether or not they are ACM, as well as drawings identifying the approximate locations of asbestos bulk samples.

SAMPLING AND LABORATORY METHODOLOGY

A NYSDOL-certified asbestos inspector from Watts collected bulk samples of all suspect ACM that were identified within the project limits that may be impacted by the project and have not previously been sampled.

Samples were delivered with the proper chain-of-custody forms to Amerisci Richmond located in Midlothian, Virginia. Amerisci is a New York State accredited laboratory that is a participant in the Environmental Laboratory Approval Program (ELAP) and National Voluntary Laboratory Approval Program (NVLAP). All materials, except cellulose-containing ceiling tile and non-friable organically bound (NOB) materials, were analyzed using Polarized Light Microscopy (PLM) using Method 198.1. Cellulose-containing ceiling tiles and NOBs, which include but are not limited to, flooring materials, roofing materials, mastics, and caulks underwent gravimetric reduction and were analyzed by Polarized Light Microscopy (PLM) Method 198.6. Any cellulose-containing ceiling tile or NOB materials that were found to be negative under PLM were then analyzed by Transmission Electron Microscopy (TEM) Method 198.4. The New York State Department of Health (NYSDOH) protocol requires analysis by TEM for these materials if the PLM analysis does not confirm the presence of asbestos.

**HOMOGENEOUS MATERIALS LIST
PRE-RENOVATION SURVEY
KING-SHAW HALL RENOVATION
CORNELL UNIVERSITY
ITHACA, NEW YORK**

Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)		ACM
				PLM	TEM	Y/N
Wall Plaster Skim Coat (White)	Stairwell 30003 Wall	S	230851-01	NAD	NA	N
	Stairwell 30003 Wall		230851-02	NAD	NA	
	Stairwell 30004 Wall		230851-03	NAD	NA	
	Stairwell 30004 Wall		230851-04	NAD	NA	
Wall Plaster Base Coat (Grey)	Stairwell 30003 Wall	S	230851-05	NA ¹	NA	N
	Stairwell 30003 Wall		230851-06	NAD	NA	
	Stairwell 30003 Wall		230851-07	NAD	NA	
	Stairwell 30003 Wall		230851-08	NA ¹	NA	
	Corridor by Stairwell B004A, Wall		230851-37	NAD	NA	
	Corridor by Stairwell B004A, Wall		230851-38	NAD	NA	
	Corridor by Stairwell B004A, Wall		230851-39	NAD	NA	
	Stairwell 30003 Wall		230851-40	NAD	NA	
	Stairwell 30003 Wall		230851-41	NAD	NA	
Slate Floor Tile Grout	Room 233	M	230851-09	NAD	NA	N
			230851-10	NAD	NA	
Slate Floor Tile Set	Room 233	M	230851-11	NAD	NA	N
			230851-12	NAD	NA	
Quarry Tile Grout	Kitchen 230	M	230851-13	NAD	NA	N
			230851-14	NAD	NA	

**HOMOGENEOUS MATERIALS LIST
PRE-RENOVATION SURVEY
KING-SHAW HALL RENOVATION
CORNELL UNIVERSITY
ITHACA, NEW YORK**

Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)		ACM
				PLM	TEM	Y/N
Quarry Tile Set	Kitchen 230	M	230851-15	NAD	NA	N
			230851-16	NAD	NA	
Quarry Tile Covebase Set	Kitchen 230	M	230851-17	NAD	NA	N
			230851-18	NAD	NA	
Grey/Green 12" x 12" Floor Tile	Room 50071	M	230851-19	NAD	NAD	N
	Room 526A		230851-20	NAD	NAD	
12" x 12" Floor Tile Mastic (Black)	Room 50071	M	230851-21	NAD	NAD	N
	Room 526A		230851-22	NAD	NAD	
Floor Leveling Compound With Thin Yellow Floor Tile Mastic	Room 526A	M	230851-23	NAD	NAD	N
			230851-24	NAD	NAD	
Carpet Mastic (Yellow)	Corridor 50044	M	230851-25	NAD	NAD	N
			230851-26	NAD	NAD	
Carpet Square Mastic (Yellow/Green)	Room 429	M	230851-27	NAD	NAD	N
			230851-28	NAD	NAD	
Carpet Square Mastic With Residual Black (Yellow/Green/Black)	Room 425	M	230851-29	NAD	NAD	N
			230851-30	NAD	NAD	
Vestibule Carpet Mastic (Tan)	Vestibule 30048	M	230851-31	NAD	NAD	N
			230851-32	NAD	NAD	

**HOMOGENEOUS MATERIALS LIST
PRE-RENOVATION SURVEY
KING-SHAW HALL RENOVATION
CORNELL UNIVERSITY
ITHACA, NEW YORK**

Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)		ACM
				PLM	TEM	Y/N
Terrazzo Sink Basin	Janitor's Closet 50071	M	230851-33	NAD	NA	N
			230851-34	NAD	NA	
Duct Sealant (Grey)	Mechanical Room 50070	M	230851-35	NAD	NAD	N
			230851-36	NAD	NAD	

Results Abbreviations

NA = Not analyzed.

NA/PS = Not analyzed/positive stop.

NAD = No asbestos detected.

Type

S = Surfacing

M = Miscellaneous

ACM

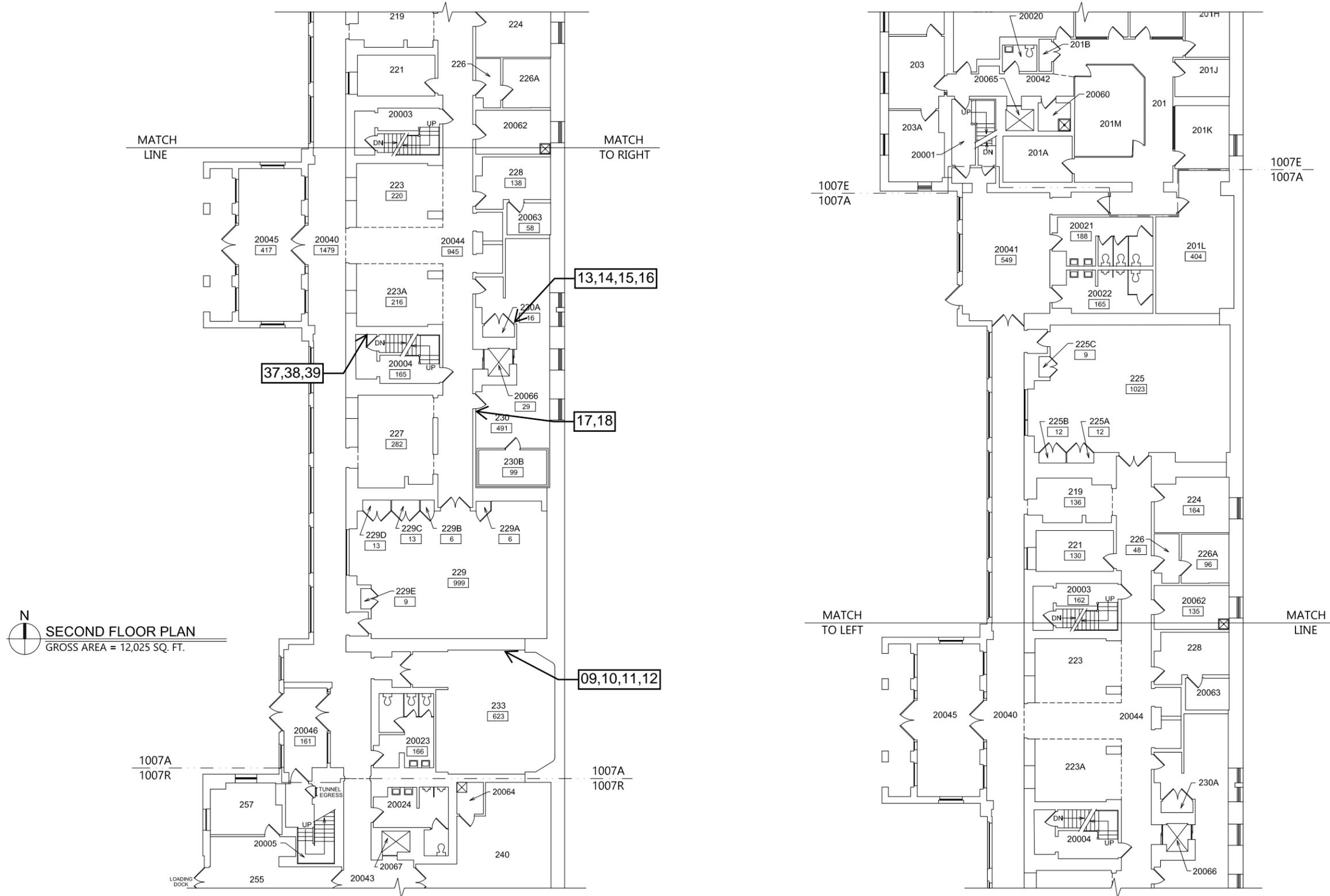
Y = Yes

N = No

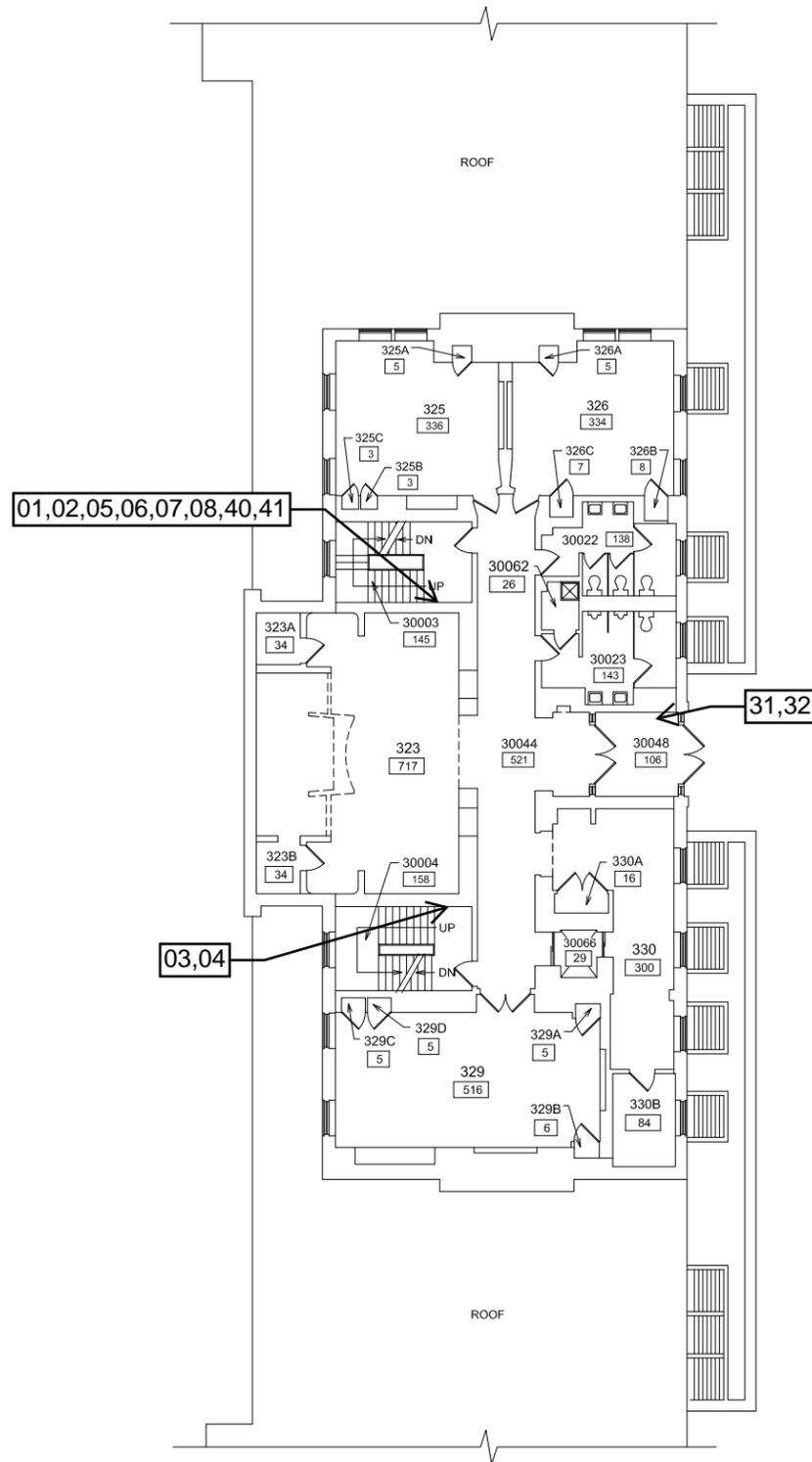
¹ During 198.1 analysis this material was determined to contain vermiculite, requiring it to be analyzed by a different analytical method. Additional samples of the base coat wall plaster were collected and analyzed for asbestos content via ELAP 198.8 analysis to definitively determine the material to be non-ACM.

2.1 - ASBESTOS SAMPLE LOCATION DRAWINGS

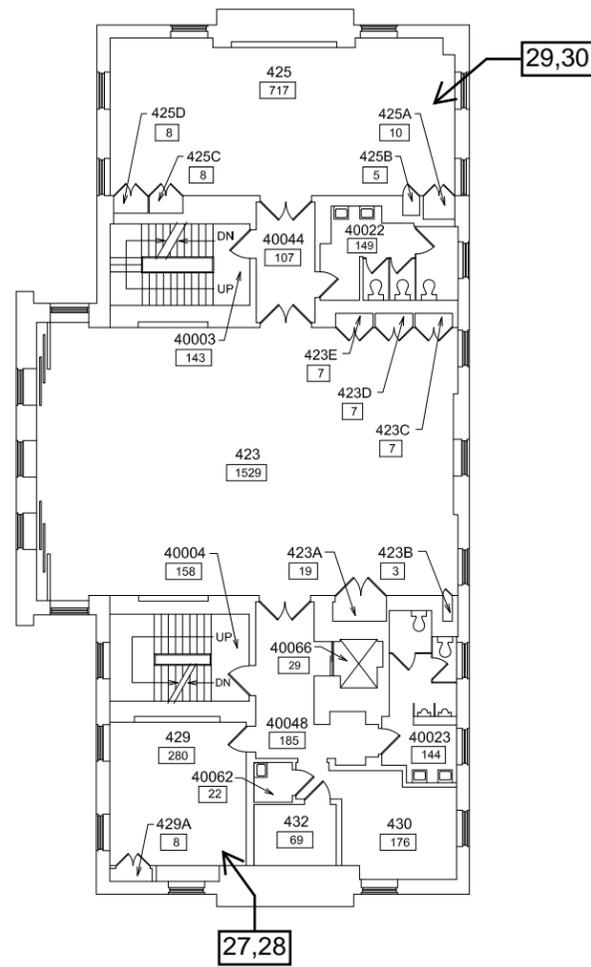
Asbestos Bulk Sample Location Drawing



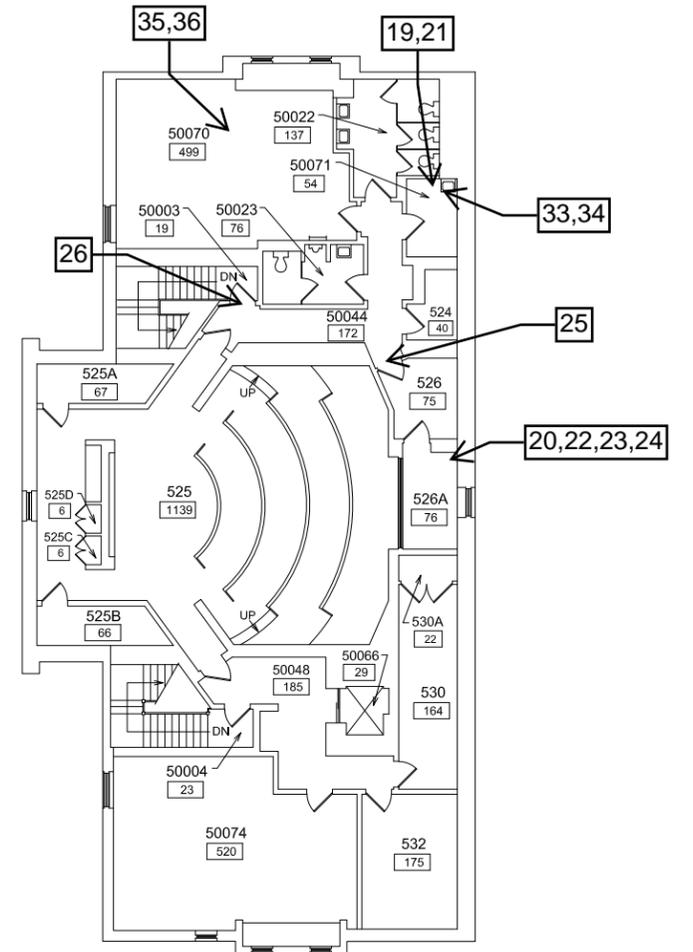
Asbestos Bulk Sample Location Drawing



THIRD FLOOR PLAN
GROSS AREA = 4,792 SQ. FT.



FOURTH FLOOR PLAN
GROSS AREA = 4,798 SQ. FT.



FIFTH FLOOR PLAN
GROSS AREA = 4,790 SQ. FT.



Cornell University

Samples collected 4/1/2024
Sample numbers are pre-fixed With "230851-"
Arrows indicate approximate bulk sample locations.



BLDG NAME:

KING-SHAW HALL

BLDG NO:

1007A

2.2 - ASBESTOS LABORATORY REPORT AND CHAIN-OF-CUSTODY FORMS



AmeriSci Richmond

13635 GENITO ROAD
MIDLOTHIAN, VIRGINIA 23112
TEL: (804) 763-1200 • FAX: (804) 763-1800

PLM Bulk Asbestos Report

Watts Architecture & Engineers
Attn: Bill Coyle
95 Perry Street
Suite 300
Buffalo, NY 14203

Date Received 04/05/24 **AmeriSci Job #** 124041227
Date Examined 04/11/24 **P.O. #**
ELAP # 10984 **Page** 1 of 7
RE: 20230851; Cornell University - King-Shal Hall Renovation;
Cornell King-Shaw Hall - Ithaca, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
230851-01 1	124041227-01 Location: Wall Plaster Skim Coat (White); Stairwell 30003 Wall	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100%			
230851-02 1	124041227-02 Location: Wall Plaster Skim Coat (White); Stairwell 30003 Wall	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100%			
230851-03 1	124041227-03 Location: Wall Plaster Skim Coat (White); Stairwell 30004 Wall	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100%			
230851-04 1	124041227-04 Location: Wall Plaster Skim Coat (White); Stairwell 30004 Wall	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100%			
230851-05 2	124041227-05 Location: Wall Plaster Base Coat (Grey); Stairwell 30003 Wall		NA ^{1,2}
Analyst Description: Bulk Material Asbestos Types: Other Material:			

PLM Bulk Asbestos Report

20230851; Cornell University - King-Shal Hall Renovation;
Cornell King-Shaw Hall - Ithaca, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
230851-06 2	124041227-06 Location: Wall Plaster Base Coat (Grey) ; Stairwell 30003 Wall	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
230851-07 2	124041227-07 Location: Wall Plaster Base Coat (Grey) ; Stairwell 30003 Wall	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Off-White, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
230851-08 2	124041227-08 Location: Wall Plaster Base Coat (Grey) ; Stairwell 30003 Wall		NA ^{1,2}
Analyst Description: Bulk Material			
Asbestos Types:			
Other Material:			
230851-09 3	124041227-09 Location: Slate Floor Tile Grout; Room 233	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
230851-10 3	124041227-10 Location: Slate Floor Tile Grout; Room 233	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
230851-11 4	124041227-11 Location: Slate Floor Tile Set; Room 233	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			

Client Name: Watts Architecture & Engineers

PLM Bulk Asbestos Report

20230851; Cornell University - King-Shal Hall Renovation;
Cornell King-Shaw Hall - Ithaca, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
230851-12 4	124041227-12 Location: Slate Floor Tile Set; Room 233	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
230851-13 5	124041227-13 Location: Quarry Tile Grout; Kitchen 230	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Lt. Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
230851-14 5	124041227-14 Location: Quarry Tile Grout; Kitchen 230	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Lt. Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
230851-15 6	124041227-15 Location: Quarry Tile Set; Kitchen 230	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Lt. Grey, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
230851-16 6	124041227-16 Location: Quarry Tile Set; Kitchen 230	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Lt. Grey, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
230851-17 7	124041227-17 Location: Quarry Tile Covebase Set; Kitchen 230	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			

Client Name: Watts Architecture & Engineers

PLM Bulk Asbestos Report

20230851; Cornell University - King-Shal Hall Renovation;
Cornell King-Shaw Hall - Ithaca, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
230851-18 7	124041227-18 Location: Quarry Tile Covebase Set; Kitchen 230	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
230851-19 8	124041227-19 Location: Grey/Green 12"x12" Floor Tile; Room 50071	No	NAD (NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Green, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 4.6%			
Comment: Heat Sensitive (organic): 15.1%; Acid Soluble (inorganic): 80.3%; Inert (Non-asbestos): 4.6%			
230851-20 8	124041227-20 Location: Grey/Green 12"x12" Floor Tile; Room 26A	No	NAD (NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Green, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 2.7%			
Comment: Heat Sensitive (organic): 12.5%; Acid Soluble (inorganic): 84.8%; Inert (Non-asbestos): 2.7%			
230851-21 9	124041227-21 Location: 12"x12" Floor Tile Mastic (Black); Room 50071	No	NAD (NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 21%			
Comment: Heat Sensitive (organic): 52.4%; Acid Soluble (inorganic): 26.6%; Inert (Non-asbestos): 21.0%			
230851-22 9	124041227-22 Location: 12"x12" Floor Tile Mastic (Black); Room 526A	No	NAD (NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 34%			
Comment: Heat Sensitive (organic): 39.6%; Acid Soluble (inorganic): 25.6%; Inert (Non-asbestos): 34.8%			

PLM Bulk Asbestos Report

20230851; Cornell University - King-Shal Hall Renovation;
Cornell King-Shaw Hall - Ithaca, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
230851-23 10	124041227-23	No	NAD
Location: Floor Leveling Compound With Thin Yellow Floor Tile Mastic; Room 526A			(NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Yellow, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 37%			
Comment: Heat Sensitive (organic): 19.2%; Acid Soluble (inorganic): 43.4%; Inert (Non-asbestos): 37.4%			
230851-24 10	124041227-24	No	NAD
Location: Floor Leveling Compound With Thin Yellow Floor Tile Mastic; Room 526A			(NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Yellow, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 52%			
Comment: Heat Sensitive (organic): 15.8%; Acid Soluble (inorganic): 31.6%; Inert (Non-asbestos): 52.6%			
230851-25 11	124041227-25	No	NAD
Location: Carpet Mastic (Yellow); Corridor 50044			(NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Yellow, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 48%			
Comment: Heat Sensitive (organic): 33.9%; Acid Soluble (inorganic): 17.9%; Inert (Non-asbestos): 48.2%			
230851-26 11	124041227-26	No	NAD
Location: Carpet Mastic (Yellow); Corridor 50044			(NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Yellow, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 49%			
Comment: Heat Sensitive (organic): 26.4%; Acid Soluble (inorganic): 24.4%; Inert (Non-asbestos): 49.2%			
230851-27 12	124041227-27	No	NAD
Location: Carpet Square Mastic (Yellow/Green); Room 429			(NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Yellow, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 20%			
Comment: Heat Sensitive (organic): 75.0%; Acid Soluble (inorganic): 4.3%; Inert (Non-asbestos): 20.7%			

PLM Bulk Asbestos Report

20230851; Cornell University - King-Shal Hall Renovation;
Cornell King-Shaw Hall - Ithaca, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
230851-28 12	124041227-28 Location: Carpet Square Mastic (Yellow/Green); Room 429	No	NAD (NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Yellow, Heterogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 18% Comment: Heat Sensitive (organic): 79.3%; Acid Soluble (inorganic): 2.3%; Inert (Non-asbestos): 18.5%			
230851-29 13	124041227-29 Location: Carpet Square Mastic With Residual Black (Yellow/Green/Black); Room 425	No	NAD (NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Yellow, Heterogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 40% Comment: Heat Sensitive (organic): 52.0%; Acid Soluble (inorganic): 7.0%; Inert (Non-asbestos): 40.9%			
230851-30 13	124041227-30 Location: Carpet Square Mastic With Residual Black (Yellow/Green/Black); Room 425	No	NAD (NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Yellow, Heterogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 42% Comment: Heat Sensitive (organic): 52.3%; Acid Soluble (inorganic): 5.7%; Inert (Non-asbestos): 42.0%			
230851-31 14	124041227-31 Location: Vestibule Carpet Mastic (Tan); Vestibule 30048	No	NAD (NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Yellow, Heterogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 61% Comment: Heat Sensitive (organic): 34.2%; Acid Soluble (inorganic): 4.4%; Inert (Non-asbestos): 61.4%			
230851-32 14	124041227-32 Location: Vestibule Carpet Mastic (Tan); Vestibule 30048	No	NAD (NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Yellow, Heterogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 55% Comment: Heat Sensitive (organic): 38.7%; Acid Soluble (inorganic): 5.8%; Inert (Non-asbestos): 55.5%			

PLM Bulk Asbestos Report

20230851; Cornell University - King-Shal Hall Renovation;
Cornell King-Shaw Hall - Ithaca, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
230851-33 15	124041227-33 Location: Terrazzo Sink Basin; Janitor's Closet 50071	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
230851-34 15	124041227-34 Location: Terrazzo Sink Basin; Janitor's Closet 50071	No	NAD (by NYS ELAP 198.1) by Daisha Addison on 04/11/24
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100%			
230851-35 16	124041227-35 Location: Duct Sealant (Grey); Mechanical Room 50070	No	NAD (NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 28%			
Comment: Heat Sensitive (organic): 43.9%; Acid Soluble (inorganic): 27.6%; Inert (Non-asbestos): 28.4%			
230851-36 16	124041227-36 Location: Duct Sealant (Grey); Mechanical Room 50070	No	NAD (NOB by NYS ELAP 198.6) by Daisha Addison on 04/11/24
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 15%			
Comment: Heat Sensitive (organic): 44.0%; Acid Soluble (inorganic): 40.1%; Inert (Non-asbestos): 15.9%			

Reporting Notes:

- (1) Spray-On Fireproofing and other Surfacing Material containing Vermiculite (SOF-V/SM-V) must be analyzed by ELAP method 198.8.
- (2) A 10 gram minimum per sample must be provided. AmeriSci Richmond is certified to perform NY ELAP method 198.8

Analyzed by: Daisha Addison
Date: 4/11/2024



Reviewed by: Cory M. Parnell



*NAD = no asbestos detected, Detection Limit <1%, Reporting Limits: CVES = 1%, 400 Pt Ct = 0.25%, 1000 Pt Ct = 0.1%; "Present" or NVA = "No Visible Asbestos" are observations made during a qualitative analysis; NA = not analyzed; NA/PS = not analyzed / positive stop; PLM Bulk Asbestos Analysis using Meiji, Model MT 6120 microscope, Serial #2200363, by EPA 600/R-93/116 per 40 CFR 763 (NVLAP Lab Code 101904-0) and ELAP PLM Analysis Protocol 198.1 for New York friable samples which includes quantitation of any vermiculite observed (198.6 for NOB samples) or EPA 400 pt ct by EPA 600/M4-82-020 (NYSDOH ELAP Lab # 10984); CA ELAP Lab # 2508; Note: PLM is not consistently reliable in detecting asbestos in floor coverings and similar NOB materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing in New York State (also see EPA Advisory for floor tile, FR 59, 146, 38970, 8/1/94). NIST Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the laboratory. This PLM report relates ONLY to the items tested.

Table I
Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4

20230851; Cornell University - King-Shal Hall Renovation; Cornell King-Shaw Hall - Ithaca, NY

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	230851-01	1	---	---	---	---	NAD	NA
	Location: Wall Plaster Skim Coat (White); Stairwell 30003 Wall							
02	230851-02	1	---	---	---	---	NAD	NA
	Location: Wall Plaster Skim Coat (White); Stairwell 30003 Wall							
03	230851-03	1	---	---	---	---	NAD	NA
	Location: Wall Plaster Skim Coat (White); Stairwell 30004 Wall							
04	230851-04	1	---	---	---	---	NAD	NA
	Location: Wall Plaster Skim Coat (White); Stairwell 30004 Wall							
05	230851-05	2	---	---	---	---	NA	NA
	Location: Wall Plaster Base Coat (Grey) ; Stairwell 30003 Wall							
06	230851-06	2	---	---	---	---	NAD	NA
	Location: Wall Plaster Base Coat (Grey) ; Stairwell 30003 Wall							
07	230851-07	2	---	---	---	---	NAD	NA
	Location: Wall Plaster Base Coat (Grey) ; Stairwell 30003 Wall							
08	230851-08	2	---	---	---	---	NA	NA
	Location: Wall Plaster Base Coat (Grey) ; Stairwell 30003 Wall							
09	230851-09	3	---	---	---	---	NAD	NA
	Location: Slate Floor Tile Grout; Room 233							
10	230851-10	3	---	---	---	---	NAD	NA
	Location: Slate Floor Tile Grout; Room 233							
11	230851-11	4	---	---	---	---	NAD	NA
	Location: Slate Floor Tile Set; Room 233							
12	230851-12	4	---	---	---	---	NAD	NA
	Location: Slate Floor Tile Set; Room 233							
13	230851-13	5	---	---	---	---	NAD	NA
	Location: Quarry Tile Grout; Kitchen 230							
14	230851-14	5	---	---	---	---	NAD	NA
	Location: Quarry Tile Grout; Kitchen 230							
15	230851-15	6	---	---	---	---	NAD	NA
	Location: Quarry Tile Set; Kitchen 230							
16	230851-16	6	---	---	---	---	NAD	NA
	Location: Quarry Tile Set; Kitchen 230							

Client Name: Watts Architecture & Engineers

Table I
Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4

20230851; Cornell University - King-Shal Hall Renovation; Cornell King-Shaw Hall - Ithaca, NY

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	230851-17	7	---	---	---	---	NAD	NA
Location: Quarry Tile Covebase Set; Kitchen 230								
18	230851-18	7	---	---	---	---	NAD	NA
Location: Quarry Tile Covebase Set; Kitchen 230								
19	230851-19	8	0.521	15.1	80.3	4.6	NAD	NAD
Location: Grey/Green 12"x12" Floor Tile; Room 50071								
20	230851-20	8	0.356	12.5	84.8	2.7	NAD	NAD
Location: Grey/Green 12"x12" Floor Tile; Room 26A								
21	230851-21	9	0.327	52.4	26.6	21.0	NAD	NAD
Location: 12"x12" Floor Tile Mastic (Black); Room 50071								
22	230851-22	9	0.957	39.6	25.6	34.8	NAD	NAD
Location: 12"x12" Floor Tile Mastic (Black); Room 526A								
23	230851-23	10	0.409	19.2	43.4	37.4	NAD	NAD
Location: Floor Leveling Compound With Thin Yellow Floor Tile Mastic; Room 526A								
24	230851-24	10	0.579	15.8	31.6	52.6	NAD	NAD
Location: Floor Leveling Compound With Thin Yellow Floor Tile Mastic; Room 526A								
25	230851-25	11	0.450	33.9	17.9	48.2	NAD	NAD
Location: Carpet Mastic (Yellow); Corridor 50044								
26	230851-26	11	0.337	26.4	24.4	49.2	NAD	NAD
Location: Carpet Mastic (Yellow); Corridor 50044								
27	230851-27	12	0.393	75.0	4.3	20.7	NAD	NAD
Location: Carpet Square Mastic (Yellow/Green); Room 429								
28	230851-28	12	0.737	79.3	2.3	18.5	NAD	NAD
Location: Carpet Square Mastic (Yellow/Green); Room 429								
29	230851-29	13	0.432	52.0	7.0	40.9	NAD	NAD
Location: Carpet Square Mastic With Residual Black (Yellow/Green/Black); Room 425								
30	230851-30	13	0.442	52.3	5.7	42.0	NAD	NAD
Location: Carpet Square Mastic With Residual Black (Yellow/Green/Black); Room 425								
31	230851-31	14	0.970	34.2	4.4	61.4	NAD	NAD
Location: Vestibule Carpet Mastic (Tan); Vestibule 30048								
32	230851-32	14	0.514	38.7	5.8	55.5	NAD	NAD
Location: Vestibule Carpet Mastic (Tan); Vestibule 30048								

Client Name: Watts Architecture & Engineers

Table I
Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4

20230851; Cornell University - King-Shal Hall Renovation; Cornell King-Shaw Hall - Ithaca, NY

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	230851-33	15	----	----	----	----	NAD	NA
Location: Terrazzo Sink Basin; Janitor's Closet 50071								
34	230851-34	15	----	----	----	----	NAD	NA
Location: Terrazzo Sink Basin; Janitor's Closet 50071								
35	230851-35	16	0.575	43.9	27.6	28.4	NAD	NAD
Location: Duct Sealant (Grey); Mechanical Room 50070								
36	230851-36	16	0.565	44.0	40.1	15.9	NAD	NAD
Location: Duct Sealant (Grey); Mechanical Room 50070								

Analyzed by: Cory M. Parnell
 Date: 4/11/2024



Reviewed by: Cory M. Parnell



Semi-Quantitative Analysis: NAD = no asbestos detected; NA = not analyzed; NA/PS = not analyzed due to positive stop; Trace = <1%; PLM analysis by EPA 600/R-93/116 per 40 CFR 763 (NVLAP Lab Code 101904-0) or NY ELAP 198.1 for New York friable samples which includes quantitation of any vermiculite observed (198.6 for NOB samples) or EPA 400 pt ct by EPA 600/M4-82-020 (NY ELAP Lab # 10984); TEM prep by EPA 600/R-93/116 Section 2.3 (analysis by Section 2.5, not covered by NVLAP Bulk accreditation); or NY ELAP 198.4 for New York NOB samples (NY ELAP Lab # 10984). Analysis using Jeol, Model JEM-100CX II microscope, Serial #156147-247. ** Warning Notes: Consider PLM fiber diameter limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris, soils or other heterogeneous materials for which a combination PLM/TEM evaluation is recommended; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only.

**WATTS ARCHITECTS & ENGINEERS
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY**

Client: Mitchell/Giurgola Architects, LLP
 Project: Cornell University - King-Shal Hall Renovation
 Building / Location: Cornell King-Shaw Hall - Ithaca, NY
 Contact: Bill Coyle at (716) 380-6024
 Preliminary Results to: wcoyle@watts-ae.com and
 Mail Report & Invoice to: Watts Architects & Engineers
 95 Perry Street, Buffalo, NY 14203

Watts Project No: 20230851
 Date: 4/1/2024

Analysis Requested:
 198.1 X 198.4 X
 198.8 198.6 X
 Turnaround Requested:
 3 Hr. 48 Hr.
 6 Hr. 72 Hr.
 12 Hr. 4 Day
 24 Hr. X 5 Day

Sample Number	Material Description	HA	Sample Location	Laboratory Results	
				PLM	TEM
230851-01	Wall Plaster Skim Coat (White)	1	Stairwell 30003 Wall		
230851-02	Wall Plaster Skim Coat (White)	1	Stairwell 30003 Wall		
230851-03	Wall Plaster Skim Coat (White)	1	Stairwell 30004 Wall		
230851-04	Wall Plaster Skim Coat (White)	1	Stairwell 30004 Wall		
230851-05	Wall Plaster Base Coat (Grey)	2	Stairwell 30003 Wall		
230851-06	Wall Plaster Base Coat (Grey)	2	Stairwell 30003 Wall		
230851-07	Wall Plaster Base Coat (Grey)	2	Stairwell 30003 Wall		
230851-08	Wall Plaster Base Coat (Grey)	2	Stairwell 30003 Wall		
230851-09	Slate Floor Tile Grout	3	Room 233		
230851-10	Slate Floor Tile Grout	3	Room 233		
230851-11	Slate Floor Tile Set	4	Room 233		
230851-12	Slate Floor Tile Set	4	Room 233		
230851-13	Quarry Tile Grout	5	Kitchen 230		
230851-14	Quarry Tile Grout	5	Kitchen 230		
230851-15	Quarry Tile Set	6	Kitchen 230		
230851-16	Quarry Tile Set	6	Kitchen 230		
230851-17	Quarry Tile Covebase Set	7	Kitchen 230		
230851-18	Quarry Tile Covebase Set	7	Kitchen 230		

Sampled By: Bill Coyle Date: 4/1/2024 Time: N/A Received By: FedEx Date: 4/3/2024

Relinquished By: *Wish* Date: 4/3/2024 Time: 1700 Received By: Date: Received

Comments: If PLM NOB is negative, analyze by TEM.
 If Vermiculite is detected, cease analysis and contact the Watts Project Manager for further instructions.

APR 05 2024
AW

124041227

**WATTS ARCHITECTS & ENGINEERS
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY**

Client: Mitchell/Giurgola Architects, LLP
 Project: Cornell University - King-Shal Hall Renovation
 Building / Location: Cornell King-Shaw Hall - Ithaca, NY
 Contact: Bill Coyle at (716) 380-6024
 Preliminary Results to: wcoyle@watts-ae.com and
 Mail Report & Invoice to: Watts Architects & Engineers
 95 Perry Street, Buffalo, NY 14203

Watts Project No: 20230851
 Date: 4/1/2024
 Turnaround Requested:
 3 Hr. 48 Hr.
 6 Hr. 72 Hr.
 12 Hr. 4 Day
 24 Hr. 5 Day

Analysis Requested:
 198.1 X 198.4 X
 198.8 198.6 X

Sample Number	Material Description	HA	Sample Location	Laboratory Results	
				PLM	TEM
230851-19	Grey/Green 12" x 12" Floor Tile	8	Room 50071		
230851-20	Grey/Green 12" x 12" Floor Tile	8	Room 526A		
230851-21	12" x 12" Floor Tile Mastic (Black)	9	Room 50071		
230851-22	12" x 12" Floor Tile Mastic (Black)	9	Room 526A		
230851-23	Floor Leveling Compound With Thin Yellow Floor Tile Mastic	10	Room 526A		
230851-24	Floor Leveling Compound With Thin Yellow Floor Tile Mastic	10	Room 526A		
230851-25	Carpet Mastic (Yellow)	11	Corridor 50044		
230851-26	Carpet Mastic (Yellow)	11	Corridor 50044		
230851-27	Carpet Square Mastic (Yellow/Green)	12	Room 429		
230851-28	Carpet Square Mastic (Yellow/Green)	12	Room 429		
230851-29	Carpet Square Mastic With Residual Black (Yellow/Green/Black)	13	Room 425		
230851-30	Carpet Square Mastic With Residual Black (Yellow/Green/Black)	13	Room 425		
230851-31	Vestibule Carpet Mastic (Tan)	14	Vestibule 30048		
230851-32	Vestibule Carpet Mastic (Tan)	14	Vestibule 30048		
230851-33	Terrazzo Sink Basin	15	Janitor's Closet 50071		
230851-34	Terrazzo Sink Basin	15	Janitor's Closet 50071		
230851-35	Duct Sealant (Grey)	16	Mechanical Room 50070		
230851-36	Duct Sealant (Grey)	16	Mechanical Room 50070		

Sampled By: Bill Coyle Date: 4/1/2024 Time: N/A Received By: FedEx Date: 4/3/2024

Relinquished By: *Wiegand* Date: 4/3/2024 Time: 1700 Received By: Date:

Comments: If PLM NOB is negative, analyze by TEM.
 If Vermiculite is detected, cease analysis and contact the Watts Project Manager for further instructions.

Resealed

APR 05 2024

aw

AmeriSci Job #: 124051409
Client: Watts A & E

Table I
PLM Analysis of Surfacing Material Containing Vermiculite (SM-V) by NYS ELAP 198.8
Cornell King-Shaw Hall-Ithaca, NY

AmeriSci Sample #	Client Sample #	Analyst Description	Percent Non-Fibrous	Percent Non-Asbestos Fibers	Percent Chrysotile	Percent Amphibole	Total Percent Asbestos	Footnote
1	230851-37	Cement	100	0	0	0	0	
2	230851-38	Cement	100	0	0	0	0	
3	230851-39	Cement	100	0	0	0	0	
4	230851-40	Cement	100	0	0	0	0	
5	230851-41	Cement	100	0	0	0	0	

Analyzed by: CDM

Date: 05/17/24

Reporting Notes:

ELAP Lab ID: 10984 : PLM analysis by NY ELAP 198.8

NAD= No Asbestos Detected; **ND**= None Detected; **NA** = Not Analyzed; **NA/PS** = Not Analyzed/Positive Stop

Footnote:

AmeriSci Job #:	124-05-1409
Client:	Watts A & E
Job Site:	Cornell King-Shaw Hall- Ithaca, NY

**Asbestos Analysis of NYS ELAP Method 198.8
PLM analysis for Asbestos in Surfacing Material Containing Vermiculite (SM-V)**

BENCH SHEET

AmeriSci Richmond Sample #: Crucible ID#

	Tech/Analyst	Date
Gravimetric Prep	DB	05/15/24
PLM Chrysotile Analysis	EHA	05/17/24
Centrifugation	DB	05/17/24
PLM Amphibole Analysis	CDM	05/17/24

STEREOBINOCULAR EXAMINATION

COLOR: White TEXTURE: Cement HOMOGENEITY: Homogeneous
 HOMOGENIZATION: _____ PROBABLE FIBERS: None

INITIAL WEIGHTS	COMMENTS							
Weight Of Crucible	24.6718							
Weight of Crucible+Subsample	27.8026							
Weight of Subsample	3.1308							
ASHING								
Weight of Crucible+Ash	27.7421							
Weight of Ash	3.0703							
Weight Loss During Ash	0.0605							
Weight Percent Organic and Water	1.9324							
ACID TREATMENT/FLOTATION								
Weight of Dish for Floats		2nd Measure						
Weight of Dish and Floats		% Difference	Acceptable					
Weight of Floats	0.0000	0	#DIV/0!	#DIV/0!				
Weight Percent Floats	0.0000							
Weight of Dish+Filter for Residue	8.1433	2nd Measure						
Weight of Dish+Filter+Residue	9.8267	9.8267	% Difference	Acceptable				
Weight of Residue	1.6834	1.6834	0.00%	YES				
Weight Loss During Acid Treatment	1.3869							
Weight Percent Acid-Soluble Materials	44.2986							
Weight Percent Residue	53.7690							
PLM EXAMINATION OF RESIDUE (CHRYSOTILE)	Analyzed	PTCT	Chrysotile	Non-Empty	PTCT	Chrysotile	Non-Empty	Trace Detected
Number of Occupied Points	400	Slide 1:	0	50	Slide 5:	0	50	NO
Number of Chrysotile Points	0	Slide 2:	0	50	Slide 6:	0	50	
Percent Chrysotile by PTCT	0	Slide 3:	0	50	Slide 7:	0	50	
PERCENT CHRYSOTILE IN SAMPLE	0.0	Slide 4:	0	50	Slide 8:	0	50	
HEAVY LIQUID CENTRIFUGATION								
Weight Of Dish+Filter+Balance Of Residue	9.8006	Morphology	RI	RI	Sign Of	Extinction	Birefringence	Fiber ID
Weight of Balance Of Residue	1.6573		Parallel	Perpendicular	Elongation	Angle		
Weight Of Dish+Filter for Centrifugate	8.1751							
Weight Of Dish+Filter+Centrifugate	8.3263							
Weight Of Centrifugate	0.1512							
Weight Percent Centrifugate	4.9055							
PLM EXAMINATION OF CENTRIFUGATE (AMPHIBOLE)	Analyzed	PTCT	Amphibole	Non-Empty	PTCT	Amphibole	Non-Empty	Trace Detected
Number of Occupied Points	400	Slide 1:	0	50	Slide 5:	0	50	NO
Number of Amphibole Asbestos Points	0	Slide 2:	0	50	Slide 6:	0	50	
Percent Amphibole Asbestos by PTCT	0	Slide 3:	0	50	Slide 7:	0	50	
PERCENT AMPHIBOLE ASBESTOS IN SAMPLE	0.00	Slide 4:	0	50	Slide 8:	0	50	
AMPHIBOLE IDENTIFICATION								
PERCENT TOTAL ASBESTOS IN SAMPLE	0.00	Morphology	RI	RI	Sign Of	Extinction	Birefringence	Fiber ID
		Parallel	Perpendicular	Elongation	Angle			

3.0 - INSPECTION PHOTOGRAPHS



Photo 1: View of typical finishes on the 2nd floor of King-Shaw Hall. No asbestos-containing materials were identified within the building.



Photo 2: View of a typical conference room on the 2nd floor. Carpet square mastic was tested and determined to be non-ACM. Ceiling-recessed can light fixtures have non-suspect vinyl wire insulation.



Photo 3: View of typical finishes on the 3rd floor. Wood and stone wall panels throughout the building are secured with clips and so are non-suspect for asbestos.



Photo 4: View of a typical conference room on the 3rd floor. Carpet mastic was sampled and determined to be non-ACM.



Photo 5: View of typical finishes on the 5th floor. Carpet mastic associated with the thick red carpet was sampled and identified to be non-ACM.



Photo 6: Typical view of mechanical piping in the building. All of the pipes and HVAC ducts that were observed above suspended ceilings were insulated with non-ACM fiberglass insulation.



Photo 7: View of Kitchen 230. Quarry tile flooring and covebase grout and set were sampled and determined to be non-ACM.

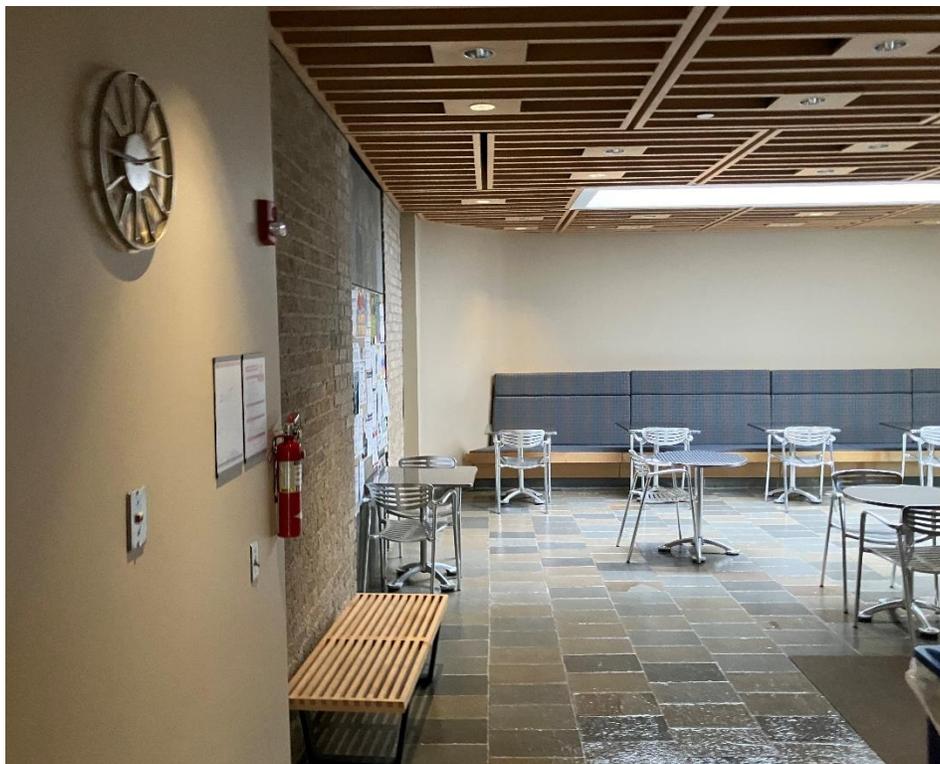


Photo 8: View of finishes in dining area 233. The slate tile flooring grout and set were sampled and determined to be non-ACM.

4.0 – LABORATORY ACCREDITATIONS

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

AmeriSci Richmond
dba AmeriSci Richmond
13635 Genito Road
Midlothian, VA 23112
Cory M. Parnell
Phone: 804-763-1200
Email: cparnell@amerisci.com
<http://www.amerisci.com>

ASBESTOS FIBER ANALYSIS

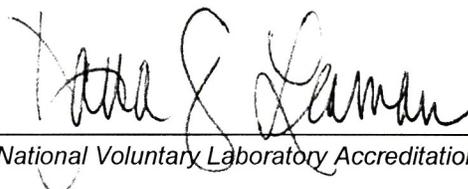
NVLAP LAB CODE 101904-0

Bulk Asbestos Analysis

<u>Code</u>	<u>Description</u>
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

<u>Code</u>	<u>Description</u>
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.



For the National Voluntary Laboratory Accreditation Program

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2025
Issued April 01, 2024

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

*MR. CORY M. PARNELL
AMERISCI RICHMOND
13635 GENITO RD
MIDLOTHIAN, VA 23112*

NY Lab Id No: 10984

*is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:*

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual
Asbestos-Vermiculite-Containing Mate	Item 198.8 of Manual



Serial No.: 68665

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.

5.0 – CONSULTANT’S LICENSE AND CERTIFICATIONS

WE ARE YOUR DOL



DIVISION OF SAFETY & HEALTH LICENSE AND CERTIFICATE UNIT, STATE OFFICE CAMPUS, BLDG. 12, ALBANY, NY 12226

ASBESTOS HANDLING LICENSE

Watts Architecture & Engineering, D.P.C.
95 Perry Street, Suite 300, Buffalo, NY, 14203

License Number: 68007

License Class: RESTRICTED

Date of Issue: 08/30/2023

Expiration Date: 09/30/2024

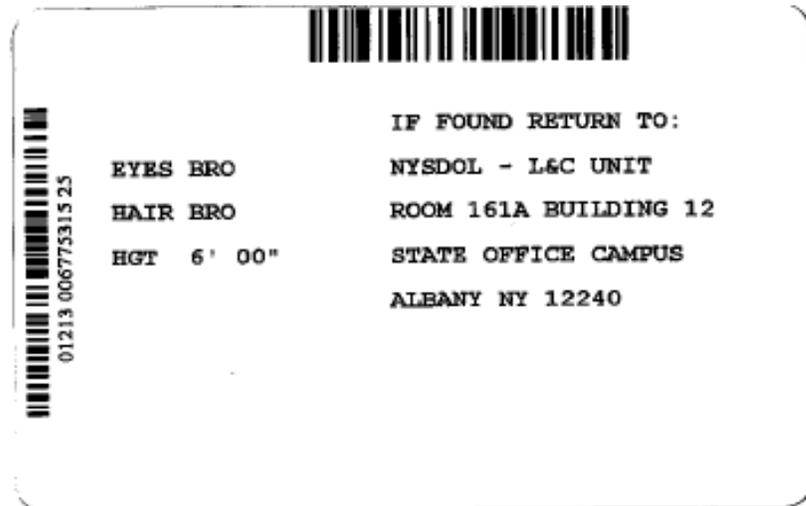
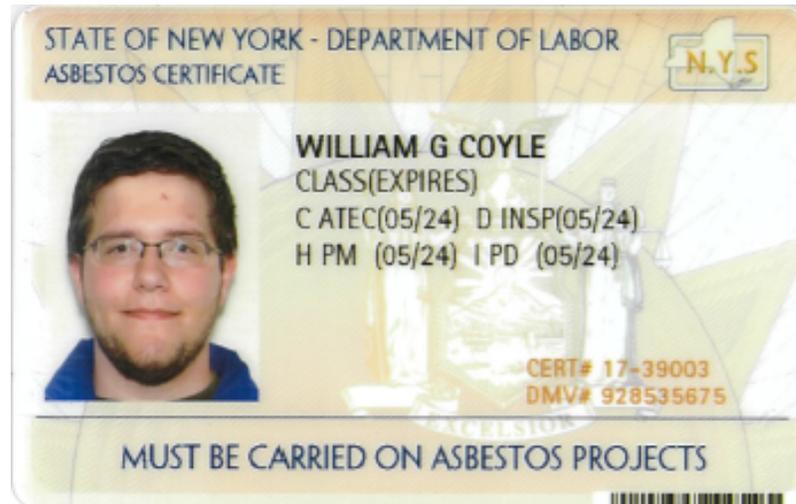
Duly Authorized Representative: Kevin Janik

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

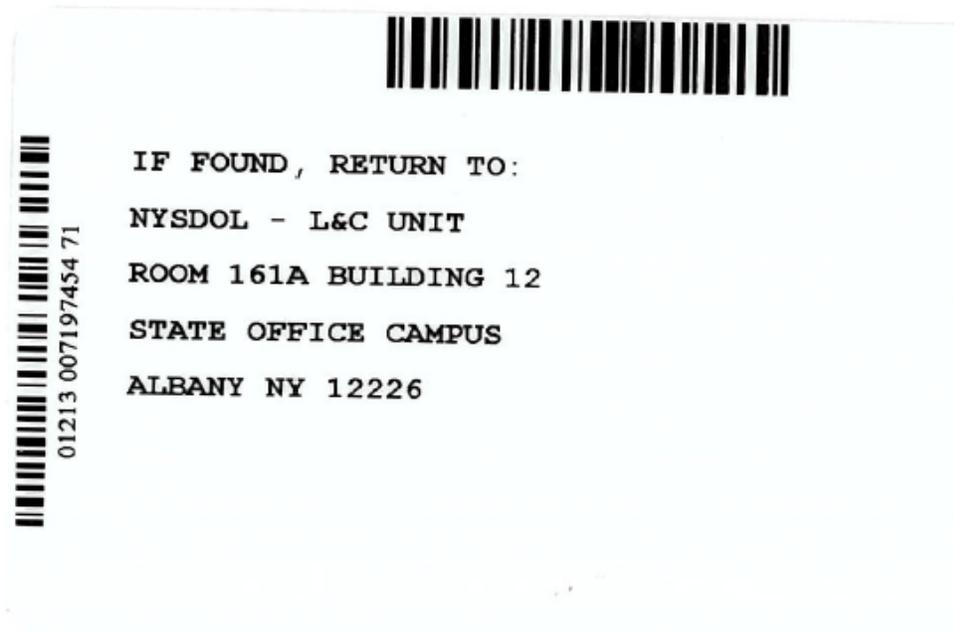
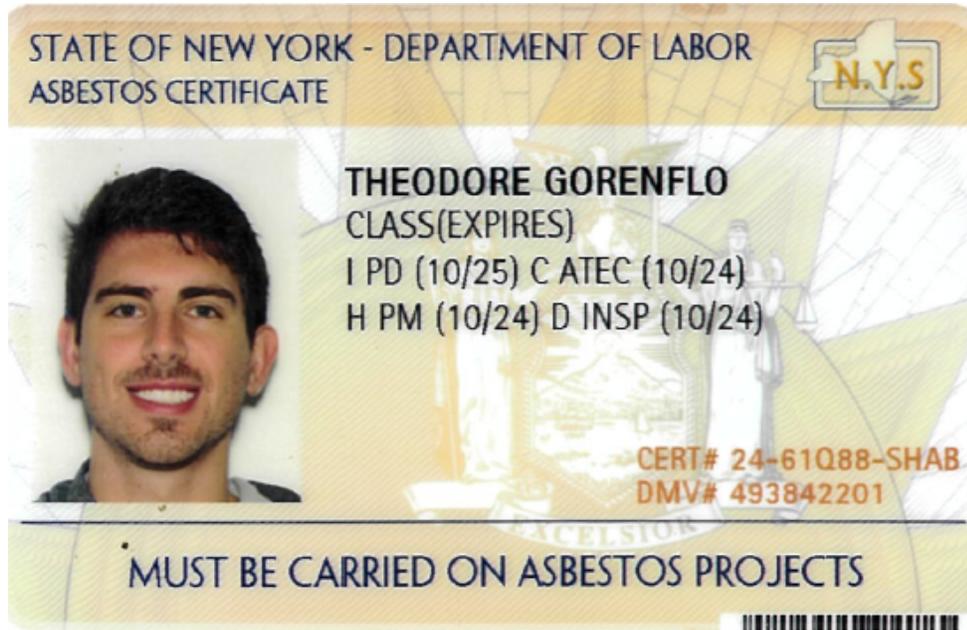
Amy Phillips, Director
For the Commissioner of Labor

EXCELSIOR



William Coyle

- C - Air Sampling Technician
- D - Inspector
- H - Project Monitor
- I - Project Designer



Theodore Gorenflo

- C - Air Sampling Technician
- D - Inspector
- H - Project Monitor
- I - Project Designer

**6.0 – LABORATORY REPORTS AND CHAIN-OF-CUSTODY FORMS
FROM PRIOR TESTING**



AmeriSci New York

117 EAST 30TH ST.
NEW YORK, NY 10016

TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Delta Engineers
Attn: Stephen Prislupsky
860 Hooper Road

Endwell, NY 13760

Date Received 12/11/12 **AmeriSci Job #** 212122378
Date Examined 12/12/12 **P.O. #**
ELAP # 11480 **Page** 1 of 9
RE: 2012.004.282; Cornell University; ILR Conference 1007A,
Energy Conservation Project "Limited" ACM Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2012.004 282 - 01A Location: Floor 2, Surfacing, White Top Coat (Ceiling) Plaster - 20062 Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %	212122378-01	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 01B Location: Floor 3, Surfacing, White Top Coat (Ceiling) Plaster - 330B Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %	212122378-02	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 01C Location: Floor 4, Surfacing, White Top Coat (Ceiling) Plaster - 432 Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %	212122378-03	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 02A Location: Floor 2, Surfacing, Brown Base Coat (Ceiling) Plaster - 20062 Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Animal hair Trace, Non-fibrous 100 %	212122378-04	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 02B Location: Floor 3, Surfacing, Brown Base Coat (Ceiling) Plaster - 330B Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Animal hair Trace, Non-fibrous 100 %	212122378-05	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12

PLM Bulk Asbestos Report

2012.004.282; Cornell University; ILR Conference 1007A,
Energy Conservation Project "Limited" ACM Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2012.004 282 - 02C Location: Floor 4, Surfacing, Brown Base Coat (Ceiling) Plaster - 432	212122378-06	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Animal hair Trace, Non-fibrous 100 %			
2012.004 282 - 03A Location: Floor 3, Surfacing, White Top Coat (Wall) Plaster - 30003	212122378-07	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
2012.004 282 - 03B Location: Floor 4, Surfacing, White Top Coat (Wall) Plaster - 40003	212122378-08	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
2012.004 282 - 03C Location: Floor 5, Surfacing, White Top Coat (Wall) Plaster - 50004	212122378-09	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
2012.004 282 - 04A Location: Floor 3, Surfacing, Grey Base Coat (Wall) Plaster - 30003	212122378-10	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
2012.004 282 - 04B Location: Floor 4, Surfacing, Grey Base Coat (Wall) Plaster - 40003	212122378-11	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			

PLM Bulk Asbestos Report

2012.004.282; Cornell University; ILR Conference 1007A,
Energy Conservation Project "Limited" ACM Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2012.004 282 - 04C Location: Floor 5, Surfacing, Grey Base Coat (Wall) Plaster - 50004 Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %	212122378-12	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 05A Location: Floor 3, Surfacing, Brown Spray - On Fireproofing- 30044 Analyst Description: Brown, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 20 %, Mica 2 %, Non-fibrous 73 %, Vermiculite 5 %	212122378-13	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 05B Location: Floor 4, Surfacing, Brown Spray - On Fireproofing - 430 Analyst Description: Brown, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 20 %, Mica 2 %, Non-fibrous 73 %, Vermiculite 5 %	212122378-14	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 05C Location: Floor 5, Surfacing, Brown Spray - On Fireproofing - 532 Analyst Description: Brown, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 20 %, Mica 2 %, Non-fibrous 73 %, Vermiculite 5 %	212122378-15	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 06A Location: Floor 5, Surfacing, Grey Spray - On Fireproofing - 50074 Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 20 %, Non-fibrous 80 %	212122378-16	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 06B Location: Floor 5, Surfacing, Grey Spray - On Fireproofing - 50074 Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 20 %, Non-fibrous 80 %	212122378-17	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12

Client Name: Delta Engineers

PLM Bulk Asbestos Report

2012.004.282; Cornell University; ILR Conference 1007A,
Energy Conservation Project "Limited" ACM Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2012.004 282 - 06C Location: Floor 5, Surfacing, Grey Spray - On Fireproofing - 50074 Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 20 %, Non-fibrous 80 %	212122378-18	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 07A Location: Floor 5, Surfacing, White Fireproofing Patch Material - 532 Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 30 %, Non-fibrous 62 %, Vermiculite 8 %	212122378-19	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 07B Location: Floor 5, Surfacing, White Fireproofing Patch Material - 532 Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 30 %, Non-fibrous 62 %, Vermiculite 8 %	212122378-20	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 07C Location: Floor 5, Surfacing, White Fireproofing Patch Material - 50074 Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 30 %, Non-fibrous 62 %, Vermiculite 8 %	212122378-21	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 08A Location: Floor 2, Misc., Green With Black Specks 12" X 12" Floor Tile - 20062 Analyst Description: Green, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 2.5 %	212122378-22	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
2012.004 282 - 08B Location: Floor 3, Misc., Green With Black Specks 12" X 12" Floor Tile - 300B Analyst Description: Green, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 19 %	212122378-23	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12

PLM Bulk Asbestos Report

2012.004.282; Cornell University; ILR Conference 1007A,
 Energy Conservation Project "Limited" ACM Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2012.004 282 - 09A Location: Floor 2, Misc., Yellow Mastic From Green With Black Specks FT - 20062 Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 6 %	212122378-24	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
2012.004 282 - 09B Location: Floor 3, Misc., Yellow Mastic From Green With Black Specks FT - 330B Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 2.6 %	212122378-25	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
2012.004 282 - 10A Location: Floor 3, Misc., Grey Floor Leveler - 330B Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %	212122378-26	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 10B Location: Floor 3, Misc., Grey Floor Leveler - 330B Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %	212122378-27	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 11A Location: Floor 2, Misc., White 2' X 2' LT. Textured Ceiling Tile - 2nd Floor Corridor Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 18.8 %	212122378-28	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
2012.004 282 - 11B Location: Floor 3, Misc., White 2' X 2' LT. Textured Ceiling Tile - 330B Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 17 %	212122378-29	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12

PLM Bulk Asbestos Report

2012.004.282; Cornell University; ILR Conference 1007A,
Energy Conservation Project "Limited" ACM Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2012.004 282 - 11C Location: Floor 4, Misc., White 2' X 2' LT. Textured Ceiling Tile - 432	212122378-30	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 10.9 %			
2012.004 282 - 11D Location: Floor 5, Misc., White 2' X 2' LT. Textured Ceiling Tile - 50045	212122378-31	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 18.2 %			
2012.004 282 - 12A Location: Floor 5, Misc., White Fissured 2' X 2' Ceiling Tile - 526	212122378-32	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 50.6 %			
2012.004 282 - 12B Location: Floor 5, Misc., White Fissured 2' X 2' Ceiling Tile - 526A	212122378-33	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 52.8 %			
2012.004 282 - 13A Location: Floor 2, Misc., LT Grey Wallpaper Covering - 20023	212122378-34	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
Analyst Description: OffWhite, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 5.1 %			
2012.004 282 - 13B Location: Floor 3, Misc., LT Grey Wallpaper Covering - 30023	212122378-35	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
Analyst Description: OffWhite, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 3.6 %			

PLM Bulk Asbestos Report

2012.004.282; Cornell University; ILR Conference 1007A,
Energy Conservation Project "Limited" ACM Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2012.004 282 - 14A Location: Floor 3, Misc., Tan Wallpaper Covering - 330A Analyst Description: OffWhite, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 2 %	212122378-36	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
2012.004 282 - 14B Location: Floor 4, Misc., Tan Wallpaper Covering - 430 Analyst Description: OffWhite, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 3.8 %	212122378-37	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
2012.004 282 - 15A Location: Floor 2, Misc., Orange Speed Block - 20062 Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %	212122378-38	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 15B Location: Floor 4, Misc., Orange Speed Block - 430 Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %	212122378-39	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 16A Location: Floor 2, Misc., Red Fire Stop Patch - 20062 Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 19.9 %	212122378-40	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
2012.004 282 - 16B Location: Floor 3, Misc., Red Fire Stop Patch - 330B Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 6.5 %	212122378-41	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12

PLM Bulk Asbestos Report

2012.004.282; Cornell University; ILR Conference 1007A,
 Energy Conservation Project "Limited" ACM Survey

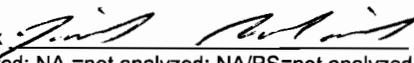
Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2012.004 282 - 17A Location: Floor 4, Misc., Grey Duct Sealant - 432 Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 14.2 %	212122378-42	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
2012.004 282 - 17B Location: Floor 5, Misc., Grey Duct Sealant - 50074 Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 13.3 %	212122378-43	No	NAD (by NYS ELAP 198.6) by David W. Roderick on 12/12/12
2012.004 282 - 18A Location: Floor 2, Misc., White Sheetrock (Wall) - 20062 Analyst Description: Brown/Grey, Heterogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 40 %, Non-fibrous 60 %	212122378-44	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 18B Location: Floor 3, Misc., White Sheetrock (Wall) - 330B Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 1 %, Non-fibrous 99 %	212122378-45	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 18C Location: Floor 4, Misc., White Sheetrock (Wall) - 432 Analyst Description: Brown/Grey, Heterogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 10 %, Non-fibrous 90 %	212122378-46	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 18D Location: Floor 5, Misc., White Sheetrock (Wall) - 50074 Analyst Description: Brown/Grey, Heterogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 50 %, Non-fibrous 50 %	212122378-47	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12

PLM Bulk Asbestos Report

2012.004.282; Cornell University; ILR Conference 1007A,
Energy Conservation Project "Limited" ACM Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2012.004 282 - 19A Location: Floor 2, Misc., White Joint Compound (Wall) - 20062 Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %	212122378-48	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 19B Location: Floor 3, Misc., White Joint Compound (Wall) - 330B Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %	212122378-49	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 19C Location: Floor 4, Misc., White Joint Compound (Wall) - 432 Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %	212122378-50	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12
2012.004 282 - 19D Location: Floor 5, Misc., White Joint Compound (Wall) - 50074 Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %	212122378-51	No	NAD (by NYS ELAP 198.1) by David W. Roderick on 12/12/12

Reporting Notes:

Analyzed by: David W. Roderick 
*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop; PLM Bulk Asbestos Analysis by EPA 600/M4-82-020 per 40 CFR 763 (NVLAP Lab Code 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or 198.6 for NOB samples (NY ELAP Lab ID11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. AIHA Lab # 102843, RI Cert#AAL-094, CT Cert#PH-0186, Mass Cert#AA000054.

Reviewed By:  END OF REPORT _____

Table I
Summary of Bulk Asbestos Analysis Results

2012.004.282; Cornell University; ILR Conference 1007A, Energy Conservation Project "Limited" ACM Survey

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	2012.004 282 - 01A						NAD	NA
Location:	Floor 2, Surfacing, White Top Coat (Ceiling) Plaster - 20062							
02	2012.004 282 - 01B						NAD	NA
Location:	Floor 3, Surfacing, White Top Coat (Ceiling) Plaster - 330B							
03	2012.004 282 - 01C						NAD	NA
Location:	Floor 4, Surfacing, White Top Coat (Ceiling) Plaster - 432							
04	2012.004 282 - 02A						NAD	NA
Location:	Floor 2, Surfacing, Brown Base Coat (Ceiling) Plaster - 20062							
05	2012.004 282 - 02B						NAD	NA
Location:	Floor 3, Surfacing, Brown Base Coat (Ceiling) Plaster - 330B							
06	2012.004 282 - 02C						NAD	NA
Location:	Floor 4, Surfacing, Brown Base Coat (Ceiling) Plaster - 432							
07	2012.004 282 - 03A						NAD	NA
Location:	Floor 3, Surfacing, White Top Coat (Wall) Plaster - 30003							
08	2012.004 282 - 03B						NAD	NA
Location:	Floor 4, Surfacing, White Top Coat (Wall) Plaster - 40003							
09	2012.004 282 - 03C						NAD	NA
Location:	Floor 5, Surfacing, White Top Coat (Wall) Plaster - 50004							
10	2012.004 282 - 04A						NAD	NA
Location:	Floor 3, Surfacing, Grey Base Coat (Wall) Plaster - 30003							
11	2012.004 282 - 04B						NAD	NA
Location:	Floor 4, Surfacing, Grey Base Coat (Wall) Plaster - 40003							
12	2012.004 282 - 04C						NAD	NA
Location:	Floor 5, Surfacing, Grey Base Coat (Wall) Plaster - 50004							
13	2012.004 282 - 05A						NAD	NA
Location:	Floor 3, Surfacing, Brown Spray - On Fireproofing- 30044							
14	2012.004 282 - 05B						NAD	NA
Location:	Floor 4, Surfacing, Brown Spray - On Fireproofing - 430							
15	2012.004 282 - 05C						NAD	NA
Location:	Floor 5, Surfacing, Brown Spray - On Fireproofing - 532							
16	2012.004 282 - 06A						NAD	NA
Location:	Floor 5, Surfacing, Grey Spray - On Fireproofing - 50074							

Table I
Summary of Bulk Asbestos Analysis Results

2012.004.282; Cornell University; ILR Conference 1007A, Energy Conservation Project "Limited" ACM Survey

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	2012.004 282 - 06B						NAD	NA
Location: Floor 5, Surfacing, Grey Spray - On Fireproofing - 50074								
18	2012.004 282 - 06C						NAD	NA
Location: Floor 5, Surfacing, Grey Spray - On Fireproofing - 50074								
19	2012.004 282 - 07A						NAD	NA
Location: Floor 5, Surfacing, White Fireproofing Patch Material - 532								
20	2012.004 282 - 07B						NAD	NA
Location: Floor 5, Surfacing, White Fireproofing Patch Material - 532								
21	2012.004 282 - 07C						NAD	NA
Location: Floor 5, Surfacing, White Fireproofing Patch Material - 50074								
22	2012.004 282 - 08A		0.161	14.9	82.6	2.5	NAD	NAD
Location: Floor 2, Misc., Green With Black Specks 12" X 12" Floor Tile - 20062								
23	2012.004 282 - 08B		0.195	18.5	62.6	19.0	NAD	NAD
Location: Floor 3, Misc., Green With Black Specks 12" X 12" Floor Tile - 300B								
24	2012.004 282 - 09A		0.084	54.8	39.3	6.0	NAD	NAD
Location: Floor 2, Misc., Yellow Mastic From Green With Black Specks FT - 20062								
25	2012.004 282 - 09B		0.114	70.2	27.2	2.6	NAD	NAD
Location: Floor 3, Misc., Yellow Mastic From Green With Black Specks FT - 330B								
26	2012.004 282 - 10A						NAD	NA
Location: Floor 3, Misc., Grey Floor Leveler - 330B								
27	2012.004 282 - 10B						NAD	NA
Location: Floor 3, Misc., Grey Floor Leveler - 330B								
28	2012.004 282 - 11A		0.064	10.9	70.3	18.8	NAD	NAD
Location: Floor 2, Misc., White 2' X 2' L.T. Textured Ceiling Tile - 2nd Floor Corridor								
29	2012.004 282 - 11B		0.088	13.6	69.3	17.0	NAD	NAD
Location: Floor 3, Misc., White 2' X 2' L.T. Textured Ceiling Tile - 330B								
30	2012.004 282 - 11C		0.110	17.3	71.8	10.9	NAD	NAD
Location: Floor 4, Misc., White 2' X 2' L.T. Textured Ceiling Tile - 432								
31	2012.004 282 - 11D		0.181	13.3	68.5	18.2	NAD	NAD
Location: Floor 5, Misc., White 2' X 2' L.T. Textured Ceiling Tile - 50045								
32	2012.004 282 - 12A		0.670	19.6	29.9	50.6	NAD	NAD
Location: Floor 5, Misc., White Fissured 2' X 2' Ceiling Tile - 526								

Table I
Summary of Bulk Asbestos Analysis Results

2012.004.282; Cornell University; ILR Conference 1007A, Energy Conservation Project "Limited" ACM Survey

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	2012.004 282 - 12B		0.360	15.8	31.4	52.8	NAD	NAD
	Location: Floor 5, Misc., White Fissured 2' X 2' Ceiling Tile - 526A							
34	2012.004 282 - 13A		0.059	69.5	25.4	5.1	NAD	NAD
	Location: Floor 2, Misc., LT Grey Wallpaper Covering - 20023							
35	2012.004 282 - 13B		0.055	58.2	38.2	3.6	NAD	NAD
	Location: Floor 3, Misc., LT Grey Wallpaper Covering - 30023							
36	2012.004 282 - 14A		0.051	82.4	15.7	2.0	NAD	NAD
	Location: Floor 3, Misc., Tan Wallpaper Covering - 330A							
37	2012.004 282 - 14B		0.052	82.7	13.5	3.8	NAD	NAD
	Location: Floor 4, Misc., Tan Wallpaper Covering - 430							
38	2012.004 282 - 15A		----	----	----	----	NAD	NA
	Location: Floor 2, Misc., Orange Speed Block - 20062							
39	2012.004 282 - 15B		----	----	----	----	NAD	NA
	Location: Floor 4, Misc., Orange Speed Block - 430							
40	2012.004 282 - 16A		0.151	36.4	43.7	19.9	NAD	NAD
	Location: Floor 2, Misc., Red Fire Stop Patch - 20062							
41	2012.004 282 - 16B		0.185	40.0	53.5	6.5	NAD	NAD
	Location: Floor 3, Misc., Red Fire Stop Patch - 330B							
42	2012.004 282 - 17A		0.233	43.8	42.1	14.2	NAD	NAD
	Location: Floor 4, Misc., Grey Duct Sealant - 432							
43	2012.004 282 - 17B		0.181	44.2	42.5	13.3	NAD	NAD
	Location: Floor 5, Misc., Grey Duct Sealant - 50074							
44	2012.004 282 - 18A		----	----	----	----	NAD	NA
	Location: Floor 2, Misc., White Sheetrock (Wall) - 20062							
45	2012.004 282 - 18B		----	----	----	----	NAD	NA
	Location: Floor 3, Misc., White Sheetrock (Wall) - 330B							
46	2012.004 282 - 18C		----	----	----	----	NAD	NA
	Location: Floor 4, Misc., White Sheetrock (Wall) - 432							
47	2012.004 282 - 18D		----	----	----	----	NAD	NA
	Location: Floor 5, Misc., White Sheetrock (Wall) - 50074							
48	2012.004 282 - 19A		----	----	----	----	NAD	NA
	Location: Floor 2, Misc., White Joint Compound (Wall) - 20062							

**Table I
Summary of Bulk Asbestos Analysis Results**

2012.004.282; Cornell University; ILR Conference 1007A, Energy Conservation Project "Limited" ACM Survey

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
49	2012.004.282 - 19B			---	---	---	NAD	NA
Location: Floor 3, Misc., White Joint Compound (Wall) - 330B								
50	2012.004.282 - 19C			---	---	---	NAD	NA
Location: Floor 4, Misc., White Joint Compound (Wall) - 432								
51	2012.004.282 - 19D			---	---	---	NAD	NA
Location: Floor 5, Misc., White Joint Compound (Wall) - 50074								

Analyzed by: John P. Koubiadis, Date Analyzed 12/12/2012

**Quantitative Analysis (Semi/Full): Bulk Asbestos Analysis - PLM by EPA 600/M4-82-020 per 40 CFR or ELAP 198.1 for New York friable samples or ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (not covered by NVLAP Bulk accreditation) or ELAP 198.4; for New York samples; NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses); AIHA Lab # 102843, NVLAP Lab Code 200546-0, NYSDOH ELAP Lab ID#11480.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogeneous materials).

Reviewed By: 

21 21 22 378

Bulk Sampling Data Sheet/COC

Client: Cornell University	Delta Project No.: 2012.004.282	Date: 12/10/12	Page 1 of 4
Project: ILR Conference Room A Energy Conservation Project Limited ACM Survey	Client Project No.:	Turnaround Time: <input type="checkbox"/> RUSH <input checked="" type="checkbox"/> 24 Hours <input type="checkbox"/> 48 Hours <input type="checkbox"/> Other	
Collected By: D. Franklin			

Sample Number	Material Type	Material Condition	Floor	Sample Location/Description
2012.004.282 - 01A	Surfaceing	Poor	2	White Top Coat (ceiling) Plaster - 20062
- 01B			3	↓ ↓ ↓ ↓ ↓ - 330B
- 01C			4	↓ ↓ ↓ ↓ ↓ - 432
- 02A			2	Brown Base Coat (ceiling) Plaster - 20062
- 02B			3	↓ ↓ ↓ ↓ ↓ - 330B
- 02C			4	↓ ↓ ↓ ↓ ↓ - 432
- 03A		Good	3	White Top Coat (wall) Plaster - 30003
- 03B			4	↓ ↓ ↓ ↓ ↓ - 40003
- 03C			5	↓ ↓ ↓ ↓ ↓ - 50004
- 04A			3	Grey Base coat (wall) Plaster - 30003

Instructions: Analyze all non-NOB samples by NYS ELAP 198.1 PLM methodology. Analyze all NOB samples initially by NYS ELAP 198.6 PLM methodology. If all samples from a given sample set are reported as non-asbestos by 198.6, analyze by NYS ELAP 198.4 TEM methodology. Stop analysis after 1st positive for a given sample set.
Email Results to wjohnson@deltaengineers.com, sprislupsky@deltaengineers.com, rcherevko@deltaengineers.com

Notes: _____

Submitted By: Derek Franklin Date: 12/10/12
(Printed) (Signature)

Received By: [Signature] Date: 12/11/12
(Printed) (Signature)

Bulk Sampling Data Sheet/COC

21 21 22 378

Client: Cornell University	Delta Project No.: 2012.004.282	Date: 12/10/12	Page 2 of 4
Project: ILR Conference 087A	Client Project No.:	Turnaround Time: <input type="checkbox"/> RUSH <input checked="" type="checkbox"/> 24 Hours	
Energy Conservation Project "limited"	Collected By: D Franklin	<input type="checkbox"/> 48 Hours <input type="checkbox"/> Other	
ACM Survey			

Sample Number	Material Type	Material Condition	Floor	Sample Location/Description
2012.004.282 - 04B	Surfacing	Good	4	Grey Base Coat (wall) Plaster - 4003
- 04C			5	" " " " - 5004
- 05A			3	Brown Spray-on Fireproofing - 30044
- 05B			4	↓ ↓ ↓ ↓ - 430
- 05C			5	↓ ↓ ↓ ↓ - 532
- 06A			5	Grey spray-on Fireproofing - 50074
- 06B			5	↓ ↓ ↓ ↓ - ↓
- 06C			5	↓ ↓ ↓ ↓ - ↓
- 07A			5	White Fireproofing Patch Material - 532
- 07B			5	↓ ↓ ↓ ↓ - 532
- 07C			5	↓ ↓ ↓ ↓ - 50074
- 08A	MISC		2	Green w/ Black Specks 12"x12" Floor Tile - 20062
- 08B			3	" " " " " " - 330B
- 09A			2	Yellow Mastic from Green w/ Black Specks FT - 20062
- 09B			3	" " " " " " - 330B
- 10A			3	Grey Floor Leveler - 330B

Bulk Sampling Data Sheet/COC

21 21 22 378

Client: Cornell University	Delta Project No.: 2012.004.282	Date: 12/10/12	Page 3 of 4
Project: ILR Conference 1009A Energy Conservation Project "Univided"	Client Project No.:	Turnaround Time: <input type="checkbox"/> RUSH <input checked="" type="checkbox"/> 24 Hours	
ACM Survey	Collected By: D. Franklin	<input type="checkbox"/> 48 Hours <input type="checkbox"/> Other	

Sample Number	Material Type	Material Condition	Floor	Sample Location/Description
2012.004.282 - 10B	Misc.	Good	3	Grey Floor Leveler - 330B
- 11A			2	White 2'x2' LT. Textured Ceiling Tile - 2nd Fl. Corridor
- 11B			3	↓ ↓ ↓ ↓ ↓ - 330B
- 11C			4	↓ ↓ ↓ ↓ ↓ - 432
- 11D			5	↓ ↓ ↓ ↓ ↓ - 50048
- 12A			5	White Fissured 2'x2' Ceiling Tile - 526
- 12B			5	" " " " " - 526A
- 13A			2	LT. Grey Wallpaper Covering - 20023
- 13B			3	" " " " " - 30023
- 14A			3	Tan Wallpaper Covering - 330A
- 14B			4	" " " " " - 430
- 15A			2	Orange Speed Block - 20062
- 15B			4	" " " " " - 430
- 16A			2	Red Fire Stop Patch - 20062
- 16B			3	" " " " " - 330B
↓ - 17A	↓	↓	4	Grey Dried Sealant - 432

**EMSL Analytical, Inc.**

490 Rowley Road, Depew, NY 14043

Phone/Fax: (716) 651-0030 / (716) 651-0394

<http://www.EMSL.com>buffalolab@emsl.com

EMSL Order:	141600384
CustomerID:	WATT50
CustomerPO:	
ProjectID:	

Attn: **Edward Jones**
Watts Architecture & Engineering
95 Perry Street
Suite 300
Buffalo, NY 14203

Phone: (716) 206-5100
 Fax: (716) 206-5199
 Received: 02/06/16 9:00 AM
 Analysis Date: 2/8/2016
 Collected: 2/5/2016

Project: 1501848 / King-Shaw Hall, Auto Door Operator, Vestibule 30048, ILR Complex, King-Shaw Hall, 3rd Floor Vestibule 30048 to Garden Ave,

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1501848-01 141600384-0001		Description	white 2'x2' textured ceiling tile		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	2/8/2016	Gray			Inconclusive: None Detected
TEM NYS 198.4 NOB	2/8/2016	Gray			None Detected
Sample ID 1501848-02 141600384-0002		Description	white 2'x2' textured ceiling tile		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	2/8/2016	Gray			Inconclusive: None Detected
TEM NYS 198.4 NOB	2/8/2016	Gray			None Detected
Sample ID 1501848-03 141600384-0003		Description	dark gray caulk, door perimeter		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	2/8/2016	Black			Inconclusive: None Detected
TEM NYS 198.4 NOB	2/8/2016	Black			None Detected
Sample ID 1501848-04 141600384-0004		Description	dark gray caulk, door perimeter		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	2/8/2016	Black			Inconclusive: None Detected
TEM NYS 198.4 NOB	2/8/2016	Black			None Detected
Sample ID 1501848-05 141600384-0005		Description	drywall, wall		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	2/8/2016	Brown/Gray	10.00% Cellulose	90.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

**EMSL Analytical, Inc.**

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Phone/Fax: (716) 651-0030 / (716) 651-0394

<http://www.EMSL.com>buffalolab@emsl.com

EMSL Order:	141600384
CustomerID:	WATT50
CustomerPO:	
ProjectID:	

Test Report:Asbestos Analysis of Bulk Material

Test	Color	Non Asbestos		Asbestos
		Fibrous	Non-Fibrous	
Sample ID 1501848-06 141600384-0006	Description Homogeneity	drywall, wall Homogeneous		
PLM NYS 198.1 Friable 2/8/2016	Gray		100.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM				Not Analyzed
PLM NYS 198.6 NOB				Not Analyzed
TEM NYS 198.4 NOB				Not Analyzed
Sample ID 1501848-07 141600384-0007	Description Homogeneity	joint compound, on drywall Homogeneous		
PLM NYS 198.1 Friable 2/8/2016	White		100.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM				Not Analyzed
PLM NYS 198.6 NOB				Not Analyzed
TEM NYS 198.4 NOB				Not Analyzed
Sample ID 1501848-08 141600384-0008	Description Homogeneity	joint compound, on drywall Homogeneous		
PLM NYS 198.1 Friable 2/8/2016	White		100.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM				Not Analyzed
PLM NYS 198.6 NOB				Not Analyzed
TEM NYS 198.4 NOB				Not Analyzed
Sample ID 1501848-09 141600384-0009	Description Homogeneity	spray-on fireproofing		
PLM NYS 198.1 Friable 2/8/2016				Not Analyzed
Spray-On Fireproofing containing vermiculite. NYS requires ELAP method 198.8				
PLM NYS 198.6 VCM				Not Analyzed
PLM NYS 198.6 NOB				Not Analyzed
TEM NYS 198.4 NOB				Not Analyzed
Sample ID 1501848-10 141600384-0010	Description Homogeneity	spray-on fireproofing		
PLM NYS 198.1 Friable 2/8/2016				Not Analyzed
Spray-On Fireproofing containing vermiculite. NYS requires ELAP method 198.8				
PLM NYS 198.6 VCM				Not Analyzed
PLM NYS 198.6 NOB				Not Analyzed
TEM NYS 198.4 NOB				Not Analyzed
Sample ID 1501848-11 141600384-0011	Description Homogeneity	spray-on fireproofing		
PLM NYS 198.1 Friable 2/8/2016				Not Analyzed
Spray-On Fireproofing containing vermiculite. NYS requires ELAP method 198.8				
PLM NYS 198.6 VCM				Not Analyzed
PLM NYS 198.6 NOB				Not Analyzed
TEM NYS 198.4 NOB				Not Analyzed



EMSL Analytical, Inc.

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<http://www.EMSL.com>

buffalolab@emsl.com

EMSL Order:	141600384
CustomerID:	WATT50
CustomerPO:	
ProjectID:	

Test Report:Asbestos Analysis of Bulk Material

Test	Color	Non Asbestos		Asbestos
		Fibrous	Non-Fibrous	
Analyst(s)				
<u>Mark Tate</u>				
Tom Hanes				

Rhonda McGee, Laboratory Manager
or other approved signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non-asbestos containing. All samples examined for the presence of vermiculite when analyzed via NYS 198.1.

-NYS Guidelines for Vermiculite containing samples are available at http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance_Rev070913.pdf

EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples were received in good condition unless otherwise noted.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation.

Samples analyzed by EMSL Analytical, Inc. Depew, NY NYS ELAP 11606

**WATTS ARCHITECTURE & ENGINEERING
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY**

Page: 1 of 1

141600384

Client: Cornell University
Project: King-Shaw Hall, Auto Door Operator, vestibule 30048, ILR Complex
Building / Location: King-Shaw Hall, 3rd floor vestibule 30048 to Garden Ave, Ithaca, NY
Contact: Edward J. Jones at (716) 206-5142
Preliminary Results to: ejones@watts-ae.com
Mail Report & Invoice to: Watts Architecture & Engineering
 95 Perry Street, Buffalo, NY 14203

Date: Friday 02/05/2016
Watts Project No.: 1501848

Analysis Requested:
 198.1 x 198.6 x 198.4 x 24 Hr.
Turnaround Requested:
 3 Hr. 48 Hr.
 6 Hr. 72 Hr.
 12 Hr. 4 Day
 24 Hr. 5 Day
 7 Day

Sample Number	Material Description	HA	Sample Location	Laboratory Results	
				PLM	TEM
1501848-01	White 2' x 2' textured ceiling tile	1	Vestibule 30048, 3rd floor entrance facing Garden Ave.		
1501848-02	White 2' x 2' textured ceiling tile	1	Lobby 30044, ceiling tile by vestibule 30048		
1501848-03	Dark gray caulk, door perimeter	2	Inner door at vestibule 30048, lobby side, south edge		
1501848-04	Dark gray caulk, door perimeter	2	Inner door at vestibule 30048, vestibule side, north edge		
1501848-05	Drywall, wall	3	Vestibule 30048, 3rd floor entrance south wall, above suspended ceiling tiles		
1501848-06	Drywall, wall	3	Lobby 30044, by vestibule 30048, south wall above suspended ceiling tiles		
1501848-07	Joint compound, on drywall	4	Vestibule 30048, 3rd floor entrance south wall, above suspended ceiling tiles		
1501848-08	Joint compound, on drywall	4	Lobby 30044, by vestibule 30048, south wall above suspended ceiling tiles		
1501848-09	Spray-on fireproofing	5	Vestibule 30048, 3rd floor, on metal beam along south wall above ceiling tile		
1501848-10	Spray-on fireproofing	5	Lobby 30044, by vestibule 30048, on metal beam along south wall above ceiling tiles		
1501848-11	Spray-on fireproofing	5	Lobby 30044, by vestibule 30048, on metal beam along south wall above ceiling tiles		

Sampled By: Edward J. Jones **Date:** 02/05/16 **Received By:** SSA/NOB WI **Date:** 2/6/16 9:20 AM
Relinquished By: Edward Jones **Date:** 02/06/16 **Received By:** 9800

Comments: If PLM NOB is negative, analyze by TEM. Stop at first positive for each homogeneous material description group.
 * Submit samples of Sof with Vermiculite For Analysis via 198-8.
 Samples 1501848-09, 1501848-10 and 1501848-11, 1 week Turn-A-round.
 Composite samples if needed. Stop at first positive via 198-8 For Asbestos.
 Edward Jones



EMSL Analytical, Inc.
 528 Mineola Avenue, Carle Place, NY 11514
 Phone/Fax: (516)997-7251 / (516)997-7528
<http://www.EMSL.com> carleplacelab@emsl.com

EMSL Order #: **061601167**
 Customer ID: **WATT50**
 Customer PO: **1501848**

Attn: **Ed Jones** Phone: **716-206-5100**
Watts Architecture & Engineering Fax: **716-206-5199**
95 Perry Street
Suite 300

Project: **Cornell University, King-Shaw Hall, Auto Door Operator, Vestibule 30048, ILR Complex, 3rd**

Date Collected: **02/05/2016**
 Date Received: **02/09/2016**
 Date Analyzed: **02/15/2016**

Report Date: 02/15/2016

Revision: R0

Asbestos Analysis by NYS ELAP Method 198.8
PLM Analysis for Asbestos in Sprayed-On Fireproofing Containing Vermiculite (SOF-V) Bulk Samples

<i>Lab Number</i>	<i>Client Sample Identification</i>	<i>Appearance</i>	<i>Percentage Matrix Material</i>	<i>Percentage non-Asbestos Fibers</i>	<i>Chrysotile Percentage</i>	<i>Amphibole Percentage</i>	<i>Total Percentage</i>
061601167-0001	1501848-09-11	Tan Non-Fibrous Homogeneous	100	0.0	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected

Report Date
02/15/2016

Report Revision
R0

Revision Comments
Initial Report

Michelle McGowan, Laboratory Manager
 or other approved signatory



Asbestos Analysis of NYS ELAP Method 198.8
PLM analysis for Asbestos in Sprayed-On Fireproofing Containing Vermiculite (SOF-V) Bulk Samples
Bench Sheet

EMSL Sample ID: **061601167-0001** Crucible ID: **B1**

	Analyst	Date
Gravimetric Prep	MG/KB	2/9/2016
Chrysotile Analysis	MG	2/10/2016
Centrifugation Date	MG/KB	2/15/2016
Amphibole Analysis	MG	2/15/2016

Stereoscopic			
Color	Tan	Stereoscopic % Asbestos	0
Texture	Non-Fibrous		
Homogeneity	Homogeneous	Vermiculite Detected	Yes

Initial Weights*	
Weight of Crucible	39.0364
Weight of Crucible and Sub Sample	42.3077
Weight of Sub-Sample	3.2713
Ashing	
Weight of Crucible & Ash	41.9547
Weight of Ash	2.9183
Weight Loss During Ashing	0.3530
Weight Percent Organic and Water	10.7908
Acid Treatment/ Flotation	
Weight of Dish for Floats	8.6488
Weight of Dish & Floats	8.8208
Weight of Floats	0.1720
Weight Percent Floats	5.2578
Weight of Dish & Filter for Residue	8.4727
Weight of Dish & Filter & Residue	9.5071
Weight of Residue	1.0344
Weight Loss During Acid/Flotation Treatment	1.7119
Weight Percent Acid-Soluble/Float Materials	52.3309
Weight Percent Residue	31.6205

Non-Asbestos Fiber	Optical Property	Visual %	Calc %

	Chrysotile Identification Optical Properties							Temperature (C°)	
	RI	RI	Morphology	Sign	Pleochorism	Birefringence	Fiber Color	Extinction	
Weight of Ash									
Weight Loss During Ashing									
Weight Percent Organic and Water									
Weight of Dish for Floats									
Weight of Dish & Floats									
Weight of Floats									
	Amphibole Identification Optical Properties							Temperature (C°)	
	RI	RI	Morphology	Sign	Pleochorism	Birefringence	Fiber Color	Extinction	
Weight Percent Floats									
Weight of Dish & Filter for Residue									
Weight of Dish & Filter & Residue									
Weight of Residue									
Weight Loss During Acid/Flotation Treatment									
Weight Percent Acid-Soluble/Float Materials									
Weight Percent Residue									

PLM Examination of Residue (Chrysotile)	Analyzed	PTCT	Chrysotile	Non-Empty	PTCT:	Chrysotile	Non-Empty	Trace Detected?
Number of Occupied Points	400	Slide 1:	0	50	Slide 5:	0	50	<input type="checkbox"/> None <i>Check box if yes</i>
Number of Chrysotile Points	0	Slide 2:	0	50	Slide 6:	0	50	
Percent Chrysotile by PTCT	0.00	Slide 3:	0	50	Slide 7:	0	50	
(if greater than 1% no further analysis needed)	0.0000	Slide 4:	0	50	Slide 8:	0	50	

Heavy Liquid Centrifugation	
Weight of Dish & Filter & Balance of Residue (Post Chrysotile Analysis)	9.5018
Weight of Balance of Residue	1.0291
Weight of Dish & Filter for Centrifugate	8.5575
Weight of Dish & Filter & Centrifugate	8.6229
Weight of Centrifugate	0.0654
Weight Percent Centrifugate	2.0095

PLM Examination of Centrifugate (Amphibole)	Analyzed	PTCT	Amphibole	Non-Empty	PTCT:	Amphibole	Non-Empty	Trace Detected?
Number of Occupied Points	400	Slide 1:	0	50	Slide 5:	0	50	<input type="checkbox"/> None <i>Check box if yes</i>
Number of Amphibole Points	0	Slide 2:	0	50	Slide 6:	0	50	
Percent Amphibole by PTCT	0.00	Slide 3:	0	50	Slide 7:	0	50	
Percent Amphibole in Sample	0.0000	Slide 4:	0	50	Slide 8:	0	50	

Percent of Total Asbestos in Sample	0.0000
--	---------------

* All Weights in grams



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EMSL Order #: **061601167**
 Customer ID: **WATT50**
 Customer PO: **1501848**

Attn: **Ed Jones**
Watts Architecture & Engineering
95 Perry Street
Suite 300

Phone: **716-206-5100**
 Fax: **716-206-5199**

Project: **Cornell University, King-Shaw Hall, Auto Door Operator,**

Date Collected: **02/05/2016**
 Date Received: **02/09/2016**
 Date Analyzed: **02/15/2016**

Report Date
02/15/2016

Report Revision
 R0

Revision Comments
 Initial Report

Michelle McGowan, Laboratory Manager
 or other approved signatory

Additional Comments: NYS ELAP ID: 11469

About us



EMSL Analytical, Inc. offers a full line of analytical solutions for over 30 years across North America. For more information about our nationally accredited locations, vast line of testing services, and our food safety solutions please visit www.EMSL.com or call (800) 220-3675.



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RECEIVED
ENVIRONMENTAL ANALYTICAL

**WATTS ARCHITECTURE & ENGINEERING
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY**

Client: Cornell University
 Project: King-Shaw Hall, Auto Door Operator, vestibule 30048, ILR Complex
 Building / Location: King-Shaw Hall, 3rd floor vestibule 30048 to Garden Ave, Ithaca, NY
 Contact: Edward J. Jones at (716) 206-5142
 Preliminary Results to: ejones@watts-ae.com
 Mail Report & Invoice to: Watts Architecture & Engineering
 95 Perry Street, Buffalo, NY 14203

Watts Project No.: 1501848
 Date: Friday 02/05/2016
 Page: 1 of 1

Analysis Requested:
 198.1 x 198.6 x 198.4 x
 3 Hr. 6 Hr. 12 Hr. 24 Hr.
 Turnaround Requested:
 48 Hr. 72 Hr. 4 Day 5 Day 7 Day

Sample Number	Material Description	HA	Sample Location	Laboratory Results	
				PLM	TEM
1501848-01	White 2' x 2' textured ceiling tile	1	Vestibule 30048, 3rd floor entrance facing Garden Ave.		
1501848-02	White 2' x 2' textured ceiling tile	1	Lobby 30044, ceiling tile by vestibule 30048		
1501848-03	Dark gray caulk, door perimeter	2	Inner door at vestibule 30048, lobby side, south edge		
1501848-04	Dark gray caulk, door perimeter	2	Inner door at vestibule 30048, vestibule side, north edge		
1501848-05	Drywall, wall	3	Vestibule 30048, 3rd floor entrance south wall, above suspended ceiling tiles		
1501848-06	Drywall, wall	3	Lobby 30044, by vestibule 30048, south wall above suspended ceiling tiles		
1501848-07	Joint compound, on drywall	4	Vestibule 30048, 3rd floor entrance south wall, above suspended ceiling tiles		
1501848-08	Joint compound, on drywall	4	Lobby 30044, by vestibule 30048, south wall above suspended ceiling tiles		
1501848-09	Spray-on fireproofing	5	Vestibule 30048, 3rd floor, on metal beam along south wall above ceiling tile		
1501848-10	Spray-on fireproofing	5	Lobby 30044, by vestibule 30048, on metal beam along south wall above ceiling tiles		
1501848-11	Spray-on fireproofing	5	Lobby 30044, by vestibule 30048, on metal beam along south wall above ceiling tiles		

061601167

Sampled By: Edward J. Jones Date: 02/05/16 Received By: *Edward J. Jones* Date: 2/6/16
 Relinquished By: *Edward J. Jones* Date: 02/06/16 Received By: *Edward J. Jones* Date: 2/9/16
 Comments: IF PLM NOB is negative, analyze by TEM. Submit samples for each homogeneous material description group.
 * Submit samples of sof with vestibule for analysis via 198-8. *EP*
 Samples 1501848-09, 1501848-10 and 1501848-11. 1 week turn-around.
 Composite samples if needed. stop at first positive via 198-8 for Asbestos.
 Edward Jones

SECTION 01 35 43 GENERAL ENVIRONMENTAL REQUIREMENTS

1.0 GENERAL

1.1 DESCRIPTION

- A. This Section and the listed Related Sections provides minimum requirements for the protection of the environment during the project. The requirements of this Section shall apply to both Contractor and all tiers of Subcontractors involved in the project.
- B. In addition to the requirements of this Section and the listed Related Sections, all laws and regulations by applicable local, state, and federal agencies shall apply to the Work of this Contract. In some cases the requirements of these Specifications may by intention exceed such legal requirements, but in no case shall this Specification be interpreted or understood to reduce or eliminate such requirements.
- C. Prior to bidding, review the entire Bidding Documents and report in writing to the Owner's Representative any error, inconsistency, or omission that may have environmental impacts.

1.2 RELATED SECTIONS

- A. Section 01 35 44 – Spill Control

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 – Submittals:
 - 1. Analytical laboratory sample results and material Certifications for all imported soil and granular materials (“borrow”).
 - 2. Contractor's Waste Material Disposal Plan.
 - 3. Weight tickets from the Borrow Material Supplier.
 - 4. Proposed methods for dewatering and construction water management.
 - 5. Analytical laboratory sample results for all waste materials.
 - 6. Copies of manifests for all waste materials disposed of off-site.

1.4 JOB SITE ADMINISTRATION

- A. In accordance with Article 2 of the General Conditions, provide a competent supervisory representative with full authority to act for the Contractor at the site.

- B. If at any time operations under the representative's supervision do not comply with this Section, or the representative is otherwise unsatisfactory to the Owner, replace, if requested by the Owner, said representative with another representative satisfactory to the Owner. There shall be no change in superintendent without the Owner's approval.
- C. Remove from the Work any employee of the Contractor or any Subcontractor when so directed by the Owner. The Owner may request the removal of any employee who does not comply with these specifications.

1.5 CLEARING, SITE PREPARATION AND SITE USE

- A. In accordance with Section 01 14 00, only that portion of the working area that is absolutely necessary and essential for the Work shall be cleared for construction. All clearing should be approved and performed to provide minimum practical exposure of soils.
- B. The Contractor shall make every effort to avoid the destruction of plants, trees, shrubs and lawns outside the area of construction so as not to unduly disturb the ecological or environmental quality of the area.
- C. Topsoil excavated as part of the Project, which can be reused as part of the Project, shall be stockpiled for future use and temporarily stabilized to prevent erosion.

1.6 NOISE AND VIBRATION

- A. Limit and control the nature and extent of activities at all times to minimize the effects of noise and vibrations. Take adequate measures for keeping noise levels, as produced by construction related equipment, to safe and tolerable limits as set forth by the Occupational Safety and Health Administration (OSHA), the New York State Industrial Code Guidelines and Ordinances and all City, Town and Local ordinances. Equip all construction equipment presenting a potential noise nuisance with noise-muffling devices adequate to meet these requirements

1.7 DUST CONTROL

- A. Take adequate measures for controlling dust produced by drilling, excavation, backfilling, loading, saw cutting or other means. The use of calcium chloride or petroleum-based materials for dust control is prohibited. Dust control measures are required throughout the duration of construction.
- B. If, in the opinion of the Owner's Representative, the Contractor is not adequately controlling dust, the Owner will first notify the Contractor. If the Contractor does not take adequate actions necessary, the Owner may, at the Contractor's expense, employ alternative means to control dust.
- C. Erect, maintain, and remove when appropriate barriers or other devices, including mechanical ventilation systems, as required by the conditions of the Work for the protection of users of the project area, the protection of the work being done, or the containment of dust and debris. All such barriers or devices shall be provided in conformance with all applicable codes, laws, and regulations including OSHA.

1.8 PROTECTION OF THE ENVIRONMENT

- A. Construction procedures observed by the Contractor, its Subcontractors and other employees shall include protection of the environment, in accordance with all pertinent Cornell standards, policies, local laws, executive orders, ordinances, and federal and state regulations. Construction procedures that are prohibited in the undertaking of work associated with this Contract include, but are not limited to:
1. Dumping of spoil material or any liquid or solid pollutant into any storm or sanitary sewer, drainage way, stream sewer, any wetlands (as defined by federal and state regulations), any surface waters, or at unspecified locations.
 2. Indiscriminate, arbitrary, or capricious operation of equipment in any stream corridors, any wetlands, or any surface waters.
 3. Pumping of any silt-laden water from trenches or other excavations into any storm sewers, sanitary sewers, drainage ways, wetlands, or surface waters.
 4. Damaging vegetation beyond the extent necessary for construction of the facilities.
 5. Disposal of trees, brush, and other debris in any location on University property, unless such areas are specifically identified on the drawing or in the specifications or specifically approved by the Owner's site representative.
 6. Permanent or unspecified alteration of the flow line of a stream.
 7. Burning trash, project debris, or waste materials.
- B. Take all necessary precautions to prevent silt or waste of any kind from entering any drainage or waterways or downstream properties as a result of the Work.
- C. Runoff of potable water used for concrete curing or concrete truck or chute cleaning operations shall not be allowed to reach the storm water system or open water due to the levels of residual chlorine (New York State water quality standards, 6 NYCRR Part 703.5) and other potential contaminants. If necessary, obtain permission from the local sewer authority and collect and pump the runoff to the sanitary sewer.
- D. Limit the nature and extent of any activities that could result in the release or discharge of pollutants. Report any such release or discharge immediately to the Owner's Representative and clean up spills immediately, as detailed in Section 01 35 44 – Spill Control Procedures.

1.9 TEMPORARY RE-ROUTING OF PIPING AND DUCTWORK

- A. Obtain approval from the Owner's Representative prior to any temporary re-routing of piping and exhaust ductwork necessary for the completion of the Work. Submit re-routing plans to the Owner's Representative in writing.

The following shall require approval of the Owner:

1. Temporary storm, sanitary or water line connections.

2. Temporary exhaust ductwork connections where such connections may impact air emissions.
- B. Instruct all personnel to observe extreme caution when working in the vicinity of mechanical equipment and piping. Personnel shall not operate or tamper with any existing valves, switches, or other devices or equipment without prior approval by the Owner's Representative.

1.10 HAZARDOUS OR TOXIC MATERIALS

- A. Inform officers, employees, agents, contractors, subcontractors at every tier, and any other party which may come into contact with any hazardous or toxic materials as a result of its performance hereunder of the nature of such materials, and any health and safety or environmental risks associated therewith.
- B. Do not use hazardous or toxic materials in a manner that will violate Cornell University Policies or any state, federal, or municipal environmental health and safety regulations. In situations where the risks are unclear consult with Environment, Health and Safety (EHS) for guidance.
- C. Provide complete care and treatment for any injury sustained by any parties coming into contact with any hazardous or toxic materials as a result of Contractor's performance or failure to perform hereunder.
- D. At the completion of project Contractor shall remove all unused chemical products and hazardous materials from campus. Transportation of these materials shall be in accordance with all federal, state, and local regulations. Request and receive written approval from EHS prior to disposal of any on-site disposal.

1.11 DISPOSAL OF WASTE MATERIAL AND TITLE

- A. Prior to start of work and first payment, Contractor shall prepare and submit "Contractor Waste Material Disposal Plan" to the Owner's Representative. The plan shall identify the waste transportation and treatment, storage or disposal (TSD) companies which will manage all waste material and any site(s) for disposal of the waste material. Contractor must use this form to document waste disposal methods and locations.
- B. The "Contractor Waste Material Disposal Plan" form, together with definitions associated with the form waste descriptions. Forms may be downloaded at:

<https://ehs.cornell.edu/environmental-compliance/solid-waste/construction-demolition-waste>

- C. Contractor shall be responsible for the proper cleanup, containment, storage and disposal of any hazardous material/chemical spill occurring during its work. For Cornell University owned hazardous waste EHS will oversee, approve or effect the proper disposal. Title, risk of loss, and all other incidents of ownership to the Waste Material, shall vest in Contractor at the time Contractor or any transporter acting on its behalf takes physical possession of Waste Material. Complete and maintain full records of the chain of custody and control, including certificates of disposal or destruction, of all Waste Materials loaded, transported and/or disposed of. Deliver all such records to the Owner in accordance with applicable laws and regulations and any instructions from the Owner in a timely manner and in any event prior to final payment(s) under this Contract.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 35 43*****

SECTION 01 35 44 SPILL CONTROL

1.0 GENERAL

1.1 SPILL PREVENTION

- A. In order to minimize the potential for discharge to the environment of oil, petroleum, or hazardous substances on site, the following requirements shall apply to all projects:
1. All oil, petroleum, or hazardous materials stored or relocated temporarily on site during the construction process shall be stored in such a manner as to provide protection from vehicular damage and to provide containment of leaks or spills. Horizontal diked oil storage tanks, temporary berms or barriers, or similar methods of providing secondary/spill containment shall be employed as appropriate at each site.
 2. Any on-site filling or dispensing activities shall occur within an area in which a temporary berm, boom, or similar containment barrier has been placed to prevent the inadvertent discharge to the environment of harmful quantities of any products.
 3. All oil, petroleum, or hazardous materials stored on site shall be located in such a manner as to minimize the potential of damage from construction operations or vehicles, away from drainage ways and environmentally sensitive areas, and in accordance with all fire and life safety codes and standards.
- B. Remove immediately from the site any storage, dispensing, or operating equipment that is leaking oil or hazardous substances or is in anyway unsuitable for the safe storage of such materials.

1.2 SPILL CONTROL PROCEDURES

All Contractor personnel working at the project site shall be knowledgeable of the potential health and safety concerns associated with petroleum and other hazardous substances that could potentially be released at the project site. Following are a list of activities that should be conducted by the Contractor in the event of an oil/petroleum spill or the release of any other hazardous substance. In the event of a large quantity spill that would require cleanup procedures that are beyond the means of the Contractor, an emergency spill cleanup contractor shall be hired by the Contractor. In the event the Contractor has the personnel necessary to clean up the spill, the following procedures shall be followed:

- A. Personnel discovering/responding to a spill shall:
1. Identify and locate the source of the spill. If unsafe conditions exist, leave the area, inform nearby personnel, notify the site supervisor, and initiate spill reporting (Section 1.3).

2. Limit the discharge of product, if safely possible, by: (1) diverting discharge to a containment area; (2) creating temporary dikes with soils or other available materials; and (3) utilizing sorbent materials. If secondary containment is present, verify that valves and drains are closed prior to diverting the product to this area.
 3. The individual discovering a spill shall initiate containment procedures to prevent material from reaching a potential migratory route, through implementation of the following actions, or any other methods necessary. Methods employed shall not compromise worker safety.
 - a. Stop the spill at once (if possible).
 - b. Extinguish sources of ignition (e.g., flames, sparks, hot surfaces, cigarettes, etc.).
 - c. Clear personnel from the spill location and cordon off the area.
 - d. Utilize available spill control equipment in an effort to ensure that fires, explosions, and releases do not occur, recur, or spread.
 - e. Use sorbent materials to control the spill at the source.
 - f. Construct a temporary containment dike of sorbent materials, cinder blocks, bricks, or other suitable materials to help contain the spill.
 - g. Attempt to identify the character, exact source, amount, and area of the released materials. Identification of the spilled material should be made as soon as possible so that the appropriate cleanup procedure can be identified.
 - h. Assess possible hazards to human health or the environment as a result of the release, fire, or explosion.
 - i. If spill response measures involve the temporary cessation of any operations, the Contractor shall monitor the affected equipment for: (1) leaks; (2) pressure buildup; (3) gas generation; or (4) ruptures in valves, pipes, or other equipment.
- B. Spill Cleanup:
1. Following containment of the spill, the following spill cleanup procedures shall be initiated.
 - a. Use proper waste containers.
 - b. Remove bulk liquid and place material in properly labeled waste container. Be sure not to collect incompatible or reactive substances in the same container.
 - c. Cleanup materials not reclaimed on-site shall be disposed of in accordance with all applicable state and federal regulations.
 - d. Apply sorbent materials to pick up remaining liquid after bulk liquid has been removed. The Contractor shall not walk over spilled material. Absorbed material shall be collected and placed in a separate waste container, and shall not be mixed with bulk liquid.

- e. Clean spill control equipment and containers. Replace equipment in its proper location. Restock or reorder any supplies used to clean up the spill.
 - f. Carefully wash spilled product from skin and clothing using soap. Change clothes, if necessary, to avoid further contact with product.
 - g. Disposal of all spilled product and waste generated by spill response activities shall be made off-site, and shall be arranged through the Contractor.
 - h. A Spill Report shall be completed, including a description of the event. A sample Spill Documentation Form is available at:
<https://ehs.cornell.edu/campus-health-safety/emergency-services/fire-medical-spill-response/spill-cleanup-procedure>
- C. Fire or Explosion:
- 1. In the event of a fire or explosion at the site, the Contractor shall:
 - a. Verify that the local fire department and the appropriate emergency response services (e.g., ambulance, police) have been notified. Confirm contact information for these services at Project Kick-off Meeting.
 - For projects on the Cornell Campus call Cornell Police at (607) 255-1111 who will notify the appropriate emergency response agencies
 - b. Report to the scene, if safe to do so, and evaluate the situation (e.g., spill character, source, etc.). Coordinate, as necessary, with other appropriate site and emergency personnel.
 - c. Ensure that people are cleared from the area and all accounted.
 - d. Ensure that fires are safely extinguished (if possible), valves closed, and other immediate actions necessary to mitigate the emergency are addressed, if safe to do so.
 - e. Initiate responsible measures necessary to prevent subsequent fires, explosions, or releases from occurring or spreading to other areas of the site. These measures include stopping processes or operations, collecting, and containing released oil, or removing and isolating containers.
 - f. Take appropriate action to monitor for: (1) leaks; (2) pressure build-ups; (3) gas generation; or (4) ruptures in pipes, valves, or other equipment.

1.3 SPILL REPORTING AND DOCUMENTATION

In the event of a spill CALL CORNELL POLICE AT 607-255-1111 who will notify the appropriate departments within the university and coordinate with the contractor for external reporting, if required.

The contractor shall be responsible for the initiation of spill reporting and documentation procedures. All petroleum spills must be reported to NYSDEC Spill Hotline at 1-800- 457-7362, less than two hours following discovery. Notification must be made to Cornell Environment, Health and Safety (EHS), 607-255-8200, within 24 hours of reporting the release. The Contractor will be expected to provide EHS with the DEC issued spill number. Any petroleum spill must be reported to NYSDEC unless ALL of the following criteria apply:

TABLE 1
CRITERIA TO EXEMPT SPILL REPORTING

CRITERIA	DESCRIPTION
Quantity	The spill must be known to be less than 5 gallons.
Containment	The spill must be contained on an impervious surface or within an impervious structure, such that it cannot enter the environment.
Control	The spill must be under control and not reach a drain or leave the impervious surface.
Cleanup	The spill must be cleaned-up within two hours of occurrence.
Environment	The spill must not have already entered into environmental media such as soil, surface water (including storm water conveyances), sanitary sewers, or ground water.

A release of a “reportable quantity” or unknown amount of a hazardous substance must also be immediately reported to NYSDEC Spill Hotline. Spills of reportable quantities of chemicals or “harmful quantities”² of oil to navigable waters must be reported to the federal **National Response Center, 1-800-424-8802**. Additional regulatory agency spill reporting requirements may apply depending on the material released and the media to which it is released to.

Spill Reporting Information: When making a telephone report, the caller should be prepared to provide the following information, if possible:

1. The date and time of the spill or release.
2. The identity or chemical name of the material released or spilled, including an indication of whether the material is defined as an extremely hazardous substance.
3. An estimate of the quantity of material released or spilled into the environment and the approximate duration of the event.
4. The exact location of the spill, including the name(s) of the waters involved or threatened, and/or other medium or media affected by the release or spill.
5. The source of the release or spill.
6. The name, address, and telephone number of the party in charge of, or responsible for, the facility or activity associated with the release or spill.

7. The extent of the actual and potential water pollution.
8. The name and telephone number of the person in charge of operations at the spill site.
9. The steps being taken or proposed to contain and cleanup the released or spilled material and any precautions taken to minimize impacts, including evacuation.
10. The extent of injuries, if any.
11. Any known or anticipated acute or chronic health risks associated with the emergency, and information regarding necessary medical attention for exposed individuals.
12. Assistance required, if any.

If the release of a hazardous substance or oil occurs in an amount which exceeds a reportable quantity (RQ) as defined in 40 CFR Part 110, 40 CFR Part 117, 40 CFR Part 302, or 6 NYCRR Part 597, then the Contractor shall do the following:

1. Call to the National Response Center shall be made by the person in charge of the site. The applicable phone numbers are 1-800-424-8802.
2. Within 14 days of the release, submit a written description of the release. The description should include: (1) a description of the release, (2) the type of material released, (3) estimated amount of the spill; (4) the date of the release, (5) an explanation of why the release occurred; and (6) a description of the measures to be implemented to prevent and control future releases.

⁽¹⁾Reportable Quantity: A Reportable Quantity is the quantity of a hazardous substance or oil that triggers reporting requirements under the Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA) (USEPA, September 1992). While the Contractor is legally responsible for knowing the risks of materials that are part of construction, members of the owner's spill response team have access to information that may help identify these quantities with you.

⁽²⁾Harmful Quantity: A Harmful Quantity of oil includes discharges that violate applicable water quality standards; cause a film, sheen, or discoloration on a water surface or adjoining shoreline; or cause a sludge or emulsion to be deposited beneath the water surface or shoreline (40 CFR 110.3).

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 35 44*****

SECTION 01 41 00 REGULATORY REQUIREMENTS

1.0 GENERAL

1.1 PERMITS AND LICENSES

- A. The Contractor shall obtain, maintain and pay for all permits and licenses necessary for the execution of the Work and for the use of such work when completed. Such permits shall include but are not limited to building, electrical, plumbing, backflow prevention, dig safe, fill, street use, pavement cuts and repairs, and building demolition.
- B. For any projects which include demolition of a structure or load-bearing elements of a structure, the Contractor is required to complete a “Notification of Demolition and Renovation” and provide this notification to the United State Environmental Protection Agency (EPA) in advance of the work as specified in 40 CFR 61.145. The Contractor shall also provide a copy of this notification to the Owner’s Representative prior to any demolition.
- C. All Construction / Building / Hot Work / Fire Department / and Occupancy permits shall be issued and maintained through Jim Yarbrough or (jey38@cornell.edu) the SUNY Codes Official for Contract Colleges Facilities at Cornell, at no cost to the Contractor (for SUNY projects there are no permitting costs).

1.2 INSPECTIONS

- A. Apply for and obtain all required inspections, pay all fees and charges for same, include all service charges and other associated costs.

1.3 COMPLIANCE

- A. The Contractor shall give all notices, pay all fees and comply with all laws, rules and regulations applicable to the Work.

1.4 OWNER’S REQUIREMENTS

- A. The Contractor, Subcontractors, and employees of the Contractor and Subcontractors shall comply with all regulations governing conduct, access to the premises, operation of equipment and systems, and conduct while in or near the premises and shall perform the Work in such a manner as not to unreasonably interrupt or interfere with the conduct of business of the Owner.
- B. Upon completion of the project, the Contractor agrees to provide the Owner with a summary of municipal permit fees paid. This shall include the name of the permits secured, the permit fees paid by the Contractor and a copy of the permit. If no permit fees were required, the Contractor shall so state, in writing, upon completion of the project.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 41 00*****

SECTION 01 42 00 REFERENCES

1.0 GENERAL

1.1 INTENT OF CONTRACT DOCUMENTS

- A. Notes or instructions shown on any one Drawing, apply where applicable, to all other Drawings.
- B. All references to codes, specifications and standards referred to in the Specification Sections and on the Drawings shall mean, and are intended to be, the latest edition, amendment and/or revision of such reference standard in effect as of the date of these Contract Documents.
- C. Install All Work in Compliance with:
 - 1. NYS Uniform Code
 - a. International Building Code
 - b. International Residential Code
 - c. International Existing Building Code
 - d. International Fire Code
 - e. International Plumbing Code
 - f. International Mechanical Code
 - g. International Fuel Gas Code
 - h. International Property Maintenance Code
 - i. Uniform Code Supplement
 - 2. NYS Energy Code
 - a. International Energy Conservation Code
 - b. ASHRAE 90.1
 - c. Energy Code Supplement
 - 3. National Electric Code
 - 4. Occupational Safety and Health Administration (OSHA).
 - 5. Life Safety Code NFPA 101.
 - 6. All local ordinances
 - 7. Plans and Specifications in excess of code requirements and not contrary to same.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and other Division 1 Specification Sections, apply to this Section.

1.3 DEFINITIONS

- A. "General": Basic Contract definitions are included in the Conditions of the Contract.
- B. "Contract Documents": The Contract Documents consist of the Agreement between Owner and Contractor, General Conditions, General Requirements, Drawings, Specifications, addenda issued before execution of the Agreement, other documents listed in the Agreement, and modifications issued after execution of the Agreement.
- C. "The Contract": The Contract Documents form the Contract for construction and represent the entire integrated Agreement between the Owner and Contractor.
- D. "The Work": The work comprises the completed construction required by the Contract Documents and includes all labor necessary to produce such construction and all materials and equipment incorporated in such construction.
- E. "Owner": Cornell University a New York corporation.
- F. "Architect/Engineer": The Architect or Engineer is the person lawfully licensed to practice architecture and/or engineering in the state of New York, identified as such in the Owner Contractor Agreement, and is referred to throughout the Contract Documents as if singular in number. The terms Architect and/or Engineer mean the Architect and/or his authorized representative.
- G. "Contractor": The Contractor, person, firm, or corporation with whom the Construction Agreement contract is made by Owner.
- H. "Subcontractor": A person, firm, or corporation, supplying labor and/or materials for work at site of the project for and under separate contract or agreement with Contractor.
- I. "Delegated Design" describes a collaboration between a design professional and contractor (or subcontractor) where the contractor assumes allocated responsibility for an element or portion of the Project's design. Delegated design allocation and assignment may occur in any project delivery method and will involve a licensed professional to perform the design. The Contractor or Subcontractor allocated an element or portion of the Project's design, will submit its engineered, stamped plans to the primary design team, who will check for any conflicts with any other aspect of the Work and make new documents to be included in the Project's design record. Contractor or Subcontractor allocated a delegated design element of the Project shall provide professional liability insurance for the design work in such amounts and as is required by Owner.
- J. "As Approved" or "Approved": Architect's or Owner's approval.
- K. "As Directed": Owner's direction or instruction. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

- L. “Indicated”: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as “indicated.”
- M. “Regulations”: Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- N. “Furnish”: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- O. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- P. “Reinstall”. To place back into a former position.
- Q. “Replace”. Provide a substitute for.
- R. “Provide”: Furnish and install, complete and ready for the intended use.
- S. “Concealed’: Work installed in pipe shafts, chases or recesses, behind furred walls, above ceilings, either permanent or removable.
- T. “Exposed”: All capital Work not identified as concealed.
- U. “Project Site”: Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- V. “As-Built Documents”: Drawings and other records that are maintained by the Contractor to record all conditions which exist when the building construction is completed. This includes both the elements of the project itself and existing elements that are encountered during the course of project construction.
- W. “Record Drawings”: Shows construction changes in the project and the final location of all services, lines, outlets, and connections including underground and concealed items. The “record” drawings shall be compiled by the Architect based on the working as-built drawings and revised in accordance with the marked up drawings submitted by the Contractor.
- X. “Shop Drawings”: Drawings, diagrams, illustrations, charts, brochures, and other data that are prepared by Contractor or any Subcontractor, manufacturer, supplier or distributor, for some portion of the Work.
- Y. “Samples”: Physical examples furnished to illustrate materials, equipment or workmanship, and to establish standards by which the work will be judged.
- Z. “General Conditions”: The standardized contractual provisions describing the responsibilities, rights and relationships of the Owner and Contractor under the construction contract.

- AA. "Contract Limit Lines": A limit line or perimeter line established on the drawings or elsewhere in the contract documents defining the boundaries of the site available to the contractor for construction purposes.
- BB. "to do", "provide", "furnish", "install", etc., in these Specifications or on Drawings are directions given to the Contractor;

1.5 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
- D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the organizations responsible for the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil Available from Defense Standardization Program www.dps.dla.mil Available from General Services Administration www.gsa.gov	(215) 697-6257 (202) 619-8925

	Available from National Institute of Building Sciences www.nibs.org	(202) 289-7800
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080

1.6 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(703) 358-2960
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists (The) www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	ACI International (American Concrete Institute) www.aci-int.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530

AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)	
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(505) 522-1437
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
API	American Petroleum Institute www.api.org	(202) 682-8000

ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWI	Architectural Woodwork Institute www.awinet.org	(800) 449-8811 (703) 733-0600
AWPA	American Wood-Preservers' Association www.awpa.com	(334) 874-9800
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI www.bicsi.org	(800) 242-7405 (813) 979-1991
BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772
CCC	Carpet Cushion Council www.carpetcushion.org	(203) 637-1312

CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CPA	Composite Panel Association www.pbmdf.com	(301) 670-0604
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607
CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSI	Cast Stone Institute www.caststone.org	(770) 972-3011
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute www.cti.org	(281) 583-4087
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945

EJCDC	Engineers Joint Contract Documents Committee www.ejdc.org	(703) 295-5000
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association www.esda.org	(315) 339-6937
FMG	FM Global www.fmglobal.com	(401) 275-3000
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydraulic Institute www.pumps.org	(888) 786-7744 (973) 267-9700
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IBR	Institute of Boiler & Radiation Manufacturers	
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830

IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
	Available from ANSI www.ansi.org	(202) 293-8020
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (702) 567-8150
ITS	Intertek www.intertek.com	(800) 345-3851 (713) 407-3500
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864 (804) 314-8955
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(847) 480-9138

MFMA	Metal Framing Manufacturers Association www.metalframingmfg.org	(312) 644-6610
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6623 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) www.ncaa.org	(317) 917-6222
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-3550
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110

NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	International Electrical Testing Association www.netaworld.org	(888) 300-6382 (303) 697-8441
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association www.nofma.org	(901) 526-5016
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930
NYBFU	New York Board of Fire Underwriters www.nybfu.org	(212) 227-3700

PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.ce.uiuc.edu	(217) 333-3929
PLANET	Professional Landcare Network www.landcarenetwork.org	(800) 395-2522
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
RCSC	Research Council on Structural Connections www.boltcouncil.org	(800) 644-2400 (312) 670-2400
RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580
RIS	Redwood Inspection Service www.calredwood.org	(888) 225-7339 (415) 382-0662
SAE	SAE International www.sae.org	(877) 606-7323 (724) 776-4841
SBI	Steel Boiler Institute	
SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(516) 294-5424
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(703) 683-2075
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991

SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpete.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing, & Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrassod.org	(847) 649-5555
TRI	Tile Roofing Institute www.tilerooting.org	(312) 670-4177

UFPO	Underground Facilities Protective Organization www.ufpo.org	(800) 962-7962 (800) 962-7811
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USGBC	U.S. Green Building Council www.usgbc.org	(202) 828-7422
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCSC	Window Covering Safety Council www.windowcoverings.org	(800) 506-4636
WDMA	Window & Door Manufacturers Association www.wdma.com	(800) 223-2301
WI	Woodwork Institute www.wicnet.org	(916) 372-9943
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233 (703) 931-4533
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543
NEC	National Electric Code	

- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999

PBS	Public Building Service (See GSA)	
PHS	Office of Public Health and Science www.osophs.dhhs.gov/ophs	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board www.nas.edu/trb	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USPS	Postal Service www.usps.com	(202) 268-2000

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 42 00*****

SECTION 01 45 00 QUALITY CONTROL

1.0 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall provide and maintain an effective Contractor Quality Control (CQC) program and perform sufficient inspections and tests of all items of Work, including those of Subcontractors, to ensure compliance with Contract Documents. Include surveillance and tests specified in the technical sections of the Specifications. Furnish appropriate facilities, instruments, and testing devices required for performance of the quality control function. Controls must be adequate to cover construction operations and be keyed to the construction sequence. Construction shall not begin until the Owner has approved the CQC program.

1.2 CONTROL OF ON-SITE CONSTRUCTION

- A. Include a control system for the following phases of inspection:
1. Pre-Installation Meeting. For all sections where pre-installations are defined, the Contractor shall arrange for a pre-installation meeting. When practical, pre-installation meetings shall be scheduled to take place on the same day as regularly schedule progress meetings. The Contractor shall make available, during this meeting, all approved submittals and products.
 - a. Agenda to include the following:
 - i. Appointment
 - ii. Appointment of official representatives of participants in the Project.
 - iii. Review of existing conditions and affected work, and testing thereof as required.
 - iv. Review of installation procedures and requirements.
 - v. Review of environmental and site condition requirements.
 - vi. Schedule of the applicable portions of the Work.
 - vii. Schedule of submission of samples, color chips, and items for Owners consideration.
 - viii. Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences, Section 01 50 00.
 - ix. Requirements for notification for reviews. Allow a minimum of 48 hour notice to Architect for review of the Work.

- x. Requirements for inspections and tests, as applicable. Schedule and undertake inspections and tests in accordance with Section 01 41 00.
 - xi. Delivery schedule of specified equipment.
 - xii. Special safety requirements and procedures.
- b. The following minimum personnel shall be at the meeting:
- i. Project Manager.
 - ii. Project Field Supervisor
 - iii. Subcontractor
 - iv. Architect's Representative
 - v. Owner's Representative
 - vi. Commissioning Agent, when applicable
 - vii. Testing Agency, when applicable
2. Preparatory Inspection. Perform this inspection prior to beginning work on any definable feature of Work. Include a review of contract requirements with the supervisors directly responsible for the performance of the Work; check to assure that materials, products, and equipment have been tested, submitted, and approved; check to assure that provisions have been made for required control testing; examine the work area to ascertain that preliminary work has been completed; physically examine materials and equipment to assure that they conform to shop drawings and data and that the materials and equipment are on hand.
3. Initial Inspection. Perform this inspection as soon as work commences on a representative portion of a particular feature of workmanship review control testing for compliance with contract requirements.
4. Follow-up Inspections. Perform these inspections on a regular basis to assure continuing compliance with contract requirements until completion of that particular work.

1.3 CONTROL OF OFF-SITE OPERATIONS

- A. Perform factory quality control inspections for items fabricated or assembled off-site as opposed to "off-the-shelf" items. The CQC Representative at the fabricating plant shall be responsible for release of the fabricated items for shipment to the job site. The CQC Representative at the job site shall receive the item and note any damage incurred during shipment. The Contractor shall be responsible for protecting and maintaining the item in good condition throughout the period of on-site and during erection or installation. Although any item found to be faulty may be rejected before its use, final acceptance of an item by the Owner is based on its satisfactory incorporation into the Work and acceptance of the completed Project.

1.4 TESTING

- A. The Owner may engage the services of an independent testing laboratory to confirm that an installed item or element of work conforms to the Specification and workmanship requirements.

1.5 OWNER'S REPRESENTATIVE

- A. The Owner shall designate a Representative to monitor the progress and execution of the Work. The Representative shall have the authority to call for test samples, to approve or to reject work performed and to stop work in progress, if, in its opinion, the work is not in conformance with the Contract Documents. The Representative shall not be authorized to make changes or interpretations of the Contract Documents.
1. The Contractor shall maintain a project Deficiency/Issues Log in the ePM system to track non-conforming materials or sub-standard workmanship identified by Owner's Representative.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 45 00*****

SECTION 01 45 33 CODE REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

1.0 GENERAL

1.1 REQUIREMENTS

- A. Special Inspections and Structural Testing shall be in accordance with Chapter 17 of the *Building Code of New York State* (BCNYS).
- B. Hold a Special Inspections preconstruction meeting at least seven (7) days prior to the initial planned date for start of construction.
 - 1. Discussion shall include the following:
 - a. Review of specifications and Schedule of Special Inspections for work requiring Special Inspections.
 - b. Responsibilities of Contractor, Owner, Testing Agency, Special Inspector, and Registered Design Professional.
 - c. Notification and reporting procedures.
 - 2. Attendees shall include the Contractor, Owner's representative, Testing Agency, Special Inspector, and Registered Design Professionals for Structural Engineering and for Architecture.

1.2 DEFINITIONS

- A. Registered Design Professional: The licensed Professional Engineer or Registered Architect whose seal appears on the Construction Drawings.
- B. Code Enforcement Official: The Officer or other designated authority charged with administration and enforcement of the BCNYS.
- C. Testing/Inspecting Agency: An agent retained by the Special Inspector or by the Owner and coordinated by the Special Inspector, to perform some of the inspection services on behalf of the Special Inspector. (An example of an Inspecting Agent is a Geotechnical Engineer.)
- D. Statement of Special Inspections: A document prepared by the Registered Design Professional and filed with and approved by the Code Enforcement Official that includes the Schedule of Special Inspections listing the materials and work requiring Special Inspections. This document includes the inspections and verifications required for the project and the individuals, agencies, and/or firms who will be retained to perform these services.
- E. Continuous Special Inspection: The full-time observation of work by the Special Inspector or Testing Agency while the work is being performed.

- F. Periodic Special Inspections: The part-time or intermittent observation of work by the Special Inspector or Testing Agency for work that has been or is being performed and at the completion of the Work.

1.3 QUALIFICATIONS

- A. The Special Inspector and Testing/Inspecting Agency shall be accepted by the Owner.
- B. Special Inspections shall be performed by agents who have relevant experience for each category of inspections indicated on the drawings.
- C. Minimum qualifications of inspection agents are indicated on the drawings.

1.4 SUBMITTALS

- A. The Special Inspector and Testing/Inspecting Agency shall submit to the Registered Design Professional and Code Enforcement Official for review, a copy of their qualifications including the names and qualifications of each of the individual inspectors and technicians who will be performing inspections or tests.
- B. The Special Inspector and Testing/Inspecting Agency shall disclose any past or present business relationship or potential conflict of interest with the Contractor or any of the Subcontractors whose work will be inspected or tested.

1.5 PAYMENT

- A. The Owner will engage and pay for the services of the Special Inspector and Testing/Inspecting Agency.
- B. If any materials requiring Special Inspections are fabricated in a plant not located within 200 miles of the project site, the Contractor shall be responsible for the travel expenses of the Special Inspector or Testing/Inspecting Agency.
- C. The Contractor shall be responsible for the cost of any retesting or re-inspection of work failing to comply with the requirements of the Contract Documents.

1.6 OWNER RESPONSIBILITIES

- A. The Owner will provide the Special Inspector with a complete set of Contract Documents sealed by the Registered Design Professional and approved by the Code Enforcement Official.

1.7 CONTRACTOR RESPONSIBILITIES

- A. The Contractor shall cooperate with the Special Inspector and his agents so that Special Inspections and testing may be performed without hindrance.
- B. As indicated in the Schedule of Special Inspections, the Contractor shall notify the Special Inspector and/or Testing/Inspecting Agency at least 48 hours in advance of a required inspection or test.

- C. The Contractor shall provide incidental labor and facilities to provide access to the Work to be inspected or tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.
- D. If Special Inspections or testing require the use of the Contractor's scaffolding to access work areas, the Contractor shall provide a competent person to perform the daily evaluation of the scaffolding to verify that it is safe to use. The Contractor shall notify the Special Inspector and Testing Agent of this review before each use. The Contractor is responsible for the safe assembly and stability of the scaffolding.
- E. The Contractor shall keep the latest set of Construction Drawings, field sketches, accepted shop drawings, and specifications at the project site for field use by the Inspectors and Testing Technicians.
- F. The Contractor shall perform remedial work (if required) and sign non-conformance reports stating that remedial work has been completed. The Contractor shall submit signed reports to the Special Inspector as Work proceeds.
- G. The Special Inspection program shall in no way relieve the Contractor of his obligation to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control program.
- H. The Contractor shall be solely responsible for construction site safety.

1.8 LIMITS ON AUTHORITY

- A. The Special Inspector or Testing/Inspecting Agency shall not release, revoke, alter, or enlarge on the requirements of the Contract Documents.
- B. The Special Inspector or Testing/Inspecting Agency shall not have control over the Contractor's means and methods of construction.
- C. The Special Inspector or Testing/Inspecting Agency shall not be responsible for construction site safety.
- D. The Special Inspector or Testing/Inspecting Agency shall not have the authority to stop the Work.

2.0 INSPECTIONS AND TESTING

- A. The Contractor shall follow the Special Inspection requirements developed by the Registered Design Professional of Record.

3.0 DOCUMENTATION

3.1 RECORDS AND REPORTS

- A. Detailed reports shall be prepared of each test or inspection. The reports shall include the following general information:
1. Project name and number.
 2. Date of test or inspection.
 3. Name of Testing Agency or Inspecting Agency.
 4. Name of technician or inspector.
 5. Weather conditions.
 6. Locations and elevations of specific areas tested or inspected referenced to gridlines.
 7. Description of test or inspection.
 8. Reference to applicable ASTM standard.
 9. Summary of observations, results, and recommendations.
 10. Description of any areas or materials requiring retesting or re-inspection.
- B. Concrete compressive strength test reports shall contain the following information:
1. Name of Contractor and concrete supplier.
 2. Name of concrete testing service.
 3. Name of technician making and testing specimens.
 4. Truck number and delivery ticket number.
 5. Date and location within the structure of concrete placement.
 6. Concrete type, class, mix proportions of materials, and design compressive strength at 28 days.
 7. Slump, air content, unit weight, and concrete temperature.
 8. Total time period between batching and completion of placement for each truck.
 9. Compressive strength and type of break for all tests.
- C. Field reports for concrete inspection shall contain the general information noted above, plus ambient temperature and cylinder numbers.
- D. Test reports for masonry materials shall include proportions, composition, and compressive strength.

3.2 COMMUNICATION

- A. The Testing/Inspecting Agency shall immediately notify the Owner, Contractor, Special Inspector, and Registered Design Professional by telephone or email of any test results failing to comply with the requirements of the Contract Documents.
- B. The Special Inspector shall immediately notify the Contractor of any work found to be in nonconformance with the Contract Documents during inspections. If the nonconforming work is not corrected while the Special Inspector is on-site, the Special Inspector shall notify the Owner and Registered Design Professional within 24 hours (one business day) and issue a nonconformance report. The Special Inspector may use the Special Inspection Non-Conformance Report form at the end of this section or other similar form.
- C. If the nonconforming work is not corrected at the time of substantial completion of the structure or other appropriate time, the Special Inspector shall notify the Owner.

3.3 DISTRIBUTION OF REPORTS

- A. The Testing/Inspecting Agency shall submit reports to the Owner, Special Inspector and the Registered Design Professional within seven (7) days of the inspection or test. Reports may be submitted in the ePM system.
- B. The Special Inspector shall submit reports to the Owner and Registered Design Professional within seven (7) days of the inspections. Reports may be submitted in the ePM system
- C. If requested by the Code Enforcement Official, the Special Inspector shall submit interim reports which include all inspections and tests performed since the beginning of construction or since the previous interim report. Interim reports shall be addressed to the Code Enforcement Official with copies sent to the Registered Design Professionals (Structural Engineer and Architect) and Contractor. Interim reports shall be signed by the agent performing inspections.

3.4 FINAL REPORT OF SPECIAL INSPECTIONS

- A. At the completion of Work, each Testing/Inspecting Agency shall electronically submit an Agent's Final Report of Special Inspections to the Special Inspector stating that work was completed in substantial conformance with the Contract Documents and that appropriate inspections and tests were performed. The Testing/Inspecting Agency may use the Agent's Final Report of Special Inspections form provided at the end of this section or other similar form.
- B. At the completion of Work, the Special Inspector shall compile all inspection and test reports generated by each Agent into a Final Report of Special Inspections. The Final Report of Special Inspections shall state that required inspections have been performed and shall itemize any nonconforming work not corrected or resolved.
- C. The Special Inspector may use the Final Report of Special Inspections form provided at the end of this section or other similar form based on CASE Form 102-2001.
- D. The Special Inspector shall submit The Final Report of Special Inspections to the Owner, Registered Design Professional and Code Enforcement Official prior to issuance of a Certificate of Use and Occupancy.

SPECIAL INSPECTION NON-CONFORMANCE REPORT NO.

DATE: _____

TO:

CC: Contractor:

FROM: _____, Special Inspector

PROJECT:

PART I: REFERENCE SPECIAL INSPECTION REPORT NO.

(Attach copy of report)

DESCRIPTION OF NON-CONFORMANCE:

RDP RESPONSE: (PROVIDE ATTACHMENTS IF NECESSARY)

RDP SIGNATURE _____ DATE _____

IS RE-INSPECTION BY SPECIAL INSPECTOR REQUIRED YES NO

PART II: CONTRACTOR VERIFICATION (To be completed by either the *[General Contractor or Construction Manager]* or Subcontractor and returned to the Special Inspector and the RDP.)

I verify that as of the date listed, the non-conforming item noted above has been corrected as required.

Date Completed _____ By _____
(Contractor's Site Representative)

AGENT'S FINAL REPORT OF SPECIAL INSPECTIONS

Project Name: _____ Special Inspector: _____

Location: _____ Agent: _____

Special Inspector's Project: _____

Agent's Project: _____

To the best of my information, knowledge, and belief, the Special Inspections or testing required for this project and designated for this Agent in the Statement of Special Inspections (which includes the Schedule of Special Inspections) submitted for permit have been performed and discovered discrepancies have been reported and resolved other than the following:

Comments:

[Attach continuation sheets if required to complete description of uncorrected discrepancies.]

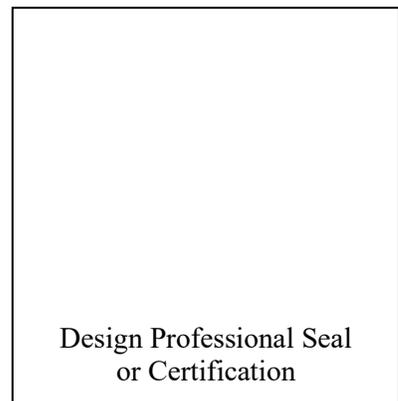
Respectfully submitted,
Agent of the Special Inspector

(Type or print name)

Signature Date

Address

City, State, Zip



**FINAL REPORT OF SPECIAL INSPECTIONS
AND STRUCTURAL OBSERVATIONS**

Project Name: _____ Registered Design Professionals
Location: _____ Architecture: *Name*
Address
Owner: CORNELL UNIVERSITY
Owner's Address: _____ Structural Engineering: *Name*
Address

Special Inspector: *Name*
Address

To the best of my information, knowledge, and belief, the Special Inspections required for this project and itemized in the Statement of Special Inspections (which includes the Schedule of Special Inspections) submitted for permit have been performed and discovered discrepancies have been reported and resolved other than the following:

Comments:

[Attach continuation sheets if required to complete description of uncorrected discrepancies.]

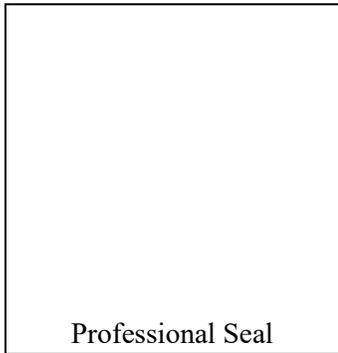
Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report. Agent's Final Reports of Special Inspections are attached and are also a part of this Final Report.

Respectfully submitted,

Special Inspector

(Type or print name)

Signature Date



END OF SECTION 01 45 33

SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS

1.0 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall furnish, install and maintain all temporary facilities and services of every kind, as required by the Contractor and by its Subcontractors for their performance of the Work and compliance with the Contract Documents, and shall remove such facilities and complete such services upon the completion of all other work, or as Cornell University may direct.
- B. The Contractor shall obtain all required permits and approvals for and shall provide, construct, or install, as well as operate, maintain, service and remove temporary facilities and services.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with Federal, State and local codes and safety regulations.

2.0 PRODUCTS

2.1 MATERIALS, GENERAL

- A. Choice of materials, as suitable for the accomplishment of the intended purpose, is the Contractor's option.
- B. Materials may be new or used, but must not violate requirements of applicable codes, standards and specifications.

2.2 TEMPORARY FIRST AID FACILITIES

- A. Provide first aid equipment and supplies, with qualified personnel continuously available to render first aid at the site.
- B. Provide a sign, posted at the telephone, listing the telephone numbers for emergency medical services: Physicians, ambulance services and hospitals.

2.3 TEMPORARY FIRE PROTECTION

- A. Provide a fire protection and prevention program for employees and personnel at the site. Any fire watches as a result of construction operations are the responsibility of the Contractor. Comply with NFPA 241. Develop, manage, and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with Cornell University Fire Marshall Office (UFMO) and local fire code official and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
1. Impairments “Fire Code of NYS Section 901.7”. Impairment; “the removal of fire alarm devices or sprinkler system coverage in a building.” There are two different levels of impairments
 - a. Partial Impairment. The removal of fire alarm devices or sprinkler system coverage via control valve in the immediate area of where work is to be performed.
 - Basic Impairment Notification will be sent to Local Authority Having Jurisdiction and FM Global.
 - No fire watch will be required unless the UFMO determines otherwise.
 - b. Full System Impairment. The complete removal of a fire alarm “system” or sprinkler “system”. Impairment of both the fire alarm system and sprinkler system at the same time is not allowed.
 - Full System Impairment Notification will be sent by the UFMO to local Authority Having Jurisdiction, FM Global, Ithaca Fire Department, Building Manager, Maintenance Manager, Customer Service, and Cornell Emergency Services.
 - Fire Watch staffing is the responsibility of the Contractor. The UFMO will require the Fire Watch person’s name(s) and contact information to prepare the required Fire Watch Documentation Form.
- B. Equipment:
1. Provide and maintain fire extinguishing equipment ready for instant use at all areas of the Project and at specific areas of critical fire hazard.
 2. Hand extinguishers of the types and sizes recommended by the National Board of Fire Underwriters to control fires from particular hazards.
 3. Construction period use of permanent fire protection system.
 4. Water hoses connected to an adequate water pressure and supply system to reach each area or level of construction upon building enclosure or heating of the building.

5. Maintain existing standpipes and hoses for fire protection. Provide additional temporary hoses where required to comply with requirements. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles. Provide hoses of sufficient length to protect construction areas.
 6. Maintain unobstructed access to fire extinguishers, fire hydrants, fire department connections, standpipes, temporary fire-protection facilities, stairways, and other access routes for emergency response personnel.
 7. Where existing or temporary fire protection services are being replaced with new fire protection services, do not remove or impair existing or temporary services until new services are tested, accepted, placed into operation and use, and directed by the UFMO and AHJ.
 8. At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility and systems, including connected services, and place into operation and use. Instruct key personnel on use of facilities. Protect and maintain permanent fire protection system. Repair or replace any components damaged during construction.
- C. Enforce fire-safety discipline:
1. Store combustible and volatile materials in an isolated, protected location.
 2. Avoid accumulations of flammable debris and waste in or about the Project.
 3. Prohibit smoking in the vicinity of hazardous conditions.
 4. There is NO SMOKING allowed on construction sites located in any occupied building. Smoking is prohibited in all Cornell University buildings.
 5. Closely supervise welding and torch-cutting operations in the vicinity of combustible materials and volatile conditions.
 6. Supervise locations and operations of portable heating units and fuel.
- D. Maintain fire extinguishing equipment in working condition, with current inspection certificate attached to each extinguisher.
- E. Welding or burning operations shall be conducted under a Hot Work Permit issued in accordance with Section 01 41 00. Where such work is permitted, the Contractor shall comply with Cornell EHS's *Contractor Guidelines for Hot Work* and provide an approved fire extinguisher in good operating condition within easy reach of the operating personnel. In each instance, obtain prior approval of Cornell University Environment, Health & Safety.
- Contractor Guidelines for Hot Work*, <https://ehs.cornell.edu/campus-health-safety/fire-and-life-safety/hot-work-and-welding-safety/general-contractor-guidelines-for-hot-work>
- F. Advise Cornell University Environmental Health and Safety of any items affecting Life Safety, e.g., inoperable safety devices or systems, road blockages, exit closing, etc.

2.4 CONSTRUCTION AIDS

- A. Provide construction aids and equipment required to assure safety for personnel and to facilitate the execution of the Work; Scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes, fall protection, harness, tie-off points, and other such equipment.
- B. When permanent stair framing is in place, provide temporary treads, platforms and railings, for use by construction personnel.
- C. Maintain all equipment in a safe condition.

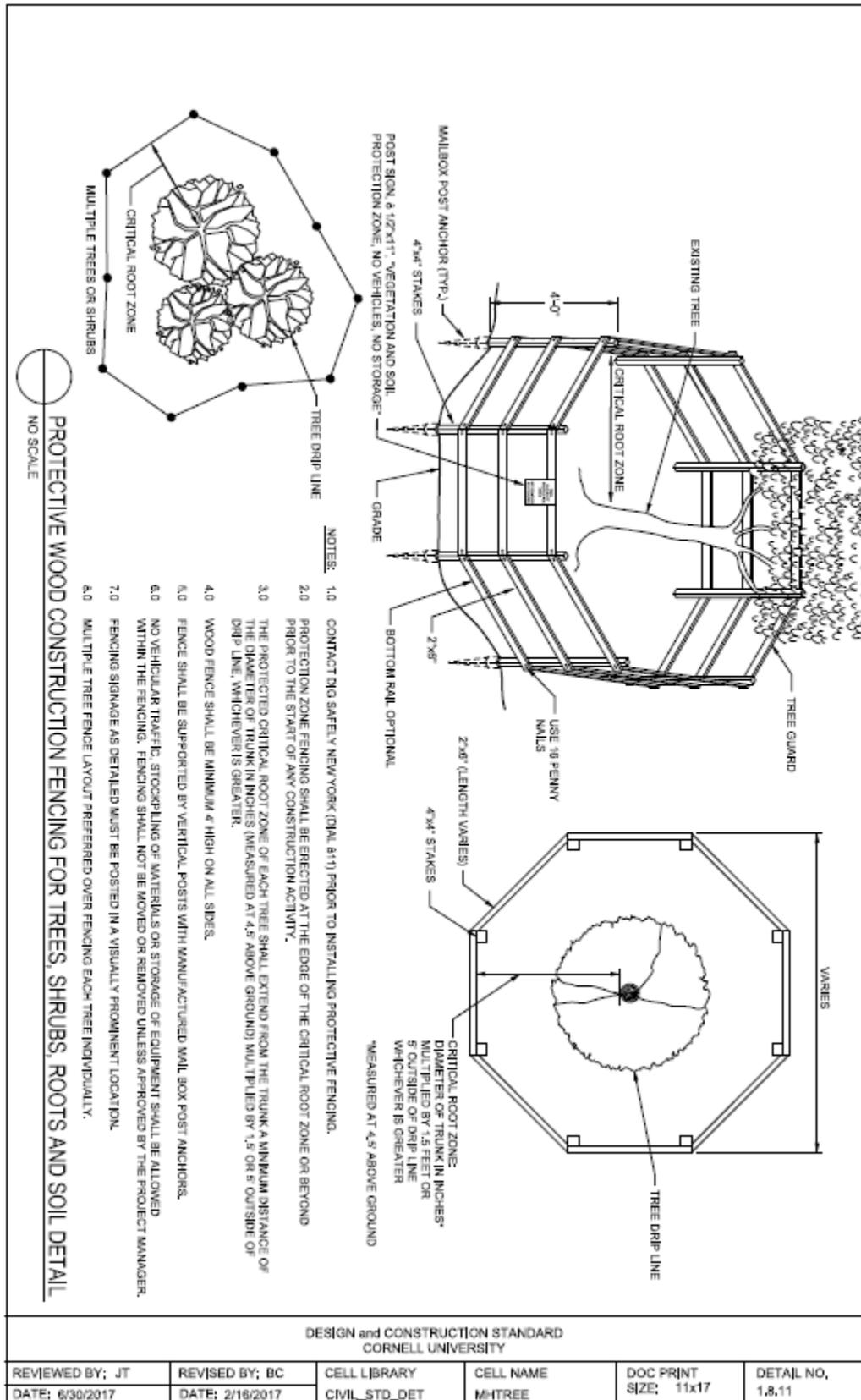
2.5 SUPPORTS

- A. The Contractor shall include cost of all materials and labor necessary to provide all supports, beams, angles, hangers, rods, bases, braces, etc. to properly support the Contract Work. All supports, etc. shall meet the approval of the Architect.
- B. Any and all supports that are of “custom” fabrication or installation shall be designed by the Contractor’s NYS licensed PE with stamped & signed shop drawings and calculations provided for same.

2.6 TREE, PLANT AND LAWN PROTECTION

- A. Preserve and protect existing trees, plants and lawns at the site which are designated to remain, and those adjacent to the site.
- B. Consult with Owner, and remove agreed-on roots and branches which interfere with construction.
 - 1. Employ certified arborist to remove, and to treat cuts.
- C. Provide temporary fences to a height of six feet, around each, or around each group of trees and plants. Provide temporary lawn protection to prevent soil compaction. Reference Cornell University Design Standards and Details for wood and chain fencing below.
- D. Protect root zones of trees, plants and lawn areas:
 - 1. Do not allow vehicular traffic or parking.
 - 2. Do not store materials or products.
 - 3. Prevent dumping of refuse or chemically injurious materials or liquids.
 - 4. Prevent puddling or continuous running water.
- E. Carefully supervise excavating, grading and filling, and subsequent construction operations to prevent damage.
- F. Replace, or suitably repair, trees, plants and lawn areas designated to remain which are damaged or destroyed due to construction operations.

- G. Roots 2 inches or larger that are damaged or cut during construction are to be sawed off close to the tree side of the excavation by certified arborist.
- H. During the leafing-out period in the spring, extra care should be exercised to reduce root damage such as keeping exposed roots wet, saturating soil when backfilling around roots, and backfilling as soon as possible.
- I. Consult Cornell University Grounds Department for mitigation of root or tree damage.



2.7 PERSONNEL, PUBLIC AND EMPLOYEE PROTECTION

- A. Provide guardrails, barricades, fences, footways, tunnels and other devices necessary to protect all personnel, employees, and the public, against hazards on, adjacent to or accessing the construction site.
 - 1. Provide signs, warning lights, signals, flags and illumination as necessary to alert persons to hazards and to provide safe, adequate visibility in areas of hazards.
 - 2. Closed sidewalks need to be indicated with OSHA-approved signs, as well as, proper barricades.
 - 3. Provide flag personnel as necessary to guide vehicles, protect personnel, public and employees.

2.8 ACCESS ROADS AND PARKING AREAS

- A. Provide adequate temporary roads and walks to achieve all-weather access into the site from public thoroughfares, and within and adjacent to the site as necessary to provide uninterrupted access to field offices, work and storage areas.
- B. Grade and provide drainage facilities to assure runoff of rainwater and to avoid blockage of flow from adjacent areas.
- C. During dry weather wet down temporary unpaved areas when necessary to prevent blowing dust.

2.9 PROJECT IDENTIFICATION AND SIGNS

- A. No Contractor signs to be displayed at the project site, unless authorized by the Owner.

2.10 SECURITY

- A. The Contractor shall provide security services as required to protect the interests of the Owner.
- B. Locks applied to construction site gates and other access entrances shall be coordinated through the Project Manager to allow keys for emergency services.

2.11 FIELD OFFICES

- A. The Owner shall designate a space within the facility to serve as a field office for the use of the Contractor and Owner.

3.0 EXECUTION

3.1 PREPARATION

- A. Consult with Owner, review site conditions and factors which affect construction procedures and temporary facilities, including adjacent properties and public facilities which may be affected by execution of the Work.
 - 1. Designate the locations and extent of temporary construction, storage, and other temporary facilities and controls required for the expeditious accomplishment of the Work.
 - 2. Allow space for use of the site by Owner and by other contractors, as required by Contract Documents.

3.2 GENERAL

- A. Comply with applicable requirements specified in sections of Division 02 through 40.
- B. Make work structurally, mechanically and electrically sound throughout.
- C. Install work in a neat and orderly manner.
- D. Maintain, clean, service and repair facilities to provide continuous usage, and to the quality specified for the original installation.
- E. Relocate facilities as required by progress of construction, by storage or work requirements, and to accommodate requirements of Owner and other contractors employed at the site.
- F. Keep the site, at all times during the progress of the Work, free from accumulation of waste matter or rubbish and shall confine its apparatus, materials and operations of its workers to the limits prescribed except as the latter may be extended with the approval of the Owner's Representative. Cleaning of the structure or structures must be performed daily and removal of waste matter or rubbish must be performed at least once a week.
- G. Contractor shall at all times keep access road and public roads clean of mud and construction debris and maintain dust control to the satisfaction of the Owner.

3.3 REMOVAL

- A. Completely remove temporary structures, materials, equipment and services:
 - 1. When construction needs can be met by use of permanent construction.
 - 2. At completion of the Project.
- B. Repair damage caused by installation or use of temporary facilities. Clean after removal.

- C. Restore existing or permanent facilities used for temporary purposes to specified, or to original condition.
 - 1. Remove foundations and underground installations for temporary construction and utilities.
 - 2. Grade the areas of the site affected by temporary installations to required elevations and slopes, and clean the area.

*****END OF SECTION 01 50 00*****

SECTION 01 51 00 TEMPORARY UTILITIES

1.0 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall furnish, install and maintain temporary utilities required by all trades for construction. Remove on completion of the Work.
- B. The Contractor shall provide all labor and materials for temporary connections and distribution.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with National Electric Code, current edition.
- B. Comply with Federal, State and local codes and safety regulations and with utility company requirements.

2.0 PRODUCTS

2.1 MATERIALS, GENERAL

- A. Materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

2.2 TEMPORARY ELECTRICITY, LIGHTING AND WATER

- A. The Contractor shall have access to the Owner's water and electric power for constructing the Work. Temporary utility connections shall be made by the Contractor as close to its operations as possible as long as such connections do not over-load the capacity of the Owner's utilities or interfere with its customary utilization thereof. Utility access points shall be determined in cooperation with and acceptable to the Owner.
- B. The Contractor shall be responsible for the economic use of the Owner's Water and Power. The Owner will pay for the water and power consumed in the construction of the Work as long as economical usage of these utilities is maintained. The Owner reserves the right to meter and charge for the power and water consumed if in the opinion of the Owner the usage of these utilities is not economically conducted by the Contractor. In such an event, the Owner shall give three (3) days written notice to the Contractor of its intentions to meter and charge for temporary utilities used by the Contractor.
- C. All temporary power systems including wiring shall be removed by the Contractor when no longer required.

- D. The minimum temporary lighting to be provided is at the rate of fifty foot candles, is to be maintained in each room and changed as required when interior walls are being erected. The required temporary lighting must be maintained for twenty-four (24) hours a day and seven (7) days a week at all stair levels and in all corridors below ground; in any and all egress; in all other spaces temporary lighting is to be maintained only during working hours. All temporary wiring and equipment shall be in conformity with the National Electric Code.
- E. The minimum temporary outdoor security lighting to be provided is as follows:
1. Along the perimeter of the site fence, consisting of vandal-resistant light fixtures with HID lamps, located 150 foot center, mounted on the inside of the construction fence.
 2. Lighting for temporary pedestrian paths and roadways, to provide a minimum of 0.1 foot-candle on the path of travel.
- F. Three-phase temporary power circuits shall be installed as required to operate construction equipment of the various trades and to install and test equipment such as pumps and elevators. The Contractor shall install and maintain temporary or permanent service for the permanently installed building equipment such as sump pumps, boilers, boiler controls, fans, pumps, so that such equipment may be operated when required and so ordered by the Owner's Representative for drainage or for temporary heat.
- G. Except as otherwise provided in the Contract, the Contractor shall submit to the Owner or the Owner's Representative for approval a proposed schedule of all utility shutdowns and cutovers of all types which may be required in connection with the Work. Such schedule shall provide a minimum of two (2) weeks advance notice to the Owner prior to the time of the proposed shutdown and cutover. The Contractor shall be responsible for all charges relating to shutdowns.
- H. Discontinuance, Changes and Removal
- The Contractor shall:
1. Discontinue all temporary services required by the Contract when so directed by the Owner or the Owner's Representative. The discontinuance of any such temporary service prior to the completion of the Work shall not render the Owner liable for any additional cost entailed thereby.
 2. Remove and relocate such temporary facilities as directed by the Owner or the Owner's Representative, and shall restore the Site and the Work to a condition satisfactory to the Owner.

2.3 TEMPORARY USE OF ELEVATOR

- A. Use of Elevator Is Prohibited
1. Before construction begins, the elevator shall be locked out and made inoperable.
 2. The Contractor may deliver or remove materials through existing openings, including windows on the upper floors or the entrances on the 2nd and 3rd floors off Garden Ave.

2.4 TEMPORARY HEAT AND VENTILATION

- A. The Contractor shall furnish temporary heat as may be necessary for constructing the Work.
- B. The Contractor will be permitted to use the building's permanent heating system for temporary heat. Permission to use the building's permanent heating system shall in no way constitute the Owner's acceptance of that portion of the Work.
- C. When using the permanent building systems for space conditioning, provide a written maintenance plan for acceptance by the Owner's Representative, prior to utilizing the equipment. Plan to address temporary filtering of air and water, sealing of open ducts, lubrication, operation outside of normal ranges, and controls/safeties. Return all equipment to its newly installed condition prior to acceptance testing.
 - 1. If the Contractor elects to use the building's permanent heating system for temporary heat, the Contractor shall provide filters with a minimum MERV of 8 at each return-air grille in system, maintain to keep them free of dust and debris, replace if necessary and remove at end of construction and clean HVAC system as required in Section 01 77 00 – Project Closeout.
- D. Any temporary system shall be removed when no longer required.
- E. During heating cycles the enclosures separating the interior building areas from outside shall be maintained closed to conserve heat energy.
- F. The Contractor shall provide for ventilation of all structures until physical completion of the Work and shall control such ventilation to avoid excessive moisture levels and rates of drying of construction materials, including but not limited to concrete and to plaster, and to prevent condensation on sensitive surfaces. The Contractor shall be responsible for any moisture intrusion that is detrimental to the Project.

2.5 TEMPORARY CONTRACTOR TELEPHONE SERVICE

- A. Site Superintendent or their Representative shall carry a cellular telephone at all times.
- B. Provide phone number to Cornell project representatives for communication during Work.

2.6 TEMPORARY SANITARY FACILITIES

- A. The Owner shall designate sanitary facilities to be utilized by the Contractor during construction.
- B. Existing plumbing facilities must be maintained during the project's duration and thoroughly cleaned at the project's completion. The Contractor will be responsible for any damage the facilities incur during the project's duration.

3.0 **EXECUTION**

3.1 **REMOVAL**

- A. Completely remove temporary materials and equipment when their use is no longer required.
- B. Clean and repair damage caused by temporary installations or use of temporary facilities.
- C. Restore existing and permanent facilities used for temporary services to specified, or to original, condition.

*****END OF SECTION 01 51 00*****

SECTION 01 51 23 HEAT DURING CONSTRUCTION

1.0 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall maintain existing or temporary building heating systems to accomplish the following:
 - 1. Protect the existing facility and facility plumbing systems against damage due to cold temperatures.
 - 2. Provide sufficient heat so that the Work can be accomplished in accordance with the Contract Documents.
 - 3. Maintain construction schedules as required by the Contract.
- B. Include in the bid price an amount necessary to provide Construction Heat as required.
- C. Existing central steam systems may be used to the extent that they do not interfere with the safe and effective completion of Work. However, any modifications to existing systems shall be corrected prior to the conclusion of Work.
- D. No natural gas is available to the facility for temporary heat.
- E. At the conclusion of the project the facility heating systems shall be returned to functional order as necessary to protect the building and facility plumbing systems.

1.2 RESPONSIBILITY

- A. The Contractor shall be responsible for repairs to the facility necessitated by the failure to provide heat during any portion of the Work.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 51 23*****

SECTION 01 66 00 STORAGE AND PROTECTION

1.0 GENERAL

1.1 DESCRIPTION

- A. Receive, pile, store and handle all materials, equipment and other items incorporated or to be incorporated in the Work, including items furnished by the Owner in a careful and prudent manner and shall protect them against loss or damage from every source.
- B. Obscure from public view, in a manner acceptable to the Owner, staging and storage areas.

1.2 TRANSPORTATION AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions; using means and methods that will prevent damage, deterioration, and loss, including theft.
- B. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction space.
- C. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
- D. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installation.
- E. Promptly inspect shipments to assure that products comply with requirements, quantities are correct and products are undamaged.
- F. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement or damage.

1.3 ON-SITE STORAGE

- A. Materials stored on the Site shall be neatly piled and protected, and shall be stored in a neat and orderly manner in locations that shall not interfere with the progress of the Work or with the daily functioning of the Institution.
- B. Materials subject to weather damage shall be protected against the weather by floored weatherproof temporary storage sheds.
- C. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

- D. Storage piles and sheds shall be located within the area designated as the Staging Area. The Contractor shall work to ensure that the condition of the staging area has no negative impact on the Campus, visually or otherwise; and that outside of that area. The Contractor has no impact at all on the Campus.
- E. Materials stored within the building shall be distributed in such a manner as to avoid overloading of the structural frame, and never shall be concentrated in such a manner as to exceed the equivalent of 50 pounds per square foot uniformly distributed loading. Stored materials shall be moved if they interfere with the progress of the Work.
- F. Should it become necessary during the course of the Work to move stored materials or equipment, the Contractor, at the direction of the Owner or the Owner's Representative, shall move such materials or equipment.

1.4 CAMPUS SITE / BOOKBANK DRIVE STORAGE

- A. All property including construction materials and equipment stored at the Bookbank Drive or other Campus site, shall be stored at the Contractor's sole risk. The Contractor is solely responsible for repair or replacement of property due to any cause of loss. Due to work at the Bookbank Drive lot, staging space is limited and not guaranteed to be provided. If staging space is needed, a request should be submitted to the Project Manager.
- B. The Contractor agrees to hold Cornell harmless from any accident or injury occurring at Bookbank Drive storage or other assigned Campus site associated with the Contractor's storage.
- C. The Contractor understands that Cornell makes "no" warranty regarding any security at the Bookbank Drive or other assigned Campus site.
- D. The Contractor agrees that it is solely responsible for any cleanup of any site contamination caused by the Contractor's storage or storage operations and the Contractor agrees to pay for cleanup of any contamination and restore the site back to the same condition it was found.
- E. It shall be assumed that the Contractor is responsible for site contamination unless the Contractor has reported condition prior to moving storage materials and equipment onto the site. Each Contractor shall be responsible for their own general area whether defined formally or not but in cases where pollutants have traveled or are found in the public areas used by all contractors, the Contractor agrees as follows:
 - 1. If it cannot be determined who is responsible for site contamination after an investigation, all contractors who could be responsible based upon location of the incident agree to share the expense of cleanup equally.
- F. No storage of hazardous materials or environmental contaminants is permitted at the Bookbank Drive or any Campus site. All barrels must have labels affixed identifying contents.

- G. The Contractor will be responsible for securing and maintaining any Campus site area designated to them. All contractor trailers or storage containers located on Cornell Campus Property will need to file for a building permit with the Town of Ithaca. If the trailer/container is there longer than 180 days, the trailer/container will need to meet the Building Code requirements of a permanent structure. The trailer/container will need a means of egress that can be operated from the inside and a fire extinguisher. The contractor will also need to file for a demolition permit when the trailer/container is removed
- H. Unoccupied storage containers not within the project fence shall be labeled in the Cornell standard.

1.5 PROTECTION

- A. The Contractor shall provide security personnel and adopt other security measures as may be necessary to adequately protect materials and equipment stored at the site. The Contractor shall be obligated to replace or pay for all materials and equipment including items furnished by the Owner which have been damaged or stolen prior to completion of the Work.
- B. Protection of Utilities
 - 1. If during the course of the Project, it is necessary to work adjacent to existing utilities, pipelines, structures and equipment, the Contractor shall take all necessary precautions to protect existing facilities from damage.
 - 2. Locations of utilities as shown on the Contract Documents are approximate only. The Contractor shall excavate or otherwise locate to verify existing utilities in advance of its operation.
- C. Protective Covering
 - 1. All finished surfaces shall be protected by the Contractor as follows:
 - a. Door and windowsills and the jambs and soffits of openings used as passageways or through which material is handled, shall be cased and protected adequately against possible damage resulting from the conduct of the work of all trades.
 - b. All surfaces shall be clean and not marred upon delivery of the building to the Owner. The Contractor shall, without extra compensation, replace all blocks, gypsum board, plaster, paint, tile, and all other surfaces, whether or not protected, which are damaged, and shall refinish (including painting as specified) to satisfaction of Owner.
 - c. Tight wood sheathing shall be laid under any materials that are stored on finished concrete surfaces and planking must be laid before moving any materials over these finished areas. Wheelbarrows used over such areas shall have rubber tires on wheels.
 - d. Contractor has the responsibility for protection of carpeting and all finish flooring during all phases of the Work including after installation.

- e. All floors exposed to view as a floor finish shall be protected by overlaying with plywood in all areas subject to construction traffic within and without the building, special care shall be taken to protect all stair finish surfaces including but not limited to flooring, wood in-fill stairs, cabinetry, counters, equipment, etc.
2. HVAC ductwork shall be protected by the Contractor as follows to prevent introduction of contaminants:
 - a. Ductwork shall be wrapped at the factory using plastic wrap to exclude moisture and contaminants. The wrapping shall not be removed until immediately prior to installation.
 - b. Ductwork shall not be exposed to moisture or contaminants at any point in the manufacturing, shipping, storage or installation process.
 - c. Ductwork shall not be staged or stored outside or otherwise exposed to the weather.
 - d. Ductwork shall be transported only inside of covered vehicles.
 - e. Once installed, ductwork shall be protected from contamination during the construction process.

1.6 PROTECTION AFTER INSTALLATION

- A. Protect installed products, including Owner-provided products, and control traffic in immediate area to prevent damage from subsequent operations.
- B. Provide protective coverings at walls, projections, corners, and jambs, sills, and soffits of openings in and adjacent to traffic areas.
- C. Cover walls and floors of elevator cabins, and jambs of cab doors, when elevators are used by construction personnel.
- D. Protect finish floors and stairs from dirt, wear, and damage:
 1. Secure heavy sheet goods or similar protective materials in place, in areas subject to foot traffic.
 2. Lay planking or similar rigid materials in place, in areas subject to movement of heavy objects.
 3. Lay planking or similar rigid materials in place, in areas where storage of products will occur.
- E. Protect waterproofed and roofed surfaces:
 1. Restrict use of surfaces for traffic of any kind, and for storage of products.
 2. When an activity is mandatory, obtain recommendations for protection of surfaces from manufacturer. Install protection and remove on completion of activity. Restrict use of adjacent unprotected areas.

F. Restrict traffic of any kind across planted lawn and landscape areas.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 66 00*****

SECTION 01 73 29 CUTTING, PATCHING AND REPAIRING

1.0 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall be responsible for all cutting, fitting and patching, including excavation and backfill, required to complete the Work or to:
1. Make sure several parts fit together properly.
 2. Uncover portions of the Work to provide for installation of ill-timed work.
 3. Remove and replace defective work.
 4. Remove and replace work not conforming to requirements of Contract Documents.
 5. Remove samples of installed work as specified for testing.
 6. Repair or restore existing or new surfaces and finishes to match adjacent existing or new surfaces and finishes.
- B. Upon written instructions of the Owner's Representative:
1. Uncover designated portions of Work for Architect's observation of covered work.
 2. Remove samples of installed materials for testing beyond that specified.
 3. Remove Work to provide for the alteration of previously incorrectly installed work.
 4. Patch work uncovered or removed.
- C. Do not damage or endanger any Work by cutting or altering the Work or any part thereof.
- D. Do not cut or otherwise alter the Work of the Owner except with the written consent of the Owner's Representative.
- E. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
- F. Openings and Chases
1. Build openings, including but not limited to channels, chases and flues as required to complete the Work as set forth in the Contract.
 2. After installation and completion of any work for which openings have been provided, build in, over, and around and finish all such openings as required to complete the Work.
 3. Furnish and install all sleeves, inserts, hangers and supports required for the execution of the Work.

1.2 SUBMITTALS

- A. Submit a written request to the Architect prior to executing any cutting, alteration or excavation which affects the Work of the Owner, or which may affect the structural safety of any portion of the Project. Include:
1. Identification of the Project.
 2. Description of the affected Work.
 3. The necessity for doing the cutting, alteration or excavation.
 4. The effect on the Work of the Owner's property, or on the structural integrity of the Project.
 5. Description of the proposed Work:
 - a. The scope of cutting, patching, alteration, or excavation.
 - b. Contractor and trades who will execute the work.
 - c. Products proposed to be used.
 - d. The extent of refinishing to be done.
 6. Alternatives to cutting, patching or excavation.
 7. Designation of the responsibility for the cost of cutting and patching.
 8. Written permission of any separate contractor whose work will be affected.
- B. Should conditions of the Work or the schedule indicate a change of products from the original installation, submit a request for substitution as specified in Section 01 25 00 - Substitutions and Product Options.
- C. Submit a written notice to the Architect and the Owner designating the date and the time the Work will be uncovered.

1.3 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity for load-deflection ratio.
1. Obtain written approval of the cutting and patching proposal before cutting and patching structural elements, including but not limited to the following:
 - a. Foundation construction
 - b. Bearing and retaining walls
 - c. Structural concrete
 - d. Structural steel and lintels

- e. Structural decking
 - f. Miscellaneous structural metals
 - g. Exterior wall back-up supports and anchoring systems
 - h. Piping, ductwork, vessels, and equipment supports
 - i. Equipment supports
- B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operation life or safety.
- 1. Obtain written approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
 - a. Primary operational systems and equipment
 - b. Air or smoke barriers
 - c. Water, moisture, or vapor barriers
 - d. Membranes and flashings
 - e. Fire protection systems
 - f. Control systems
 - g. Communication systems
 - h. Electrical wiring systems
 - i. Operating systems of special construction for MEP work
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Owner's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction which was cut and patched in a visually unsatisfactory manner at no expense to the Owner.
- D. Waterproofing and Water Tightness: Do not cut or alter waterproofed walls or floors or any structural members without written permission of the Owner.
- 1. Waterproofing and Roofing Membranes
 - a. Employ qualified contractors to accomplish all required cutting, patching, or repairing of existing waterproofing and roofing membranes.
 - b. Before beginning cutting, patching or repairing of existing waterproofing and roofing membranes, obtain approval of all materials, methods and contractor to be used from the Owner and agency, or agencies, holding bond or guarantee/warranty in force for membrane.

2. Water Tightness

- a. The Contractor shall be responsible for water tightness of product, materials, and workmanship, including work specified to be watertight and inferred by general practice to be watertight.
- b. All floors (slabs), walls, roof, glazing, windows, doors, sleeves through foundation walls, flashings, and similar items shall be watertight.
- c. If details or materials shown or specified are felt not satisfactory to produce water tightness, the Contractor shall inform the Owner's Representative before installation and submit proposed substitution or alternative method for review and approval. The Contractor shall execute approved change and make watertight at no additional cost to the Owner.

1.4 WARRANTIES

- A. Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

2.0 PRODUCTS

2.1 MATERIALS

- A. Comply with the Contract Documents for each product involved.
- B. Use materials identical to in-place or existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible. If identical materials are unavailable or cannot be used, use materials whose installed performance will equal or surpass that of in-place or existing materials, and will match visual appearance of in-place or existing materials.

3.0 EXECUTION

3.1 INSPECTION

- A. Inspect existing conditions of the Project, including elements subject to damage or to movement during:
 1. Cutting and patching.
 2. Excavation and backfilling.
- B. After uncovering Work, inspect the conditions affecting the installation of products, or performance of the Work.
- C. Report unsatisfactory or dubious conditions to the Architect in writing; do not proceed with the Work until the Architect has provided further instructions.

3.2 PREPARATION

- A. Provide shoring, bracing and other support as necessary to assure the structural safety of that portion of the Work.
- B. Provide devices and methods to protect other portions of the Project from damage.
- C. Provide for vertical and lateral support required to protect adjacent buildings and properties.
- D. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, including but not limited to pumping to maintain excavations free from water.
- E. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- F. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction using methods which will assure safety, will be least likely to damage elements retained or adjoining construction, and will provide proper surfaces to receive new work.
 - 1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Cut through concrete and masonry using a cutting machine, such as a carbon saw or a diamond-core drill.
 - 4. Comply with the requirements of applicable MEP work where cutting and patching of services is required.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
 - 1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
3. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 - a. For continuous surfaces, refinish to nearest intersection.
 - b. For an assembly, refinish the entire unit.
4. When patching existing plaster finished walls and partitions, the Contractor shall utilize plaster trim, lath and other metal components to match the integrity of the existing system. All plaster finishes shall match existing finishes so as to provide a uniform visual appearance.
5. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
6. Ceilings: Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
7. Concrete Masonry Units: Patch walls by tothing-in units using salvaged or new CMU units matching in-place units for type and size. Match coursing patterns, mortar joint profiles, and other features of in-place CMU walls. Use accessory materials compatible with in-place materials.
8. Brick and Masonry: Patch walls by tothing-in units using salvaged or new brick and masonry matching in-place brick and masonry units. Match coursing patterns, mortar joint profiles, and other features of in-place brick and masonry walls. Use accessory materials compatible with in-place materials.
9. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather-tight condition.
 - a. Existing Roofing: Comply with requirements of existing roofing manufacturer for cutting and patching existing roofing system. Provide flashing and trim, base sheets, base flashing, adhesives, insulation, blocking, substrate boards, accessories, and other required items to patch roofing at penetrations and roof-top mounted items.

- D. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
 - 1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.
- E. Execute excavating and backfilling by methods which will assure safety, will prevent settlement or damage to other work.
- F. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
- G. Restore Work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents.
- H. The Contractor shall replace, repair and patch all surfaces of the ground, and of any structure disturbed by its operations and its Work, which surfaces and structures are intended to remain, even if such operations and work are outside the property lines. Such replacement, repair and patching shall be with like material and shall restore surfaces as they existed.

3.4 CLEANING

- A. Clean area and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- B. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

*****END OF SECTION 01 73 29*****

SECTION 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

1.0 GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.

1.2 RELATED REQUIREMENTS

- A. Selection 024119 Selective Demolition for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.

1.3 DEFINITIONS

- A. Construction Waste: Building structure and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building structure and site improvement materials resulting from demolition.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.
- G. Alternative Daily Cover (ADC): Cover material other than soil placed on the surface of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing litter, and scavenging.

- H. Commingled Recycling (also called Single-Stream Recycling); Recycling streams that are combined on the project site and hauled away for sorting into separate recyclable streams at a recycling facility. Commingled recycling is considered as one waste stream unless diversion rates can be provided by the recycling facility for specific materials, based on measured quantities.
- I. Diversion Rate (also called Recycling Rate); The percentage of waste that is not burned or put into landfill.
 - 1. Numerator: The percentage of material by weight that is diverted from landfill or incineration by recycling, salvage, reused, and donated material, plus combusted wood.
 - 2. Denominator: The total weight of Construction and Demolition Waste
 - 3. Land clearing debris (excavated soil and landscaping materials) and hazardous waste SHALL NOT be included in total weight of Construction and Demolition Waste for this calculation.
 - 4. ADC and non-wood waste used as incinerator fuel do not count as diversion but must be included in total construction and demolition waste.
- J. Diversion Stream: A flow of material coming from a job site into markets for building materials, comprised of both a Material Category (or mixture of several material categories) and a Diversion Method. A Diversion Stream shall constitute at least five percent (5 percent), by weight or volume, of total diverted materials for the Project.
 - 1. Examples of Diversion Streams include source separated materials sent to specific recycling facilities, commingled waste sent to a mixed-waste recycling facility, deconstructed materials sent back to a manufacturer as part of a take-back program. Or salvaged materials reused on site.
 - 2. Examples of Material Categories include the following: Each of these considered a separate Diversion Stream when separated on site, however multiple materials that are commingled on site are considered one diversion stream.
 - a. Metal
 - b. Glass
 - c. Plastic
 - d. Wood
 - e. Masonry
 - f. Cardboard/paper
 - g. Gypsum Board
 - h. Ceiling Tile
 - i. Carpet

1. Examples of Diversion Methods include:
 - a. On-site Separation: Gypsum scrap; metal framing scrap; ceiling tile scrap; carpet scrap.
 - b. On-site waste diversion: Crushing concrete or asphalt for reuse onsite
 - c. Reuse Off-site: Pallets, wood reels, blankets
 - d. Salvage
 - e. Donations: Tax Deductible; non-tax deductible.
- K. Land Clearing Debris and Soil: Natural materials such as rock, soil, stone and vegetation. Excludes man-made materials even if found on-site pre-construction.
- L. Waste Stream: Comprised of two major sub-streams: Waste disposal of vial landfills or incinerators and waste diverted from disposal through recycling, reuse salvage, or donation (i.e. Diversion Stream). Land clearing debris, soil and landscaping materials, and hazardous waste do not qualify as Waste Stream.

1.4 MATERIALS OWNERSHIP

- A. Construction Waste: Building materials, structure and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tables, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 1. Carefully salvage in a manner to prevent damage and promptly return to Owner

1.5 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of minimum 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including, but not limited to, the following:
 1. Demolition Waste:
 - a. Concrete.
 - b. Concrete reinforcing steel.
 - c. Brick.
 - d. Concrete masonry units.

- e. Wood studs.
- f. Wood joists.
- g. Plywood and oriented strand board.
- h. Wood paneling.
- i. Wood trim.
- j. Structural and miscellaneous steel.
- k. Rough hardware.
- l. Roofing.
- m. Insulation.
- n. Doors and frames.
- o. Door hardware.
- p. Windows.
- q. Glazing.
- r. Metal studs.
- s. Gypsum board.
- t. Acoustical tile and panels.
- u. Carpet.
- v. Carpet pad.
- w. Demountable partitions.
- x. Equipment.
- y. Cabinets.
- z. Plumbing fixtures.
- aa. Piping.
- bb. Supports and hangers.
- cc. Valves.
- dd. Sprinklers.
- ee. Mechanical equipment.

- ff. Refrigerants.
 - gg. Electrical conduit.
 - hh. Copper wiring.
 - ii. Lighting fixtures.
 - jj. Lamps.
 - kk. Ballasts.
 - ll. Electrical devices.
 - mm. Switchgear and panel boards.
 - nn. Transformers.
2. Construction Waste:
- a. Masonry and CMU.
 - b. Lumber.
 - c. Wood sheet materials.
 - d. Wood trim.
 - e. Metals.
 - f. Roofing.
 - g. Insulation.
 - h. Carpet and pad.
 - i. Gypsum board.
 - j. Piping.
 - k. Electrical conduit.
 - l. Packaging: Regardless of salvage/recycle goal indicated in Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - Paper.
 - Cardboard.
 - Boxes.
 - Plastic sheet and film.

- Polystyrene packaging.
- Wood crates.
- Plastic pails.

1.6 SUBMITTALS, GENERAL

- A. Forms: In addition to Owner's standard forms, use Contractor's or Waste Management Company's standard forms containing the indicated minimum content.

1.7 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within fifteen (15) days of date established for the Notice to Proceed.

1.8 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, but not less than on a monthly basis, submit report. Use USGBC's LEED v4 Construction and Demolition Waste Calculator. Include the following information:
1. Material category.
 2. Generation point of waste.
 3. Total quantity of waste in tons (tonnes).
 4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
 5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
 6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work. Do not include hazardous waste in calculations.
- C. Submit typewritten statement, signed by each of Owner's Representatives who have been instructed, describing:
1. Method of Instruction.
 2. Equipment and Systems Operated.
 3. Length of Instruction Period.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

- E. Record of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
 - 1. If mixed construction and demolition (C+D) waste will be commingled on-site and diverted off-site, provide the following:
 - a. Verification of Diversion Rate: Provide project specific and/or facility-wide diversion rates in accordance with the following:
 - 1) Project-Specific: On Sorting Facility letterhead, provide project-specific monthly summaries of diversion rates from each waste receiving facility for each Diversion Stream the facility accepts, including statement that visual inspection was not used to estimate weights or volumes of Project Diversion Streams. ADC must be listed as separate line item on the report under the category of non-diverted waste.
 - 2) Facility-Wide: On Sorting Facility letterhead, provide facility-wide aggregated annual averaged diversion rates, average percentage of ADC produced by the facility, and provide documentation that the facility's method of recording and calculating these rates is regulated by a local or state government authority. The facility-wide aggregated annual averaged diversion rate shall include ADC under the category of non-diverted waste.
- H. LEED Submittal: Submit documentation to the USGBC, signed by Contractor, tabulating total waste material, quantities diverted, and means by which it is diverted, and statement that requirements for the credit have been met. Respond to questions and requests from the USGBC regarding construction waste management and disposal until the USGBC has made its determination on the project's LEED certification application. Document correspondence with USGBC as informational submittals.
- I. Qualification Data: For waste management coordinator and refrigerant recovery technician.
- J. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
 - 1. Refrigerant Recovery: Comply with requirements in Section 02 41 19 "Selective Demolition and Alteration Work" for refrigerant recovery submittals.

1.9 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements.
- B. Recycling Facility Qualifications: Experienced facility, with a record of successful recycling rates and material end uses.
- C. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- D. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- E. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of waste management coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for Contractor, each trade, and other parties that will be involved with disposal, recycling, and salvage of construction and demolition waste for Project.

1.10 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements of this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
7. Other Disposal Procedures: Account for and describe disposal method for all other waste materials, including those that will not contribute to diversion from landfill. Non-recyclable waste should be distinguished from non-diverted waste that cannot be included in Diversion Rate calculation, including:
 - a. Land clearing debris.
 - b. Excavation soil and rock.

2.0 PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Comply with hauling and disposal regulations of authorities having jurisdiction.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvaging/recycling 75 percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:
 1. Demolition Waste:
 - a. Concrete
 - b. Concrete reinforcing steel
 - c. Miscellaneous steel

- d. Insulation.
 - e. Doors and frames.
 - f. Door hardware.
 - g. Metal studs.
 - h. Gypsum board.
 - i. Acoustical tile and panels.
 - j. Piping.
 - k. Supports and hangers.
 - l. Valves.
 - m. Sprinklers.
 - n. Electrical conduit.
 - o. Copper wiring.
 - p. Electrical devices.
 - q. Switchgear and panelboards.
 - r. Transformers.
2. Construction Waste:
- a. Masonry and CMU.
 - b. Lumber.
 - c. Wood sheet materials.
 - d. Wood trim.
 - e. Metals.
 - f. Roofing.
 - g. Insulation.
 - h. Carpet and pad.
 - i. Gypsum board.
 - j. Piping.
 - k. Electrical conduit.

1. Packaging: Regardless of salvage/recycle goal indicated in "General"

3.0 EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, trades, Subcontractors, suppliers, Owner's construction forces, and Owner's Separate Contractors on proper waste management procedures, as appropriate for the Work and work occurring at Project site.
 1. Distribute waste management plan to everyone concerned within three (3) days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Comply with Section 01 50 00 - Temporary Facilities and Controls for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area as designated by Owner.
 - 5. Protect items from damage during transport and storage.
- D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- F. Plumbing Fixtures: Separate by type and size.
- G. Lighting Fixtures: Separate lamps by type and protect from breakage.
- H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panel boards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper, beverage containers, and other recyclable consumables used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor unless otherwise indicated in the 'Agreement'.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - 2. Inspect containers and bins for contamination and remove contaminated materials if found.

3. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
4. Stockpile materials away from construction area. Do not store within drip line of trees.
5. Store components off the ground and protect from the weather.
6. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
- B. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 1. Clean and stack undamaged, whole masonry units on wood pallets.
- C. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- D. Metals: Separate metals by type.
 1. Structural Steel: Stack members according to size, type of member, and length.
 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- E. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- F. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- G. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- H. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- I. Carpet Tile: Remove debris, trash, and adhesive.
 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

- J. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- K. Conduit: Reduce conduit to straight lengths and store by type and size.
- L. Lighting Fixture Lamps: Separate lamps by type and protect from breakage.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

*****END OF SECTION 01 74 19*****

SECTION 01 77 00 PROJECT CLOSEOUT

1.0 GENERAL

1.1 INSPECTIONS

A. Substantial Completion:

1. Within a minimum of five (5) days prior to substantial completion, when the Work has reached such a point of completion that the building or buildings, equipment and apparatus can be occupied and used for the purpose intended, the Contractor shall conduct a detailed inspection of the Work to ensure that all requirements of the Contract have been met and that the Work is complete and is acceptable. Contractor shall prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
2. After receipt of the Contractor's initial punch list, the Architect will make an inspection of the Work to determine that the Work is substantially complete and that requirements of the Contract have been met and that the Work is sufficiently complete and is acceptable for use. The Architect will submit a marked-up list of items to be completed and/or corrected, inclusive of the Contractor's punch list, with an estimated dollar value for each item.
3. The Architect shall prepare a Certificate of Substantial Completion, template provided by the Owner, on the basis of an inspection, when the Architect has determined that the Work is substantially complete.
4. A copy of the report of the inspection will be furnished to the Contractor as the inspection progresses so that the Contractor may proceed without delay with any part of the Work found to be incomplete or defective.
5. All work performed under a Fire Protection System Installation/Alteration Operating Permit shall be inspected by the Ithaca Fire Department, or if so delegated by the Ithaca Building Department and the Owner's Environmental Health and Safety Department.
 - a. A member of the Ithaca Fire Department shall witness all acceptance or reacceptance testing of work performed under a Fire Protection System Installation Operating Permit. All testing and inspections shall be in compliance with the applicable NFPA codes as referenced by Section 906.1 of the Fire Code of NYS.
 - b. Work classified as a 'Repair' under the Existing Building Code does not require the Ithaca Fire Department to witness the testing of the affected systems. Systems that have been repaired must still be tested as required by the Fire Code of NYS and NFPA.
 - c. The Ithaca Fire Department Shall Witness the Acceptance or Reacceptance Testing for the Following Conditions:

- Testing of any new installation of a fire alarm, fire suppression, or fire detection system as required by the Fire Code of New York State.
- Hydrostatic testing of sprinkler system where the modification affects more than twenty (20) sprinkler heads and the modified area can be isolated from the rest of the system
- Installation or replacement of a fire pump or drive elements of the fire pump.
- A Fire Alarm System with added or deleted components.
- A Fire Alarm System where the wiring or control circuits have been modified.
- A Fire Alarm System where the control unit (Fire Alarm Panel) has been replaced or the control unit software has been replaced.
- A smoke control system where the master control unit, individual fan control unit, or fan drive unit has been replaced or modified.
- An alternative fire suppression system that has been replaced or the actuation elements have been modified. Except: fusible link replacement.
- A modification or extension of the piping for a fire standpipe system where a hydrostatic test is required by NFPA 14.

B. Final Acceptance:

1. When the items appearing on the report of inspection have been completed or corrected, the Contractor shall so advise the Architect. After receipt of this notification and Contractor's certified list of completed items, the Owner's Representative will inform the Contractor of the date and time of final inspection. A copy of the report of the final inspection containing all remaining contract exceptions, omissions and incomplete Work will be furnished to the Contractor.
2. After receipt of notification of completion and all remaining contract exceptions, omissions and incomplete Work from the Contractor, the Architect will make an inspection to verify completion of the exception items appearing on the report of final inspection.

1.2 SUBMITTALS

A. Contractor's List of Incomplete Items: Initial punch list submittal at Substantial Completion.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listing by room or space number. Organize items applying to each space by major element, including categories for individual exterior face elevations, ceilings, individual walls, floors, doors, roof levels, casework, equipment, and building systems.

B. Contractor's Certified List of Completed Items: Final signed punch list submittal at Final Completion.

- C. Certificates of Release: Occupancy permits from authorities having jurisdiction.

1.3 FINAL CLEAN UP

- A. Upon completion of the Work covered by the Contract the Contractor shall leave the completed Project ready for use and occupancy without the need of further cleaning of any kind and with all Work in new condition and in perfect order. In addition, upon completion of all Work, the Contractor shall remove from the vicinity of the Work all plant, buildings, rubbish, unused materials, concrete forms and other materials belonging to him or used under its direction during construction or impairing the use or appearance of the property and shall restore such areas affected by the Work to their original condition, and, in the event of its failure to do so, the same shall be removed by the Owner at the expense of the Contractor, and the Contractor and/or its surety shall be liable therefore. Final clean-up shall include but not be limited to the following:
1. All finished surfaces shall be swept, dusted, washed and polished. This includes cleaning of the Work of all finishing trades where needed, whether or not cleaning by such trades is included in their respective sections of the specifications.
 2. Roofs, utility tunnels, manholes and pipe trenches and spaces between the new and existing Work shall be left thoroughly cleaned.
 3. Finished flooring shall be thoroughly cleaned in accordance with the manufacturer's recommendations.
 4. Where the finish of floors has been marred or damaged in any space or area, the entire floor of that space or area shall be refinished as recommended by the manufacturers of the flooring.
 5. All equipment shall be in an undamaged, bright, clean, polished and new appearing condition.
 6. All new glass shall be washed and polished, both sides. The Contractor shall be responsible for all breakage of glass in the area of the Work from the commencement of its activities until the building is turned over to Owner. The Contractor shall replace all broken glass and deliver the entire building with all glazing intact and clean.
 7. Provide new filters for all fan convectors after final cleaning.
 8. Refer to exterior clean up. Remove paint and glazing compound from surfaces.
- B. Clean adjacent structures and improvements of dust, dirt, and debris caused by construction operations. Return adjacent areas to condition existing before construction operations began.
- C. Cleaning of Renovated Duct Systems and Existing Duct Systems in Renovated Areas:
1. Cleaning work shall be performed by firm which has minimum three (3) years' experience in mechanical cleaning of air systems. Work shall be done by skilled mechanics, technicians and experienced supervisors.

2. Clean dirt, dust and debris from air units, associated equipment air ducts; sanitize same. Cleaning shall include:
 - a. Cleaning of air unit's supply, return and exhaust sections including coils, fans, filter racks, outdoor air intake shaft, and interior surfaces.
 - b. Cleaning of dampers, heating coils, humidifiers, and similar devices in ductwork.
 - c. Marking of duct-mounted damper settings, prior to cleaning, and returning dampers to marked positions after cleaning. This includes fire dampers, zone dampers, balancing dampers and volume dampers.
 - d. Cleaning of terminal supply, return and exhaust grilles, registers and diffusers.
 - e. Cutting of access holes in ductwork for cleaning process, as well as sealing and patching of same.
 - f. Removal of portions of duct system which cannot otherwise be thoroughly cleaned, and replacement thereof.
 - g. Sealing of lined duct systems, upon completion.
 - h. Removal and reinstallation of ceiling panels, tiles, ceiling support tracks, and other ceiling construction, as required to facilitate cleaning.
 - i. Providing access doors required to facilitate cleaning.
3. Cleaning shall meet National Air Duct Cleaners Association (NADCA) Standards, capable of verification by NADCA Vacuum Test. Cleanliness shall be subject to Architect's visual review; provide re-cleaning as necessary to satisfy Architect
 - a. Cleaning methods may include vacuuming, brushing, mechanical brushing, scraping, or air washing. Use method best suited for locations involved.
 - b. Do NOT use methods which could damage the system or the building.
 - c. Remove dirt, dust, lint and other accumulations by HEPA filtered air machine capable of minimum 6000 cfm. Air machine shall operate to obtain 1250 fpm across the workspace. Use brushes, mechanical agitators or air whips to dislodge contaminants to be collected by the air machine.
 - d. Cleaning shall begin at the furthest point of the return system and at the outdoor air intake. Cleaning shall proceed toward the air handling equipment. Cleaning shall finish at the furthest point of the supply ductwork.

1.4 MAINTENANCE STOCK

- A. Turn over to Owner's Representative the maintenance stock specified. Contractor shall obtain signed receipt from Owner's Representative for all maintenance stock.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 77 00*****

SECTION 01 78 22 FIXED EQUIPMENT INVENTORY

1.0 GENERAL

1.1 FIXED EQUIPMENT INVENTORY

- A. The Owner shall provide the Contractor with a list of Equipment Types to be inventoried and an Excel template.
- B. The Contractor shall populate the template (see Example Equipment List to be inventoried in Section 1.2). Once populated, the Contractor shall electronically return to the list to the Owner's Representative. The initial data to be captured on each piece of equipment shall include:
 - 1. Name of Product
 - 2. Equipment Classification
 - 3. Manufacturer
 - 4. Model Number
 - 5. Serial Number
 - 6. Cost
 - 7. Location (including Building and Room Number)
 - 8. Acquisition Date (Date of Installation)
- C. The Owner shall from the Contractor provided data, create a follow-up equipment Excel template that contains the MAXIMO ID for the equipment with all the name plate and specification fields for each type of equipment. This template shall then be returned to the Contractor.
- D. The Contractor shall be responsible for the initial labeling of the equipment and its' disconnects with the MAXIMO ID using an electronic label maker. ID labels shall be in close proximity to Equipment Identification information, visually locatable from the access point to the equipment and on the face of disconnects.
- E. The Contractor shall then populate the MAXIMO Equipment Specification Template with the equipment nameplate, specification information, and warranty information. The Contractor shall electronically submit the equipment data and any related documentation (i.e. - O&M manuals) to the Owner's Representative.

F. EXAMPLE EQUIPMENT LIST

- Building Equipment
- AC Drive/VSD
- Pump
 - Glycol
 - CWC
 - HWC
 - Potable
 - Sanitary Sewer
 - Storm Sewer
 - Sump
 - Quality Water
 - Fuel
- Fan
 - Exhaust
 - Supply
 - Return
- Heat Exchangers
- Tank
- Fan Coil
- VAV Box
- Motor
 - Pump
 - Fan

1.2 ROOF SYSTEM INVENTORY

- A. The Owner shall provide the Contractor with a list of Roof System Attributes to be inventoried in an Excel template and the FM Global form 2688 for roofs.
- B. The Contractor shall provide a dimensioned roof plan of the facility drawn to scale, Auto CAD or Microstation format. Each roof panel of the roof system is to be labeled with a unique ROOF ID number that will reference the Excel template to properly inventory Roof System Attributes of each panel. Once populated, the Contractor shall electronically return to the drawings to the Owner's Representative for review and approval.
1. Entire Roof Replacement Projects for a Facility: The Contractor is to assign a ROOF ID to each panel of the newly installed roofing system. The ROOF ID will be comprised of the unique Cornell Facility Code number followed by an underscore and a three digit number. (i.e. - Day Hall (Facility Code: 2026) - ROOF ID: 2006_001).
 2. Partial Roof Replacement Projects for a Facility: The Owner will provide a graphically representation of the facility's roof plan with the ROOF ID numbers already assigned to each panel of the roof. The Contractor is responsible to transfer the assigned ROOF ID numbers to their new drawings to be returned to the Owner's representatives.

- C. The Contractor shall populate the template. Once populated, the Contractor shall electronically return the list to the Owner's Representative. The initial data to be captured on each panel of the newly installed roof system shall include:
1. Roof Classification
 2. Manufacturer (If applicable)
 3. Description of System
 4. Roof Material
 5. Installation Type
 6. Slope of Roof (Low or Steep)
 7. Roof ID (See Section 1.1.B) for additional information
 8. Area of Roof Panel (SF)
 9. Contractor (Installer of Roof System)
 10. Warranty Number (If applicable)
 11. Warranty Expiration Date (If applicable)
 12. Material Warranty Number (If applicable)
 13. Material Warranty Expiration Date (If applicable)
 14. Asbestos Present (If any material remained in place during the reroofing project)
 15. Insulation (Yes or No), Fastening type, Thickness
 16. Flashing Material
 17. Gutter Type (If applicable)
 18. Downspout Type (If applicable)
 19. Roof Drain Type (If Applicable)
 20. Roofing Substrate
 21. Facility (State or Endowed)
 22. Vapor Barrier Type
 23. Installation Date
 24. Cost per Square Foot
 25. Remaining Useful Life (RUL)

- 26. Type of Heat Trace Element (If applicable)
- 27. Type Snow Guard Systems (If applicable)
- 28. Additional Comments as Applicable

D. The Contractor shall electronically submit the Roof System data as specified above and any related documentation (i.e. - O&M manuals and Warranty data) to the Owner's Representative.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 78 22*****

SECTION 01 78 23 OPERATING AND MAINTENANCE DATA

1.0 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract.
 - 1. Prepare operating and maintenance data as specified in this Section, as referenced in other pertinent sections of Specifications and as necessary to operate the completed Work.
 - 2. Operations and maintenance data, in final format, shall be available to the Owner prior to substantial completion.
- B. Instruct Owner's personnel in the maintenance of products and in the operation of equipment and systems.

1.2 FORM OF SUBMITTALS

- A. Prepare data in the form of an instructional manual for use by Owner's personnel.
- B. Upload electronic files to ePM system of complete manual in final form.
 - 1. Format:
 - a. Size: 8-1/2" x 11".
 - b. Text: Manufacturer's, scanned .pdf and/or neatly typewritten Word file.
 - c. Drawings in electronic format
 - Drawings are required in PDF format. Drawings shall be in AutoCAD v14 or higher format.
 - d. Provide divider for each separate product, and major component parts of equipment.
 - Provide type description of product, and major component parts of equipment.
 - Provide indexed PDF bookmarks.
 - Provide a series of files organized in subdirectories with a summary index with hyperlinks to the various documents.

- e. Cover: Identify each volume with title "OPERATIONS AND MAINTENANCE INSTRUCTIONS".

List:

- Title of Project
- Identity of separate structure as applicable.
- Identity of general subject matter covered in the manual.

1.3 CONTENT OF MANUAL

- A. Table of contents, typewritten, for each volume, arranged in a systematic order.
 - 1. Contractor, name of responsible principal, address and telephone number.
 - 2. A list of each product required to be included, indexed to the content of the volume.
 - 3. List, with each product, the name, address and telephone number of:
 - a. Subcontract or installer.
 - b. Maintenance contractor, as appropriate.
 - c. Identify the area of responsibility of each.
 - d. Local source of supply for parts and replacement.
 - 4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
- B. Product Data:
 - 1. Include only those sheets which are pertinent to the specific product.
 - 2. Annotate each sheet to:
 - a. Clearly identify the specific product or part installed.
 - b. Clearly identify the data applicable to the installation.
 - c. Delete reference to inapplicable information.
- C. Submittal Data:
 - 1. Include a record copy of the final, approved product submittal. Record copy shall be a clean copy (free of notes from the design professional) which has been updated to reflect the "as-installed" system.

- D. Drawings:
 - 1. Supplement product data with drawings as necessary to clearly illustrate:
 - a. Relations of component parts of equipment and systems.
 - b. Control and flow diagrams.
 - 2. Coordinate drawings with information on Record Documents to assure correct illustration of completed installation.
 - 3. Do not use Record Documents as maintenance drawings.
- E. Written text, as required to supplement product data for the particular installation:
 - 1. Organize in a consistent format under separate headings for different procedures.
 - 2. Provide a logical sequence of instructions for each procedure.
- F. Original copy of each warranty, bond, and service contract issued.
 - 1. Provide information sheet for Owner's personnel, give:
 - a. Proper procedures in the event of failure.
 - b. Instances which might affect the validity of warranties or bonds.

1.4 MANUAL FOR MATERIALS AND FINISHES

- A. Upload electronic files to ePM system.
- B. Content, for architectural products, applied materials and finishes:
 - 1. Manufacturer's data, giving full information on products:
 - a. Catalog number, size, and composition.
 - b. Color and texture designations.
 - c. Information required for reordering special-manufactured products.
 - d. Certification as to asbestos free
 - 2. Instructions for care and maintenance:
 - a. Manufacturer's recommendation for types of cleaning agents and methods.
 - b. Cautions against cleaning agents and methods which are detrimental to the product.
 - c. Recommended schedule for cleaning and maintenance.

- C. Content, for moisture-protection and weather-exposed products:
 - 1. Manufacturer's data, giving full information on products.
 - a. Applicable standards
 - b. Chemical composition
 - c. Details of installation
 - 2. Instructions for inspection, maintenance, and repair.
- D. Additional requirements for maintenance data: The respective sections of Specifications.

1.5 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Upload electronic files to ePM system.
- B. Content, for each unit of equipment and system, as appropriate:
 - 1. Description of unit and component parts.
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of all replaceable parts.
 - 2. Operating procedures:
 - a. Start-up, break-in, routine and normal operating instructions.
 - b. Regulation, control, stopping, shut-down and emergency instructions.
 - c. Summer and winter operating instructions.
 - d. Special operating instructions.
 - 3. Maintenance Procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Alignment, adjusting and checking.
 - 4. Servicing and lubrication required:
 - a. List of lubricants required.
 - 5. Manufacturer's printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.
 7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
 - a. Predicted life of parts subject to wear.
 - b. Items recommended to be stocked as spare parts.
 8. As-installed control diagrams by controls manufacturer.
 9. Each contractor's coordination drawings.
 - a. As-installed color coded piping diagrams.
 10. Charts of valve tag numbers, with the location and function of each valve.
 11. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
 12. Other data as required under pertinent sections of Specifications.
- C. Content, for each electric and electronic system, as appropriate:
1. Description of system and component parts:
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 2. Circuit directories of panel boards:
 - a. Electrical service.
 - b. Controls.
 - c. Communications.
 3. As-installed color coded wiring diagrams.
 4. Operating procedures:
 - a. Routine and normal operating instructions.
 - b. Sequences required.
 - c. Special operating instructions.

5. Maintenance procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Adjustment and checking.
 6. Manufacturer's printed operating and maintenance instructions.
 7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
 8. Other data as required under pertinent sections of Specifications.
- D. Additional requirements for operations and maintenance data: See the respective sections of Specifications and General Conditions.

1.6 SUBMITTAL REQUIREMENTS

- A. Submit through ePM system preliminary draft of proposed formats and outlines of contents of the O&M Manual thirty (30) calendar days after approved submittals.
- B. Submit specified number of copies of approved data in final form prior to final acceptance.

1.7 INSTRUCTIONS OF OWNER'S PERSONNEL

- A. Prior to final inspections or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and systems:
 1. Instruction time shall be sufficient to fully instruct all shifts of the Owner's operating and maintenance personnel.
- B. Operations and maintenance shall constitute the basis of instruction:
 1. Review contents of manual with Owner personnel in full detail to explain all aspects of operations and maintenance.
- C. Submit documentation, signed by each of the Owner's Representatives who have been instructed, describing:
 1. Method of Instruction.
 2. Equipment and Systems Operated.
 3. Length of Instruction Period.
- D. Contractor is fully responsible until final acceptance, even though operated by Owner's personnel, unless otherwise agreed in writing.

1.8 OPERATING INSTRUCTIONS

- A. Upload in ePM system all operating, maintenance and starting precautions and procedures to be followed by Owner for operating all systems and equipment.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

*****END OF SECTION 01 78 23*****

SECTION 01 78 36 WARRANTIES AND BONDS

1.0 GENERAL

1.1 DESCRIPTION

The Contractor shall:

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Co-execute submittals when so specified.
- D. Review submittals to verify compliance with Contract Documents.
- E. Submit to Architect for transmittal to Owner.

1.2 SUMMARY

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.
 - 2. General closeout requirements are included in Section 01 77 00 - "Project Closeout."
 - 3. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Divisions 2 through 40.
 - 4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and Subcontractors required to countersign special warranties with the Contractor.

1.3 DEFINITIONS

- A. Standard Product Warranties are pre-printed written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner

1.4 QUALITY ASSURANCE

- A. Use adequate care and diligence to review Contract Documents to identify detailed requirements relating to warranties and bonds.
- B. Verify that each item required for this submittal conforms with specified requirements.

1.5 WARRANTY REQUIREMENTS

- A. In addition to standard and special warranties described in Divisions 2 through 40, Contractor shall warrant work included in this Project, for a minimum period of one (1) year following acceptance of a Certificate of Substantial Completion by Owner, to cover performance, materials, workmanship and compliance with Contract Documents.
- B. Corrective Work: Provide service within thirty (30) calendar days when requested by Owner. Perform services during normal working hours, unless specifically directed otherwise by Owner. Coordinate with Owner's representative to schedule performance of corrective work. Where designated service providers cannot perform corrective work within the Owner's required time frame, engage another qualified service provider. Submit a written statement to Owner upon completion of corrective work; document work performed and list outstanding items, if any.
 - 1. When a completed breakdown of a piece of equipment occurs of the malfunction of a system affects the environment or program involving 50 or more persons at a time (employees and students combined), or creates a safety or security risk to the Owner, an EMERGENCY may be declared by the Owner. The Owner may declare an emergency as defined above at which time the service response must be within 4 hours and may require action during non-normal working hours.
 - 2. When an emergency condition occurs, the Owner may take immediate corrective action to relieve the problem by making, a minimum as possible, temporary adjustments and/or repairs when necessary to decrease the problem until the designated Contractor's representative can respond. These temporary adjustments and repairs will in no way jeopardize the existing warranty.
 - 3. The Owner's service staff will advise the Contractor's Representative of all temporary adjustments and repairs done in relation to the malfunctioning equipment or facility.
 - 4. If the Contractor fails to respond with actual service within four (4) hours, and/or the necessary repairs or adjustments are not satisfactorily complete twenty-four (24) hours, the Owner will have the authority to make the necessary repairs or adjustments and charge the Contractor for parts and labor.
 - 5. If all adjustments and repairs done by the Owner in relation to the above conditions are done by authorized district personnel, there will be no negative effect of future warranty claims.
- C. Related Damages and Losses: When correcting failed or damaged warranted work, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

- D. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- E. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- F. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- G. Contractor's Procurement Obligations: Do not purchase, subcontract for, or allow others to purchase or subcontract for materials or units of work for Project where a special project guaranty, specified product warranty, certification, or similar commitment is required until it has been determined that entities required to sign or countersign such commitments are willing to do so.
- H. Specific Warranty. Where a special warranty, certification, or similar commitment is required on such work or part of the Work, the Owner reserves the right to refuse to accept the Work until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.6 SUBMITTAL REQUIREMENTS

- A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect or Owner.
 - 1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect and Owner within fifteen (15) days of completion of that designated portion of the Work.
- B. When a special warranty is required to be executed by the Contractor, or the Contractor and a Subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for acceptance prior to final execution.

1.7 SUBMITTALS REQUIRED

- A. Submit warranties, bonds, and service and maintenance contracts as specified in the respective sections of Specifications. Submit a list of all required warranties.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION

3.1 FORM OF SUBMITTALS

- A. The Warranties and Bonds shall be in electronic pdf format. Each submission shall include the title of the Project and the name of the Contractor.
- B. Provide a series of files organized in subdirectories with a summary index with hyperlinks to the various documents and or references.
- C. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.
- D. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
 - 1. Product or work item.
 - 2. Item description.
 - 3. Notation of what the equipment serves (e.g. – Provides perimeter heat)
 - 4. Warranty Provider. Is the warranty provided by a manufacturer or installer?
 - 5. Firm, with name of principal and responsible party, address and telephone number.
 - 6. Scope.
 - 7. Duration.
 - a. Date of beginning of warranty, bond or service and maintenance contract
 - b. End date of warranty, bond or service and maintenance contract.
 - 8. Provide information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
 - 9. Contractor, name of responsible principal, address and telephone number.

3.2 TIME OF SUBMITTALS

- A. Make final submittals within ten (10) days after Date of Substantial Completion, prior to final request for payment.
- B. For items of work when acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within ten (10) days after acceptance, listing the date of acceptance as the start of the warranty period.

3.3 ROOF WARRANTY PACKAGE

- A. Roof warranties shall explicitly denote the specific roof panel identification number (ROOF ID) for which the warranty applies to.
- B. Roof panel identification numbers shall be generated in accordance with Section 01 78 22, FIXED EQUIPMENT INVENTORY, in coordination with the Owner's Roof Representative.
- C. Roof warranties shall include a dimensioned roof plan with roof panel identification numbers generated in accordance with Section 01 78 22, FIXED EQUIPMENT INVENTORY.
- D. Warranty Needs to be posted at all access points to the roof, With following message.

Attention

Roof Under Warranty
Do Not Alter or Repair without written
Approval from Facilities Services
Manufacture: XYZ
Installation Date: 00/00/0000
Warranty Number: 123
Warranty Expiration Date: 00/00/0000
For Immediate Assistance Contact
Roof Program Manager

END OF SECTION 01 78 36

SECTION 01 78 39 RECORD DOCUMENTS

1.0 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall maintain at the site, during construction, one record copy of:
1. Drawings
 2. Specifications
 3. Addenda
 4. Change Orders and other Modifications to the Contract
 5. Architect's Field Orders or written instructions.
 6. Final Shop Drawings, Product Data and Samples
 7. Field Test records
 8. Construction photographs

1.2 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store documents and samples in Contractor's field office apart from documents used for construction.
- B. File documents and samples in accordance with the Owner's electronic project management system document structure.
- C. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
- D. Make documents and samples available at all times for review by the Owner's Representative and the Architect.

1.3 RECORDING

- A. Label each document "AS BUILT" in neat large printed letters.
- B. Record information concurrently with construction progress.
1. Do not conceal any Work until required information is recorded.

C. Drawings

As built drawings shall consist of making any changes neatly and clearly on the Contract Drawings using colored ink or pencil, shall be kept current by the contractor on a day-to-day basis in concert with the progress of the Work. Where applicable, the change marked on a drawing is to carry the notation "per Change Order No. X", or similar reference which cites the reason for the change. As an alternative approach the Contractor can submit a plan for producing the "As-Built" drawings via electronic mark-up in Bluebeam, Adobe Professional, or other similar program as an alternative to colored pencil or ink mark-ups. Such plan shall be subject to approval of the Owner.

The day-to-day construction as built drawings shall be made available to the Architect or Owner's Representative for review upon request. The "As built" drawings shall show all changes to the following areas of construction:

1. Architectural:
 - a. Modifications to components dictated by the building code
 - b. Wall, door, window locations
 - c. Built in casework locations
 - d. New rated door and wall schedules/ locations
 - e. Material and products where submittals are requested
2. Civil and Structural
 - a. Dimensions for load carrying elements, both horizontal and vertical
 - b. Materials and products where submittals are requested
 - c. Load carrying elements and foundation systems
 - d. Site related elements including:
 - Building outlines, entranceways, areaways, roof overhangs, downspouts, significant architectural projections and other pertinent data.
 - e. All significant changes in foundations, columns, beams, openings, concrete reinforcing, lintels, concealed anchorages and "knock-out" panels made during construction.
 - f. Building envelope systems including roofing systems and building shell systems
 - g. Geotechnical subsurface information
 - h. Items that will require future maintenance
 - i. Life safety critical items

3. Mechanical (HVAC, Plumbing and Fire Protection)
 - a. Products where submittals are requested
 - b. Final locations of all equipment.
 - c. Final sizes and materials of piping and ductwork.
 - d. Final locations of inaccessible piping and ductwork.
 - e. Final locations of all controls equipment, including all sensors and actuators.
 - f. Final locations of all valves and dampers, including all shutoff valves, balance dampers and fire dampers.
 - g. Location of access doors for all equipment in concealed locations.
 - h. Final location and arrangement of all mechanical equipment and concealed gas, sprinkler, domestic, sanitary and drainage systems piping and other plumbing, including, but not limited to, supply and circulating mains, principal valves, meters, clean-outs, drains, pumps and controls, vent stacks, sanitary and storm water drainage.
4. Electrical
 - a. Products where submittals were requested.
 - b. Circuit (wire and raceway) size, number, and type.
 - c. Main circuit pathways for Fire Alarm, Emergency Power, and Access Control/Security systems.
 - d. Final locations of equipment and devices, interior and exterior luminaires, and power supplies.
 - e. Final location of electric signal system panels, final arrangement of all circuits and any significant changes made in electrical signal system design as a result of Change Order or job conditions.
5. Environmental
 - a. Utility related elements and supporting infrastructure

D. Specifications and Addenda

Legibly mark each section to record:

1. Manufacturer, trade name, catalog number, and Supplier of each product and item of equipment actually installed.
2. Changes made by Field Order or by Change Order.

1.4 **SUBMITTAL**

- A. At Contract close-out, deliver copies of all record documents to the Owner's Representative.
- B. Accompany submittal with transmittal letter in duplicate, containing:
 - 1. Date
 - 2. Project title and number
 - 3. Contractor's name and address
 - 4. Title and number of each record document
 - 5. Certification that each document is complete and accurate
 - 6. Signature of Contractor or its authorized representative.

2.0 **PRODUCTS – NOT USED**

3.0 **EXECUTION – NOT USED**

*****END OF SECTION 01 78 39*****

SECTION 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS – LEED V4/V4.1 ID+C

1.0 GENERAL

1.1 DESCRIPTION

- A. Section includes general requirements and procedures for compliance with certain prerequisites and credits needed for Project to obtain "LEED Version 4 for Interior Design and Construction" (LEED v4 ID+C) Silver certification based on USGBC's LEED v4 ID+C, with Credit Substitution applied to certain credits for review under LEED v4.1.
1. Specific requirements for LEED are also included in other Sections.
 2. Some LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
 3. A copy of the draft LEED Project checklist is attached at the end of this Section for information only.
 - a. Some LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
- B. Related Sections:
1. 01 74 19 - Construction Waste Management and Disposal: For requirements for demolition and construction waste.
 2. 01 81 19 - Indoor Air Quality Requirements: For procedural requirements for Indoor Air Quality measures.
 3. 01 91 13 - General Commissioning Requirements: For general requirements that apply to implementation of commissioning.
 4. Divisions 01 through 49 Sections: For LEED requirements specific to the work of each of those Sections. Requirements may or may not include reference to LEED.

1.2 DEFINITIONS

- A. A.LEED: USGBC's "LEED Version 4 for Interior Design and Construction" and "LEED Version 4.1 for Interior Design and Construction"
1. Definitions that are a part of "LEED Version 4 for Interior Design and Construction" (LEED v4 ID+C) and "LEED Version 4.1 for Interior Design and Construction" (LEED v4.1 ID+C) apply to this Section.

1.3 PREINSTALLMENT MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site. Review LEED requirements and action plans for meeting requirements.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Respond to questions and requests from Architect and GBCI regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the GBCI has made its determination on the Project's LEED certification application. Document responses as informational submittals.
- B. Submit documentation to GBCI and respond to questions and requests from USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the GBCI has made its determination on the Project's LEED certification application.
 - 1. Document correspondence with GBCI as informational submittals.

1.5 SUBMITTALS

- A. General: Submit additional sustainable design submittals required by other Specification Sections, in addition to this section.
- B. Sustainable design submittals are in addition to other submittals.
 - 1. If submitted item is identical to that submitted to comply with other requirements, include an additional copy with other submittal as a record copy of compliance with indicated LEED requirements instead of separate sustainable design submittal. Mark additional copy "Sustainable design submittal."
- C. Sustainable Design Documentation Submittals:
 - 1. Environmental Product Declarations complying with LEED requirements.
 - 2. Documentation for products that comply with LEED requirements for multi-attribute optimization.
 - a. Include documentation for products sourced within 100 miles of the Project site. Include statement of costs.
 - 3. Sustainability reports for products that comply with LEED requirements for raw material and source extraction reporting.
 - 4. Material ingredient reports for products that comply with LEED requirements for material ingredient reporting.
 - 5. Documentation for products that comply with LEED requirements for material ingredient optimization.

- a. Include documentation for products sourced within 100 miles of the Project site. Include statement of costs.
 6. Documentation for products that comply with LEED requirements for product manufacturer supply chain optimization.
 - a. Include documentation for products sourced within 100 miles of the Project site. Include statement of costs.
 7. Product data for adhesives and sealants used inside the weatherproofing system, indicating VOC content and laboratory test reports showing compliance with requirements for low-emitting materials. Include statement of volume of product used.
 8. Product data for paints and coatings used inside the weatherproofing system, indicating VOC content and laboratory test reports showing compliance with requirements for low-emitting materials. Include statement of volume of product used.
 9. Laboratory test reports for flooring, indicating compliance with requirements for low-emitting materials.
 10. Laboratory test reports for products containing composite wood or agrifiber products or wood glues, indicating compliance with requirements for low-emitting materials.
 11. Laboratory test reports for ceilings, walls, thermal and acoustical insulation, indicating compliance with requirements for low-emitting materials.
 12. Laboratory Test Reports for furniture, indicating compliance with requirements for low-emitting materials.
- D. Qualification Data: For LEED coordinator.
- E. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:
1. Plumbing.
 2. Mechanical.
 3. Electrical.
 4. Specialty items, such as elevators and equipment.
- F. Sustainable Design Action Plans: Provide preliminary submittals within 30 days of date established for the Notice of Award, indicating how the following requirements will be met:
1. List of proposed products with EPDs. (See subsection 2.2 A. 1.)
 2. List of proposed products complying with requirements for multi-attribute optimization. (See subsection 2.2 A. 2.)
 3. List of proposed products complying with requirements for material ingredient reporting. (See subsection 2.2 B. 1.)

4. List of proposed products complying with requirements for material ingredient optimization. (See subsection 2.2 B. 2.)
 5. List of proposed products complying with requirements for product manufacturer supply chain optimization. (See subsection 2.2 B. 3.)
- G. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with sustainable design action plans.

1.6 QUALITY ASSURANCE

- A. LEED Coordinator: Engage an experienced LEED-accredited professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

2.0 PRODUCTS

2.1 MATERIALS

- A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to these LEED credits, the Contractor shall provide additional materials and procedures necessary to obtain LEED credits indicated.

2.2 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION (LEED 4.1 requirements)

- A. Environmental Product Declarations: Provide products as follows:
1. At least 10 different products from at least three different manufacturers shall have Environmental Product Declarations that comply with LEED requirements. Product-specific Type III Environmental Product Declarations shall be valued as 1.5 products. Industry-wide (generic) Environmental Product Declarations shall be valued as one product. Product-specific declarations shall be valued as one product.
 2. At least five permanently installed products sourced from at least three different manufacturers that have a compliant embodied carbon optimization report or action plan separate from the LCA or EPD. Products sourced within 100 miles of the Project site shall be valued at twice their base contributing number of products, up to a maximum of two products.
 3. Material Ingredients: Provide products that comply with at least two of the following requirements:
- B. Material Ingredient Reporting: At least 10 different products from at least three different manufacturers using LEED-accepted programs to demonstrate the chemical inventory of the product to at least 0.1 percent (1000 ppm). Any compliant reports with third-party verification that includes the verification of content inventory are worth 1.5 products for credit achievement calculations.

2.3 **LOW-EMITTING MATERIALS (LEED 4.1 requirements)**

A. **Categories:** Reference LEED v. 4.1 ID+C – Indoor Air Quality – Low Emitting Materials credit requirements. Include 4 categories of products on the building interior that meet the low-emitting criteria, with three of those four categories at/exceeding a 90% compliance threshold. Comply with the ingredient exclusions and low-emitting criteria within the credit description. The following are the product categories from which to choose four:

1. **Paints and Coatings:** At least 75% of all paints and coatings, by volume or surface area, meet the VOC emissions evaluation AND 100% meet the VOC content evaluation.

To meet the 100% requirement for VOC content evaluation, a VOC budget may be used.

The paints and coatings product category includes all interior paints and coatings wet-applied on site, specialized finishes (dyes, sealers, hardeners and toppings for concrete floors), and plaster. Exclude foamed-in place and sprayed insulation (include in Insulation category).

2. **Adhesives and Sealants:** At least 75% of all adhesives and sealants, by volume or surface area, meet the VOC emissions evaluation AND 100% meet the VOC content evaluation.

To meet the 100% requirement for VOC content evaluation, a VOC budget may be used.

The adhesives and sealants product category includes all interior adhesives and sealants wet-applied on site.

3. **Flooring:** At least 90% of all flooring, by cost or surface area, meets the VOC emissions evaluation OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.

The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), raised flooring, wall base, transition strips/stair nosing, grills, entryway systems, underlayments, and other floor coverings.

Exclude poured concrete, subflooring (include subflooring in the composite wood category, if applicable) and wet-applied products applied on the floor (include in paints and coatings category).

4. **Wall panels:** At least 75% of all wall panels, by cost or surface area, meet the VOC emissions evaluation, OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.

The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), gypsum, curtain walls, retail slatwall, trim, interior and exterior doors, non-structural wall framing, interior and exterior windows, window film and treatments, countertops, laminate/veneer used for built-in cabinetry, non-structural sandwich panels, CMU.

Exclude cabinetry (include the composite wood components of built-in cabinetry in the composite wood category and free-standing cabinetry in the furniture category), and vertical structural elements (include structural wood panels or structural composite wood in the composite wood category, if applicable), bathroom accessories, and door hardware.

5. **Ceilings:** At least 90% of all ceilings, by cost or surface area, meet the VOC emissions evaluation, OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.

The ceilings product category includes all ceiling panels, ceiling tile, surface ceiling structures such as gypsum or plaster, suspended systems (including canopies and clouds), and glazed skylights.

Exclude overhead structural elements (include structural elements in the composite wood category, if applicable).

6. **Insulation:** At least 75% of all insulation, by cost or surface area, meets the VOC emissions evaluation.

The insulation product category includes all thermal and acoustic boards, batts, rolls, blankets, sound attention fire blankets, foamed-in place, loose-fill, blown, and sprayed insulation.

Exclude insulation for HVAC ducts and plumbing piping from the credit. Insulation for HVAC ducts may be included at the project team's discretion.

7. **Composite Wood:** At least 75% of all composite wood, by cost or surface area, meets the Formaldehyde emissions evaluation OR salvaged and reused materials criteria.

The composite wood product category includes all particleboard, medium density fiberboard (both medium density and thin), hardwood plywood with veneer, composite or combination core, and wood structural panels or structural wood products.

Exclude products covered in the flooring, ceiling, wall panels, or furniture categories from this category.

8. **(Furniture:** Do not include this category as one of the four categories chosen to comply with this credit. Furniture includes all seating, desks, tables, filing/storage, freestanding cabinetry, systems furnitures, office and bathroom partitions, shelving, lockers, etc.)

- B. **Paints and Coatings:** For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Non-flat Paints and Coatings: 50 g/L.
3. Dry-Fog Coatings: 150 g/L.
4. Primers, Sealers, and Undercoats: 100 g/L.

5. Rust-Preventive Coatings: 100 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Clear Wood Finishes, Varnishes: 275 g/L.
 9. Clear Wood Finishes, Lacquers: 275 g/L.
 10. Floor Coatings: 50 g/L.
 11. Shellacs, Clear: 730 g/L.
 12. Shellacs, Pigmented: 550 g/L.
 13. Stains: 100 g/L.
- C. Paints and Coatings: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Adhesives and Sealants: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Wood Glues: 30 g/L.
 2. Metal-to-Metal Adhesives: 30 g/L.
 3. Adhesives for Porous Materials (Except Wood): 50 g/L.
 4. Subfloor Adhesives: 50 g/L.
 5. Plastic Foam Adhesives: 50 g/L.
 6. Carpet Adhesives: 50 g/L.
 7. Carpet Pad Adhesives: 50 g/L.
 8. VCT and Asphalt Tile Adhesives: 50 g/L.
 9. Cove Base Adhesives: 50 g/L.
 10. Gypsum Board and Panel Adhesives: 50 g/L.
 11. Rubber Floor Adhesives: 60 g/L.
 12. Ceramic Tile Adhesives: 65 g/L.
 13. Multipurpose Construction Adhesives: 70 g/L.
 14. Fiberglass Adhesives: 80 g/L.

15. Contact Adhesives: 80 g/L.
16. Structural Glazing Adhesives: 100 g/L.
17. Wood Flooring Adhesives: 100 g/L.
18. Structural Wood Member Adhesives: 140 g/L.
19. Single-Ply Roof Membrane Adhesives: 250 g/L.
20. Special-Purpose Contact Adhesives (That Are Used to Bond Melamine-Covered Board, Metal, Unsupported Vinyl, Rubber, or Wood Veneer 1/16 Inch or Less in Thickness to Any Surface): 250 g/L.
21. Top and Trim Adhesives: 250 g/L.
22. Plastic Cement Welding Compounds: 250 g/L.
23. ABS Welding Compounds: 325 g/L.
24. CPVC Welding Compounds: 490 g/L.
25. PVC Welding Compounds: 510 g/L.
26. Adhesive Primer for Plastic: 550 g/L.
27. Sheet-Applied Rubber Lining Adhesives: 850 g/L.
28. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
29. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
30. Special-Purpose Aerosol Adhesives (All Types): 70 percent by weight.
31. Other Adhesives: 250 g/L.
32. Architectural Sealants: 250 g/L.
33. Nonmembrane Roof Sealants: 300 g/L.
34. Single-Ply Roof Membrane Sealants: 450 g/L.
35. Other Sealants: 420 g/L.
36. Sealant Primers for Nonporous Substrates: 250 g/L.
37. Sealant Primers for Porous Substrates: 775 g/L.
38. Modified Bituminous Sealant Primers: 500 g/L.
39. Other Sealant Primers: 750 g/L.

- E. Adhesives and Sealants: For field applications that are inside the weatherproofing system, 90 percent of adhesives and sealants shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers.
- F. "Prohibited Ingredients": Paints, coatings, adhesives, or sealants must not contain the following additives:
 - 1. Methylene chloride.
 - 2. Perchloroethylene.
- G. Flooring: Flooring shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Composite Wood: Composite wood, agrifiber products, and adhesives shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
- I. Ceilings, Walls, Thermal and Acoustical Insulation: Ceilings, walls, thermal and acoustical insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 1. Blanket insulation may contain no added formaldehyde, including urea formaldehyde, phenol formaldehyde, and urea-extended phenol formaldehyde.
- J. Exterior Applied Products: Adhesives, sealants, coatings, roofing, and waterproofing materials applied on site, 90 percent shall comply with the requirements of the VOC limits of California Air Resources Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings, and South Coast Air Quality Management District (SCAQMD), Rule 1168, effective July 1, 2005.

3.0 EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

- A. Comply with Section 017419 "Construction Waste Management and Disposal."
- B. Meet the requirements of the LEED ID+C Commercial Interiors v4 (LEED v4) "Construction and Demolition Waste Management" Credit to qualify for two points. Divert (recycle and/or salvage) at least 75% of the non-hazardous construction and demolition materials. Calculations can be by weight or volume but must be consistent throughout. Diverted materials must include at least four material streams.

3.2 CONSTRUCTION INDOOR AIR QUALITY

- A. Comply with Section 018119 "Indoor Air Quality Requirements."

3.3 GENERAL COMMISSIONING REQUIREMENTS

- A. Comply with Section 019113 "General Commissioning Requirements."



LEED v4/v4.1 for ID+C: Commercial Interiors
Project Checklist

Project Name: King-Shaw Hall
Date: 3/25/2025

Y ? N

				Notes:	Credit version
2	Credit	Integrative Process	2		
11	0	19	Location and Transportation	18	
18	Credit	LEED for Neighborhood Development Location	18		
6	Credit	Surrounding Density and Diverse Uses	8		4.1
4	Credit	Access to Quality Transit	7		4.1
1	Credit	Bicycle Facilities	1		
1	Credit	Reduced Parking Footprint	2		4.1
0	12	0	Water Efficiency	12	
Y	Prereq	Indoor Water Use Reduction	Required		
0	Credit	Indoor Water Use Reduction	12		
23	8	9	Energy and Atmosphere	39	
Y	Prereq	Fundamental Commissioning and Verification	Required		
Y	Prereq	Minimum Energy Performance	Required		
Y	Prereq	Fundamental Refrigerant Management	Required		4.0
5	Credit	Enhanced Commissioning	5		
17	Credit	Optimize Energy Performance	25		
2	Credit	Advanced Energy Metering	2		
6	Credit	Renewable Energy Production	6		
1	Credit	Enhanced Refrigerant Management	1		4.0
1	Credit	Green Power and Carbon Offsets	0		
4	1	8	Materials and Resources	13	
Y	Prereq	Storage and Collection of Recyclables	Required		
Y	Prereq	Construction and Demolition Waste Management Planning	Required		4.0
1	Credit	Long-Term Commitment	1		4.0
4	Credit	Interiors Life-Cycle Impact Reduction	4		
1	Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2		4.1

		2	Credit	Building Product Disclosure and Optimization - Sourcing of Raw M	2		
1		1	Credit	Building Product Disclosure and Optimization - Material Ingredients	2		4.1
1	1		Credit	Construction and Demolition Waste Management	2		4.0
9	9	1		Indoor Environmental Quality		17	
Y			Prereq	Minimum Indoor Air Quality Performance	Required		
Y			Prereq	Environmental Tobacco Smoke Control	Required		
1	1		Credit	Enhanced Indoor Air Quality Strategies	2		
3			Credit	Low-Emitting Materials	3		4.1
1			Credit	Construction Indoor Air Quality Management Plan	1		
2			Credit	Indoor Air Quality Assessment	2		
1			Credit	Thermal Comfort	1		
1	2	1	Credit	Interior Lighting	2		
	3		Credit	Daylight	3		
	1		Credit	Quality Views	1		
	2		Credit	Acoustic Performance	2		
4	2	0		Innovation		6	
3	2		Credit	Innovation	5		4.0
1			Credit	LEED Accredited Professional	1		4.1
2	1	3		Regional Priority - Up to 4 available		4	
1			Credit	Regional Priority: Quality Transit	1		
		1	Credit	Regional Priority: Bicycle Facilities	1		
	1		Credit	Regional Priority: Indoor Water Use Reduction (8)	1		
1			Credit	Regional Priority: Optimize Energy Performance	1		
		1	Credit	Regional Priority: Renewable Energy Production	1		
		1	Credit	Regional Priority: Interiors Lifecycle Impact Reduction	1		
53	35	40		TOTALS		Possible Points: 111	

Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80+

*** END OF SECTION 01 81 13***

SECTION 01 81 19 INDOOR AIR QUALITY REQUIREMENTS

1.0 GENERAL

1.1 SUMMARY

A. Section Includes

1. Requirements for construction indoor-air-quality (IAQ) management
2. Requirements for indoor-air-quality (IAQ) assessment before occupancy

1.2 DEFINITIONS

A. Type 1 Finish Classification: Materials and finishes which emit and/or off gas particulate, VOCs, or hazardous air pollutants as manufactured, prior to and during installation and/or curing. Type 1 Finishes include, but are not limited to, the following:

1. Composite wood products such as structural composite lumber and MDF.
2. Adhesives, sealants, and glazing compounds.
3. Transparent finishes.
4. Paint.
5. Sealers.
6. Gypsum board and associated finish processes.
7. Wood flooring and associated finish procedures.

B. Type 2 Finish Classification: Adsorptive materials and finishes which are woven, fibrous, or porous in nature and adsorb particulate, VOCs, and hazardous air pollutants emitted by Type 1 finishes. Type 2 Finishes include, but are not limited to, the following:

1. Carpet and carpet cushion.
2. Fabric wallcovering.
3. Exposed acoustic insulation.
4. Acoustic ceiling materials.
5. Acoustic wall panels.
6. Upholstered furnishings.

C. Materials classified as both Type 1 and Type 2 shall be considered to be Type 1.

- D. Air Zone: That part of any floor area served by a single air handling unit.

1.3 SUBMITTALS

- A. Construction Indoor-Air-Quality (IAQ) Management:
1. Construction IAQ management plan.
 2. Product data for temporary filtration media.
 3. Product data for filtration media used during occupancy.
 4. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.
- B. IAQ Assessment:
1. Signed statement describing the building air flush-out procedures, including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
 2. Product data for filtration media used during flush-out and occupancy.
 3. Report from testing and inspecting agency indicating results of IAQ testing and documentation showing compliance with IAQ testing procedures and requirements.
- C. Finishes Installation Sequencing Schedule: Submit a schedule of construction indicating the following:
1. Sequence of finishes applications and allowances for curing times within each air zone. Identify finishes, indicating their type classifications.
 2. Types and durations of proposed temporary ventilation. Show schedule for commissioning procedures and temporary usages of building mechanical systems, identifying types of filtration used and schedule of filter replacement and change-outs.

1.4 QUALITY ASSURANCE

- A. Preconstruction IAQ Management Conference: Conduct conference at Project site. Review methods and procedures related to IAQ management including, but not limited to, the following:
1. Review and discuss IAQ management plan including responsibilities of IAQ Management Coordinator.
 2. Review requirements for documenting IAQ Management measures.
 3. Review procedures for materials separation and storage areas.
 4. Review proposed finishes installation sequencing schedule.

5. Review IAQ management requirements for each trade.

1.5 CONSTRUCTION INDOOR-AIR-QUALITY (IAQ) MANAGEMENT PLAN

- A. Construction IAQ Management Plan: Provide a plan indicating IAQ management measures in accordance with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings Under Construction". List each measure to be implemented and describe implementation procedures. List measures applicable to project including, but not limited to, the following:
 1. HVAC Protection:
 - a. Use of temporary ventilation units.
 - b. Protection of all HVAC equipment from dust and odors and sealing of duct and equipment openings with plastic.
 - c. Protection of return side of system when system serves occupied spaces or protects finished work.
 - d. Installation and maintenance of temporary filters over grilles and openings if returns cannot be closed. Isolation of unducted plenums over construction zones, if used.
 - e. Avoidance of use of mechanical rooms for construction storage.
 - f. Replacement of all filtration media before occupancy.
 2. Source Control:
 - a. Identification of control measures for materials containing VOCs.
 - b. Recovery, isolation, and ventilation of containers containing toxic materials.
 - c. Exhausting of fume
 3. Pathway Interruption:
 - a. Isolation of construction activity from completed or occupied spaces.
 - b. Ventilation using 100 percent outside air, when allowed by weather.
 - c. Depressurization of construction areas.
 - d. Use of temporary barrier to contain construction area.
 4. Progress Cleaning:
 - a. Implementation of cleaning activities to control contaminants in building spaces during construction and before occupancy.
 - b. Protection of all porous building materials from exposure to moisture and storage in clean areas.

- c. Use of vacuum cleaners with high-efficiency particulate filters.
 - d. Increased cleaning frequency and use of wetting agents for dust.
5. Scheduling:
- a. Coordination of construction activities to minimize disruption to occupied areas.
 - b. Sequencing of construction activities to minimize impact on indoor air quality.

2.0 PRODUCTS

2.1 MATERIALS

- A. Filters: MERV rating of not less than 8.

3.0 EXECUTION

3.1 CONSTRUCTION IAQ MANAGEMENT

- A. Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
 - 1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period, install MERV 8 filter media at each return-air inlet for the air-handling system used during construction.
 - 2. Replace air filters immediately prior to occupancy.
 - 3. Store ductwork and air handling equipment in a clean, dry location prior to installation. Securely cover openings to prevent entry of dust, moisture, general construction debris, dirt and vermin.
- B. Protect absorptive materials stored on-site and installed from moisture damage.
- C. Tobacco Products: Use of tobacco products is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor air intakes.
- D. Sequence finishes application and installation activities to ensure that Type 1 finishes are applied and installed prior to application and installation of Type 2 finishes and that sufficient time is provided in the construction schedule for complete drying and curing of Type 1 finishes prior to the installation and application of Type 2 finishes. Store fuels, solvents, and other sources of VOCs separately from Type 2 finishes and other absorptive materials.

3.2 IAQ ASSESSMENT

- A. Air-Quality Testing: Engage testing agency to perform the following:
1. Conduct baseline IAQ testing, after Substantial Completion and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the LEED rating system table "Maximum Concentration Levels, by Contaminant and Testing Method."
 2. Demonstrate that the contaminant maximum concentrations are not exceeded.
 3. For each sampling point where the maximum concentration limits are exceeded, take corrective action until requirements have been met.
 4. Air-sample testing shall be conducted as follows:
 - a. All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside-air flow rate for the occupied mode throughout the duration of the air testing.
 - b. Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 5000 sq. ft..
 - c. Air samples shall be collected between 3 and 6 feet from the floor to represent the breathing zone of occupants.

*****END OF SECTION 01 81 19*****

SECTION 01 91 13 GENERAL COMMISSIONING REQUIREMENTS

1.0 GENERAL

1.1 SUMMARY

- A. This section includes general administrative and procedural requirements for the commissioning process to supplement other general commissioning process activity sections and other technical sections that specify testing of components, systems and assemblies.
- B. Related Sections include the following:
 - 1. Division 22 Section "Commissioning of Plumbing" for commissioning process activities for plumbing systems, assemblies, equipment, and components.
 - 2. Division 23 Section "Commissioning of HVAC" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.
 - 3. Division 26 Section "Commissioning of Electrical Systems" for commissioning process activities for electrical systems, assemblies, equipment, and components.

1.2 DESCRIPTION

- A. Commissioning is a systematic process of confirming that all building systems perform interactively according to the Owner's Program Requirements and the Basis of Design and continuing through construction, acceptance and the warranty period with actual verification of performance.
- B. Commissioning during design is intended to achieve the following specific objectives:
 - 1. Verify the Owner's Program Requirements and Basis of Design are clearly documented and they meet the Owner's goals and objectives.
 - 2. Provide Design Review during AE design efforts.
 - 3. Verify commissioning for the construction phase is adequately reflected in the bid documents.
- C. Commissioning during the construction phase of this project is intended to achieve the following specific objectives:
 - 1. Provide direction for the commissioning process during construction, particularly providing resolution to issues and providing details not developed during design (ex. scheduling, participation of various parties, lines of reporting and approvals, coordination, etc.)
 - 2. Verify that applicable equipment and systems are installed properly and receive adequate operational checkout by installing contractors.

3. Verify and document proper performance of equipment and systems.
 4. Verify that O&M documentation left on site is complete.
 5. Verify that the Owner's operating personnel are adequately trained.
- D. The Commissioning process does not take away from or reduce the responsibility of the system designers to design a workable system nor the installing contractors to provide a finished and fully functioning product.
- E. The CxA directs and coordinates the commissioning activities and reports to the Owner. All members in the construction process work together to fulfill their contracted responsibilities and meet the objectives of the Owner's Project Requirement's as detailed in the Contract Documents.
- F. The CxA works with the CM/GC according to established protocols to schedule the commissioning activities. The CxA will provide sufficient notice to the CM/GC and Owner for scheduling commissioning activities. Meanwhile, the CxA will integrate these activities into the master construction schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.
- G. The following narrative provides a brief overview of the commissioning tasks during construction and the general order in which they occur.
1. Commissioning during construction begins with a Commissioning Kick-Off Meeting – Construction Team conducted by the CxA where the commissioning process is reviewed with the commissioning team members.
 2. Additional meetings will be required throughout construction, scheduled by the CxA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
 3. Equipment documentation is submitted to the CxA through the submittal process, including detailed start-up procedures.
 4. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with Pre-functional checklists being completed before functional testing begins.
 5. The contractors, under their own direction, document and perform startup and initial checkout. The CxA documents that startup was completed according to the approved plans, when contracted. This may include the CxA witnessing start-up of selected equipment, if contracted.
 6. The CxA verifies installation integrity through the use of checklists.
 7. The CxA develops specific equipment and system functional performance test procedures. The contractors review the procedures.
 8. The procedures are executed by the contractors, under the direction of, and documented by the CxA.

9. Items of non-compliance in material, installation or setup are corrected at the contractor's expense and the system retested.
10. The CxA reviews the O&M documentation for completeness.
11. Commissioning is completed before Substantial Completion, whenever possible.
12. The CxA reviews and pre-approves the training plan provided by the contractors.
13. The contractors coordinate and provide training via qualified instructors.
14. Training occurs.
15. The Owner verifies that training has occurred and provides a written statement that training has occurred.
16. Deferred testing is conducted, as specified or required.

1.3 DEFINITIONS

- A. Acceptance: A formal action, to declare that some aspect of the project meets defined requirements, thus permitting subsequent activities to proceed.
- B. Acceptance Phase: Phase of commissioning after start-up and initial checkout when functional performance tests, O&M documentation review and training occurs.
- C. Architect/Engineer (AE): the prime Consultant (Architect) and Subconsultants who comprise the design team, generally the HVAC Mechanical Designer/Engineer, the Electrical Designer/Engineer and various other Subconsultants.
- D. Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the contract documents.
- E. Basis of Design (BOD): A document that records concepts, calculations, decisions and product selections used to meet the Owner's Project Requirements and to satisfy applicable regulatory requirements, standards and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process. Also known as the Design Criteria.
- F. Checklists: Verification checklists that are developed and used during all phases of the commissioning process to verify that the Owner's Project Requirements are being achieved. This includes checklists for general verification, plus testing, training, and other specific requirements.
- G. Commissioning Authority (CxA): An entity identified by the Owner who plans, schedules and coordinates the commissioning team to implement the Commissioning Process. The Owner will engage an engineering firm for the CxA under a separate contract.
- H. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

- I. Commissioning Process: A quality-focused process for enhancing the delivery of a project and includes verifying and documenting that the facility and its systems and assemblies are planned, designed, installed, tested, operated and maintained to meet the Owner's Project Requirements.
- J. Commissioning Process Progress Report: A written document that details activities completed as part of the commissioning process and significant findings from those activities that is continuously updated during the course of a project.
- K. Commissioning Report: A document recording the results of the commissioning process, including the record documents, performance of the commissioned systems and documents all sign-offs.
- L. Commissioning Specifications: The contract document that details the objective, scope and implementation of the construction and acceptance phases of the commissioning process as developed in the Commissioning Plan.
- M. Commissioning Team: A team comprised of the CxA, Owner, AE, Construction Manager/General Contractor, Contractors, maintenance and operations personnel, and occupants. Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action.
- N. Contract Documents: The documents binding on parties involved in the construction of this project (drawings, specifications, change orders, amendments, contracts, Cx Plan, etc.)
- O. Contractor: the CM or Subcontractors authorized representatives.
- P. Construction Manager (CM): the prime contractor for this project. Generally refers to all the CM's Subcontractors as well. Also referred to as the Contractor, in some contexts.
- Q. Data Logging: The monitoring and recording of flow, current, status, pressure, etc. of equipment using 'stand-alone' data recorders separate from the control system or the trending capacities of control systems.
- R. Deferred Performance Tests (DPTs): Performance tests that are performed, at the discretion of the CxA, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design, or other site conditions that disallow the test from being performed.
- S. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the Owner's Project Requirements).
- T. Equipment Manufacturer: The multiple companies that will manufacturer equipment and products for the commissioned systems and who will participate as required in the commissioning activities.
- U. Factory Testing: Testing of equipment on-site or at the factory, by factory personnel, with or without Owner's representative present.

- V. **Functional Performance Test:** The testing of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, etc. The systems are run through all the control system's sequence of operation and components are verified to be responding as the sequences state. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor.
- W. **General Contractor:** The prime contractor for this project. Generally refers to all the GC's Subcontractors as well. Also referred to as the Contractor, in some contexts.
- X. **HVAC&R:** Heating, Ventilating, Air Conditioning, and Refrigeration.
- Y. **Issues Log:** A formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the commissioning team during the course of the commissioning process.
- Z. **Manual Test:** Using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the 'observation').
- AA. **Monitoring:** The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.
- BB. **Non-Compliance:** See Deficiency.
- CC. **Non-Conformance:** See Deficiency.
- DD. **Owner's Project Requirements (OPR):** A written document that details functional requirements of the Project and the expectations of how the Project will be used and operated. This includes project and design goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information. (Also formerly known as the Design Intent Document.)
- EE. **Owner's Representative or Project Manager (Owner):** The contracting and managing authority for the Owner who oversees the design and/or construction of the project.
- FF. **Over-written Value:** Writing over a sensor value in the control system to see the response of a system.
- GG. **Phased Commissioning:** Commissioning that is completed in phases (by floors, for example) due to the size of a project or other scheduling issues, in order to minimize the total construction time.
- HH. **Re-Commissioning Management Manual:** A single manual that contains information required for recommissioning the projects' building systems.
- II. **Sampling:** Functionally testing only a fraction of the total number of identical or near identical pieces of equipment.

- JJ. Seasonal Performance Test: Performance tests that are deferred until the system(s) will experience conditions closer to their design conditions based on weather conditions.
- KK. Simulated Condition: Condition that is created for the purpose of testing the response of a system (eg. Raising/lowering the set-point of a thermostat to see the response in a VAV box).
- LL. Simulated Signal: Disconnecting a sensor and using a signal generator to simulate a sensor value for the purpose of testing a full range of conditions.
- MM. Startup: The initial starting or activating of dynamic equipment, including completing construction checklists.
- NN. Systems Manual: A systems focused composite document that includes the operation manual, maintenance manual, and additional information of use to the Owner during the occupancy and operations phase.
- OO. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean “as-built” systems, subsystems, and equipment.
- PP. Test Procedures: The step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CxA.
- QQ. Test Requirements: Requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents.
- RR. Training Plan: A written document that details the expectations, schedule, budget and deliverables of commissioning process activities related to training of project operating and maintenance personnel, users, and occupants.
- SS. Trending: Monitoring over a period of time.
- TT. Verification: The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner’s Project Requirements.
- UU. Warranty Period: Warranty period for the entire project, including equipment components, begins at Substantial Completion, and extends typically for Submittals.

1.4 QUALITY ASSURANCE

- A. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer’s calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.5 COORDINATION

- A. Commissioning Kick-Off Meeting – Construction Team: Contractors will attend a meeting of the Commissioning Team, chaired by the CxA, to review the scope of commissioning process activities and the Commissioning Plan with discussions on milestones, activities, and assignments of responsibilities. The flow and type of documents and the amount of submittal data given to the CxA will be determined. Meeting minutes will then be distributed to all parties by the CxA.
- B. Commissioning Meetings: Contractors will attend coordination meetings with the Commissioning Team, chaired by the CxA, to review progress on the Commissioning Plan, construction deficiencies, scheduling conflicts, and to discuss strategies and processes for upcoming commissioning process activities.
- C. Miscellaneous Construction Meetings: The CxA attends selected planning and job-site meetings in order to remain informed on construction progress and to update parties involved in the commissioning process.
- D. Pre-testing Meetings: Contractors will attend pretest meetings with the Commissioning Team, chaired by the CxA, to review startup reports, pre-test inspection results, testing procedures, testing personnel and instrumentation requirements, and manufacturers’ authorized service representative services for each system, subsystem, equipment, and component to be tested.
- E. Testing: Contractors will coordinate with testing personnel and agencies for timing and access for CxA to witness test.
- F. Manufacturers’ Inspection and Startup Services: Contractors will coordinate services of manufacturers’ inspection and startup services.
- G. Testing, Adjusting and Balancing: Contractors will coordinate with plan and schedule for testing, adjusting and balancing for timing and access for CxA to witness process.

2.0 PRODUCTS

2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by Testing, Adjusting, and Balancing (TAB) in their commissioning responsibilities. A sufficient quantity of two-way radios shall be provided by each Subcontractor.
- B. Special equipment, tools and instruments (specific to a piece of equipment and only available from the vendor) required for testing shall be included in the base bid price to the Owner and left on site, except for stand-alone data logging equipment that may be used by the CxA.

- C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.
- D. Data logging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the Owner.
- E. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

3.0 EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

- A. Submittals: See Section 1.5 – SUBMITTALS for requirements.
- B. Checklists
 - 1. The CxA will prepare Pre-Functional Checklists for all commissioned components, equipment, and systems.
- C. **Red-lined Drawings:** The Contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings. Preliminary red-lined drawings must be available to the Commissioning Team for use prior to start of the Functional Performance Testing. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- D. **Operation and Maintenance Data:** Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems. The CxA will review the O&M literature once for conformance to project requirements. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.
- E. **Demonstration and Training:** Contractor will provide demonstration and training as required by the specifications. A complete training plan and schedule must be submitted by the Contractor to the CxA two weeks (2) prior to any training. A training agenda for each training session must be submitted to the CxA two (2) weeks prior the training session.

3.2 OWNER'S RESPONSIBILITIES

- A. Provide the Owner's Project Requirements (OPR) documentation to the CxA and Contractors for use in developing the Commissioning Plan; testing plans and checklists.
- B. Provide the Basis of Design documents, prepared by the architect and approved by the Owner, for use in developing the Commissioning Plan; testing plans and checklists.
- C. Assign operation and maintenance personnel and schedule them to participate in Commissioning Team activities including, but not limited to, the following:
 - 1. Commissioning meetings.
 - 2. Construction phase coordination meetings.
 - 3. Piping and ductwork testing and flushing verification meetings.
 - 4. Procedures meeting for testing, adjusting and balancing.
 - 5. Testing and demonstration of systems, subsystems and equipment.
 - 6. Training in operation and maintenance of systems, subsystems and equipment.
 - 7. Final review and acceptance meetings
- D. Provide utility services required for the commissioning process.
- E. Facilitate the coordination of the commissioning work between the CxA, the Contractor and the Architect and Engineers to ensure that the commissioning activities are incorporated into the master schedule.
- F. Review and approve the commissioning plan.
- G. Coordinate any seasonal or deferred testing.
- H. Ensure that any seasonal, deferred testing and/or deficiency issues are addressed.

3.3 ARCHITECT'S DUTIES

- A. Attend the Commissioning Kick-Off Meeting – Design Team, Commissioning Kick-Off Meeting – Construction Team and selected team meetings.
- B. Perform submittal review, construction observation, as-built drawing preparation, other items as contracted.
- C. Provide the Basis of Design Document. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

- D. Participate in the resolution of system deficiencies identified during the commissioning, according to the contract documents.
- E. Construction Record documents and specifications.
- F. Ensure that the CxA's submittals comments are incorporated into the Design Professional's submittal comments prior to sending to CM or GC for distribution.
- G. Facility operating procedures for normal, abnormal, and emergency modes of operation.
- H. Participate in resolution of design non-conformance and design deficiencies identified during the warranty-period commissioning process.

3.4 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following brief overview:
 - 1. Facilitate the coordination of commissioning and incorporate commissioning activities into the overall project.
 - 2. Provide copies of all applicable submittals as required in Division 01 including all changes thereto.
 - 3. Provide detailed startup procedures.
 - 4. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, perform corrective actions.
 - 5. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
 - 6. Attend commissioning team meetings held on a scheduled basis.
 - 7. Furnish a copy of all construction documents, addenda, change orders, and approved submittals and shop drawings related to commissioned equipment to the CxA. Furnish a copy of the O&M literature to the CxA forty five (45) days after final equipment submittals.
 - 8. In each purchase order or subcontract written, include requirements for submittal data, O&M literature, commissioning tasks and training.
 - 9. Integrate and coordinate commissioning process activities with construction schedule.
 - 10. Review and accept construction checklists provided by the CxA.
 - 11. Review and accept commissioning process test procedures provided by the CxA.
 - 12. Complete commissioning process test procedures.

13. Submit training plan for approval, coordinate training and provide qualified instructors for training of Owner personnel.
14. Assist the CxA as necessary in the seasonal testing, deferred testing and deficiency resolution.
15. Ensure that Subcontractors correct deficiencies and make necessary adjustments to submittals, O&M manuals and red-lined drawings for applicable issues identified in any seasonal testing.
16. Provide written as-built controls drawings and sequences of operation for all equipment.
17. Provide a written list of time of day schedules and a schedule frequency to review them for relevance and efficiency.
18. Provide written recommendations for recalibration frequency of sensors and actuators by type and use.
19. Provide a written list of all user adjustable set-points and reset schedules with a brief discussion of the purpose of each and the range of reasonable adjustments with energy implications
20. Provide a written schedule frequency to review the various set-points and reset schedules to ensure they are current relevant and efficient values.

3.5 EQUIPMENT SUPPLIER'S RESPONSIBILITIES

A. Roles and Responsibilities

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.
2. Assist in equipment testing per agreements with Subcontractors.
3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.

3.6 COMMISSIONING AGENT'S RESPONSIBILITIES

A. Roles and Responsibilities

1. The CxA is not responsible for the design concept, the design criteria, compliance with codes, design or general construction scheduling, cost estimating or construction management.

2. The CxA may assist with problem solving and non-conformance items or deficiencies, but the CxA is not the Design Engineer / Engineer of Record, and the commissioning process does not preclude the design engineer / Engineer of Record of responsibilities for system evaluations, adequacy of systems to meet the OPR, capacities of systems, quality control checks, or any of the other elements and recommended final acceptance of systems to the Owner.
3. The primary role of the CxA is to coordinate and direct the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultants with all necessary parties, frequently updated timelines and schedules and technical expertise.

B. Commissioning Plan

1. The CxA shall develop a Commissioning Plan at the start of the project. The Commissioning Plan shall outline the organization, schedule, allocation of resources, and documentation requirements of the Commissioning Process.
2. The Commissioning Plan shall be a “living document” in which information is added to or modified by the Commissioning Team during the course of the Project.
3. At the end of the Project, the CxA shall provide the Owner with the Final Commissioning Plan for the Owner’s use.

C. Document Review

1. Review the Owner’s Project Requirements and Basis of Design developed by the design professionals.
2. Perform a focused review of the drawings and specification during the Design Development and near the end of the Construction Document Phase, if contracted.
3. Develop full commissioning specifications for all systems and equipment to be commissioned. The commissioning specifications will be subject to approval of the design team and included in the final construction specifications.
4. Review submittals applicable to systems being commissioned for compliance for commissioning needs, concurrent with the AE’s reviews.

D. Cx Team Meetings

1. Commissioning during construction will begin with a ‘Commissioning Kick-Off Meeting – for Construction Team’ conducted by the CxA where the commissioning process is reviewed with all of the commissioning team members.
2. Additional meetings may be required throughout construction, and will be scheduled by the CxA on a weekly basis with necessary parties of the commissioning team attending, in order to plan, scope, coordinate, and schedule future activities and resolve problems.

- E. Coordination and Scheduling
 - 1. Coordinate and direct commissioning activities in a logical, sequential, and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications, and consultations with all necessary parties.
 - 2. Coordinate commissioning work with the CM/GC to ensure that commissioning activities are being scheduled into the master project schedule.
- F. Commissioning Progress
 - 1. Perform site visits, as necessary, to observe component and system installations.
 - 2. Attend selected planning and jobsite meetings to obtain information on construction progress.
 - 3. Review construction meeting minutes for revisions/substitutions relating to the commissioning process.
- G. Pipe Testing, Flushing and Cleaning
 - 1. Coordinate with EHS, Cornell Pipe Shop, and other necessary departments.
 - 2. Review and approve the pipe testing, flushing and cleaning plan submitted by the Contractor.
 - 3. Witness all or part of the pipe testing, flushing and cleaning and be sufficiently confident that proper procedures are being followed.
 - 4. Document via the Commissioning Issues Log any deficiencies in the procedures or results.
- H. Pre-Functional Checks
 - 1. Verify proper installation of components, equipment, systems and assemblies. Sampling procedures may NOT be employed on systems and equipment.
- I. Equipment and System Startup and Verification
 - 1. Review and approve component, equipment, system and assembly startup plan developed and submitted by the Contractor.
 - 2. Approve system startup by reviewing startup reports, if contracted; and by selected site observation.
 - 3. Review the Testing, Adjusting and Balancing execution plan for the project, which shall be submitted by the TAB Subcontractor.
 - 4. Verify and document the accuracy of the air and water systems balancing by spot testing the air and water reported field values with TAB Subcontractors and by reviewing completed reports.

- J. Functional Performance Testing
1. With assistance from the Contractor, write Functional Performance Testing procedures for all components, equipment or systems to be commissioned.
 2. With the assistance of the Contractors, coordinate Functional Performance Testing. Witness and approve Functional Performance Testing performed by the Contractors.
 3. With the assistance of the Contractors, coordinate retesting as necessary until satisfactory performance is achieved.
 4. Witness seasonal or deferred Functional Performance Testing as necessary.
- K. Issue/Deficiency Logs
1. The CxA shall prepare a formal, ongoing, online record of deficiencies, problems and concerns – and their resolution – raised by members of the Commissioning Team during the Commissioning Process.
 2. Issues will be recorded on an online Commissioning Issues Log for the AE, CM/GC and Contractors to resolve to the satisfaction of the Owner. Issues will be added by the CxA. Team members are required to post their own responses to issues pertaining to their work. Team members are required to respond to issues added to the list within five (5) working days of being added by the CxA.
 3. Issues will be revisited one (1) time to verify that the proper corrections have been made. The Owner reserves the right to deduct from the Contractors' contract costs associated with additional revisits required for outstanding issues.
 4. When issues are resolved, they will be closed on the Issues Log by the CxA.
- L. Operation and Maintenance Data
1. The CxA shall review of the documentation submitted by the Contractor as required by the Specifications for completeness and accuracy. This commissioning review supplements, but does not replace, the Architect/Engineer's review.
 2. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined.
- M. Training
1. The CM/GC and Contractors will provide all documentation and qualified training personnel for training.
 2. The CxA will verify through the Contractor's plan and schedule, training agendas, and select observations that proper training procedures were followed on all commissioned systems.
 3. See appropriate section below pertaining to training.

- N. Systems Manual Requirements
 - 1. Index of Systems Manual with notation as to content storage location if not in actual manual.
 - 2. Executive Summary
 - 3. A list of recommended operational record keeping procedures at the facility level, including sample forms, trend logs, or others, and a rationale for each.
 - 4. Maintenance procedures, schedules and recommendations.
 - 5. Ongoing Optimization
- O. Post Occupancy Review
 - 1. The CxA will return to the site within the 12-month warranty period to address the following: review current building operations with facility staff and address outstanding issues related to the Owner's Project Requirements; interview facility staff and identify problems or concerns with operating the building; identify problems covered under warranty or under the original construction contract.
 - 2. The CxA will make suggestions for improvements in the content of the O&M Manuals. Any required changes shall be made by the contractor responsible for that section.
 - 3. The CxA shall assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.
- P. Commissioning Final Report
 - 1. The CxA shall provide a final report following the completion of all Functional Performance Testing. The report is to outline compliance and non-compliance to the construction documents, as well as identify concerns relative to future performance.

3.7 GENERAL TESTING REQUIREMENTS

- A. Pre-functional checklists are important to ensure that the equipment and systems are installed and operational. They ensure that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full pre-functional checkout. The pre-functional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system. The Commissioning Agent shall complete the pre-functional checks in the field, with assistance from the installing Contractors (where necessary).
- B. The installing contractors, under the direction of the CxA, shall perform Functional Performance Testing of systems and sub-system performance after Pre-Functional checks have been completed and all outstanding issues resolved.

- C. The installing contractor will perform tests specified in Division 1 commissioning process activity sections, and other sections specifying approved testing procedures.
 - 1. Verify and test performance using actual conditions whenever possible.
 - 2. Simulate conditions by imposing an artificial load when it is not practical to test under actual conditions. Set and document simulated conditions and methods of simulation. After test, return settings to normal operating conditions.
 - 3. Alter set points when simulating conditions is not practical.
- D. The CxA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the Contractors for review and comment.
- E. Deficiencies/Non-Conformance
 - 1. The CxA will record the results of the functional test on the test form. All deficiencies or non-conformance items shall be noted and reported to the Owner, lead Consultant, and Contractors.
 - 2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA.
 - 3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.
 - 4. As tests progress and a deficiency is identified, the CxA discusses the issue with the executing contractor.
 - 5. When there is no dispute on the deficiency and the contractor accepts responsibility to correct it, the CxA documents the deficiency and the contractor's response and intentions or corrections. The CxA and contractor then proceed to another test or sequence. Once the contractor corrects the deficiency, the test is rescheduled and repeated in the anticipation of correct operation or function. If a deficiency is identified, the cost of retesting will be as per section 3.7.
 - 6. When there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible, the CxA documents the deficiency and the contractor's response. The deficiency is then forwarded to parties assumed to be responsible for the deficiency. Resolutions are made at the lowest management level possible. Other parties are brought into the discussion as needed. Final interpretive authority is with the AE. Final acceptance authority is with the Owner and CxA. The CxA will then document the resolution process. Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency. The CxA then reschedules the test as stated in the section above. Costs of retesting are as stated below in the applicable section.

F. Cost of Retesting

1. The cost for the contractor to retest a pre-functional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the CM/GC.
2. For a deficiency identified, not related to any pre-functional checklist or start-up fault, the following shall apply: The CxA will direct the retesting of the equipment once at no “charge” to the CM/GC for their time. However, the CxA’s and owner’s time for a second retest will be charged to the CM/GC, who may choose to recover costs from the responsible contractor or subcontractor. Before retesting occurs, the CM/GC will inspect the deficiency and respond to the CxA that the issue has been addressed.
3. The time for the CxA and owner to direct any retesting required because a specific pre-functional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be back charged to the CM/GC, who may choose to recover costs from the party responsible for misinformation or deficiency.
4. The contractor shall respond in writing to the CxA and Owner at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
5. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the CM/GC, contractors or subcontractors.

G. Failure due to Manufacturer Defect

1. If 10% or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CM/GC, CxA or Owner. In such case, the Contractor shall provide the Owner with the following:
 - a. Within one week of notification from the CM/GC or Owner, the Contractor or manufacturer’s representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CM/GC or Owner within two weeks of the original notice.
 - b. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
2. The CM/GC, CxA or Owner will determine whether a replacement of all identical units or a repair is acceptable.

3. Two examples of the proposed solution will be installed by the Contractor and the Contractor will be allowed to test the installations for up to one week, upon which the CxA or owner will decide whether to accept the solution.
4. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

H. Approval

1. The CxA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CxA. The CxA recommends acceptance of each test to the Owner using a standard form.

I. Deferred Testing

1. Unforeseen Deferred Testing – If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the Owner. These tests will be conducted in the same manner as the seasonal tests, as soon as possible. Services of necessary parties will be negotiated.
2. Seasonal Testing - During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system’s design) shall be completed as part of this contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate contractors, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and record documents due to seasonal testing will be made by the contractor.

3.8 SYSTEMS TO BE COMMISSIONED

- A. Refer to individual sections listed in Section 1.2 – SUMMARY for specific systems to be commissioned.

3.9 OPERATION AND MAINTENANCE MANUALS

- A. The specific content and format requirements for the standard O&M manuals are detailed in Division 01. Special requirements for the controls contractor and TAB contractor are found in Division 23.
- B. AE Contribution – The AE will include in the beginning of the O&M manuals a separate section describing the systems including the Basis of Design prepared by the AE. They will also provide Simplified professionally drawn single line system diagrams on 8 ½” x 11” or 11” x 17” sheets. These shall include (ex. chillers/hot water system(s), condenser water system, supply air systems, exhaust systems, etc.). These shall show major pieces of equipment such as (ex. pumps, chillers, heat exchangers, control valves, expansion tanks, coils, service valves, etc.).

- C. CxA Review and Approval - Prior to substantial completion, the CxA shall review the O&M manuals, documentation and record documents for systems that were commissioned to verify compliance with the Specifications. The CxA will communicate deficiencies in the manuals to the CM/GC, Owner or AE, as requested. Upon a successful review of the corrections, the CxA recommends approval and acceptance of these sections of the O&M manuals to the CM/GC, Owner or AE. The CxA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the AE's review of the O&M manuals according to the AE's contract.

3.10 TRAINING OF OWNER PERSONNEL

- A. The CM/GC and contractors shall be responsible for training coordination, scheduling and ultimately for ensuring that training is completed.
- B. The CxA shall oversee the training of Owner's personnel for commissioned equipment and systems.
1. The CxA shall interview the Owner's staff to determine the special needs and areas where training will be most valuable. The Owner and CxA shall decide how rigorous the training should be for each piece of commissioned equipment. The CxA shall communicate the results to the CM/GC and contractors. Who will in turn communicate to the Subcontractors and vendors who also have training responsibilities.
 2. In addition to these general requirements, the specific training requirements of Owner personnel by contractors, subcontractors and vendors is specified in the individual sections listed in Section 1.2 – SUMMARY.
 3. Each Sub and vendor responsible for training will submit a written training plan to the CM/GC and/or contractors for review and approval prior to training. The CM/GC and/or contractors will submit one comprehensive training plan to the CxA and Owner.
 4. The plan will be reviewed by the CxA and Owner. Comments pertaining to its deficiencies will be forwarded to the CM/GC and Contractors. The training plan will be rewritten until approved by the CxA and Owner. The final approved training plan will cover the following elements:
 - a. Equipment (included in training)
 - b. Intended audience
 - c. Location of training
 - d. Objectives
 - e. Subjects covered (description, duration of discussion, special methods, etc.)
 - f. Duration of training on each subject
 - g. Qualified instructor for each subject
 - h. Instructor qualifications
 - i. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)

5. For the primary HVAC equipment, the Controls Subcontractor shall provide a discussion of the control of the equipment during the mechanical or electrical training conducted by each Subcontractor or vendor.
6. Training documentation shall include the following items:
 - a. Copy of the training plan, including schedule, syllabus, and agenda.
 - b. Copy of the Owner's Program Requirements.
 - c. Copy of the Basis of Design.
 - d. Compiled operations manuals.
 - e. Compiled maintenance manuals.
 - f. Completed manufacturer training manuals.
 - g. Red-lined drawings.
 - h. Other pertinent documents.
7. The CxA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CxA recommends approval of the training to the Owner using a standard form. The owner signs the approval form/letter template.
8. At one of the training sessions, the CxA provides a presentation discussing the use of the blank functional test forms for re-commissioning equipment
9. Recording of the training sessions in will be provided by the CM/GC, with recordings documented by the CM/GC and added to the O&M manuals, if required by Division 1 specifications.
10. The mechanical design engineer shall at the first training session present the overall system design concept and the design concept of each equipment section. This presentation shall be one to two hours in length and include a review of mechanical systems using the simplified system schematics (one-line drawings).

3.11 REPORTING

- A. The CxA will provide regular reports to the Owner, on a pre-determined frequency in accordance with the project schedule. The CxA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.
- B. The CxA will keep all documentation and log all commissioning-related issues that require current or future attention including deficiencies. An agreed-upon form will track the status of documentation and testing for each piece of equipment and system.

3.12 COMMISSIONING DOCUMENTATION

- A. The CxA oversees and maintains the development of commissioning documentation. The commissioning documentation shall be kept electronically, and organized by system and sub-system when practical. All pages shall be numbered, and a table of contents page(s) shall be provided. The commissioning documentation shall include, but not be limited to, the following:
1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
 2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
 3. Process and schedule for completing construction checklists and manufacturer's pre-start and startup checklists for systems, assemblies, equipment, and components to be verified and tested.
 4. Certificate of completion certifying that installation, pre-start checks, and startup procedures have been completed.
 5. Certificate of readiness certifying that systems, subsystems, equipment, and associated controls are ready for testing.
 6. Test and inspection reports and certificates.
 7. Corrective action documents.
 8. Verification of testing, adjusting, and balancing reports.
 9. Approved final test and balance report for the building being commissioned.
 10. All accepted shop drawings of systems equipment.
 11. All pre-functional performance test checklists, signed by personnel performing and/or witnessing test, organized by system and sub-system.
 12. All verification and functional performance test checklists/results, signed by personnel performing and/or witnessing test, organized by system and sub-system. This information may be used for calibrating the original energy simulation model. The revised model will be used to create the baseline for energy use in the building.

*****END OF SECTION 01 91 13*****

SECTION 01 95 00 BIM COORDINATION

1.0 GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS which are hereby made a part of the Section of the Specifications.

1.2 SUMMARY

- A. The Contractor shall direct the creation of a computer-based building information model (BIM) create by the following trades for the BIM Coordination process:
1. HVAC
 2. Electrical (including communications and security as applicable)
 3. Plumbing
 4. Fire Protection
- B. The Contractor shall review and verify the model. Owner will provide a base model.
- C. All relevant models will be incorporated into one review file for use during coordination meetings. The Coordination Team shall utilize NavisWorks clash detection software to expedite the drawing review process and resolution. Subcontractor models must be submitted in a model format that is compatible with NavisWorks.

1.3 DEFINITIONS

- A. Coordination Team: Contractor and Subcontractors.
- B. 3D Coordination Model: Electronic 3D geometric representation combining all trades involved in the coordination process.
- C. 3D Subcontractor Model: Electronic 3D geometric representation of the trade specific building elements to be installed for a specific contractor's scope of work.
- D. Virtual Design and Construction (VDC) Modeling Manager: Contractor appointed personnel responsible for working with the model and for guiding the 3D coordination process.
- E. Subcontractor BIM Production Modeler: Subcontractor personnel responsible for working with the model and for interpreting the information provided within the model.
- F. Clash Detection Software: NavisWorks Manage 2011 minimum, or other version as determined by the Contractor.

1.4 SUBMITTALS

- A. Contractor's Coordination Model: The coordination model will be reconciled by each Subcontractor to find the best collective solution to the coordination of all items.
 - 1. Each Subcontractor will supply a 3D Subcontractor Model for their own scope of work separated by areas as directed by Contractor.
 - 2. Each Subcontractor will be responsible for working in harmony with the other Subcontractors to resolve coordination issues.
 - 3. Subcontractor models will be color coded to provide delineation between systems.
 - 4. 2D coordination drawings will still be required as directed by Contractor and required for shop drawing approvals.

1.5 SCHEDULE

- A. Time is of the essence on this project. Contractor is responsible for all efforts, methods, procedures and costs required to meet or better the scheduled dates. If, at any time, it is determined by the Contractor, or the Subcontractor, that they are not on schedule for any reason within the control or responsibility of the Contractor, the Contractor shall increase its manpower or work such overtime as is required to bring the Work back within the Project Schedule. Such additional efforts shall be performed at no additional cost to the Owner.
- B. The proposed schedule includes "estimated" start dates for the construction activities. In the interest of the Project, the Contractor reserves the right to alter the sequencing of activities in order to accommodate the project conditions or Owner requirements. It is understood that the Contractor shall be obligated to complete its activities within the specified durations regardless of the actual start date. Contractor agrees to meet or better each duration.

2.0 PRODUCTS

2.1 MODELS

- A. 3D Subcontractor Model – computer generated 3D drawings used for coordination, conflict resolution, fabrication, and as-built documentation.
 - 1. Each Subcontractor will be responsible for producing a model/models to represent the Work of the Subcontractor in accordance with the work breakdown structure to be provided by the Contractor.

2. If the Subcontractor does not have the in-house capability to produce the required model/models, the Contractor may utilize the service of an outside entity to provide this service. The Subcontractor shall, within seven (7) business days of being identified as the approved low bidder, provide to the Contractor and Consultant the name, qualifications and experience history of the proposed BIM Production Modeler. The BIM Production Modeler shall have experience on projects of similar size, scope and complexity. The Contractor has the right to approve any proposed BIM Production Modeler. If the BIM Production Modeler proposed is not approved by the Contractor, then the Subcontractor shall identify another firm acceptable to the Contractor without any change in cost.
3. All elements must be drawn to scale and shall be a true representation of what is to be installed in the field in all three dimensions.
4. File origin or project insertion point (x,y,z) shall be agreed upon by the project team. Any conflicts that arise due to non-adherence with the insertion point shall be the responsibility of the non-compliant Subcontractor.
5. The file naming convention shall be broken down as follows: trade_level_date:
6. Example “MS_FLR1_070109.dwg” where “MS” designates the mechanical trade contractor, “FLR1” is the building level, and “070109” indicates the date the file is posted.
7. Model coordination files will be saved to the project on the ePM system for access by all trades, Contractor and the Owner’s Representative. The folder structure will contain a “Current Model” file folder and an “Old Model” file folder. It will be the Subcontractor’s responsibility to maintain the appropriate models in the correct file at all times.
8. When an update to a model has been posted each Subcontractor shall issue a notification via email to each of the other coordination team members notifying them that new information is available. Email, however, shall not be the primary method of delivering model or drawing updates.
9. Working units, unless otherwise specified, shall be in inches.
10. All trades must use a separate color as agreed upon. Colors and/or textures per standards shall be provided by the Contractor VDC Modeling Manager.
11. Each Subcontractor shall maintain their own model files as sole author. Subcontractors are responsible for providing the team with NavisWorks compatible files for their scope of work which will be used for coordination. In some cases separate files will be requested for specific systems within a trade in order to provide the Contractor with greater functionality in the record model.
12. In the event the design changes are issued by bulletin which will result in changes in the model/models, it is the responsibility of the Subcontractor to make any and all changes required for coordination and compliance with the design. The Subcontractor may include the cost of modeling and coordination if warranted into their request for change authorization.

13. Subcontractors will grant the Contractor a perpetual, fully paid license to use the models produced by this agreement.
 - A. Ownership:
 1. The CADD files, AutoCAD architecture files, TIF files, shop drawings, RFI's, as-built drawings, etc. (collectively "Project Information"): The Subcontractor agrees it will keep all project information in strict confidence and will not use on any other project or for any other reason. The Subcontractor further agrees it will not disseminate the project information to anyone except with a need to know.

3.0 EXECUTION

3.1 MODEL COORDINATION PROCESS

- A. Coordination Meetings
 1. Each Subcontractor is required to take part in regular coordination review meetings. The time and place for these meetings will be established by Contractor.
 2. Contractor shall include Owner and Architect in all coordination meetings and coordinate level of participation as needed for coordination. BIM Coordination updates shall be part of in each job-meeting
 3. The purpose of the coordination meeting is to identify and resolve probable interferences between building systems.
 4. Subcontractors shall supply a Subcontractor Modeling Manager or person authorized to act and make decisions on behalf of their organization.
 5. If conflicts are identified and a resolution is agreed upon it is the Subcontractor's responsibility to have the necessary changes made in their model and republish said model to the project intranet site in time for the next meeting unless another timeframe is agreed upon.
- B. Coordination Process
 1. Step 1: Subcontractors to identify conflicts between their system model and the base model and resolve with the Contractor and design team prior to MEP coordination meeting.
 2. Step 2: Subcontractors to identify any required penetrations in architectural and structural elements for their work prior to MEP coordination meeting.
 3. Step 3: Subcontractors to provide system model to the Contractor. Contractor will integrate system model with base model in NavisWorks to create a "coordination model".
 4. Step 4: Subcontractors and the Contractor to meet, review, and resolve clashes/conflicts within the coordination model.

5. Step 5: Subcontractors make changes to their system model per resolutions from MEP coordination meeting.
 6. Step 6: Repeat steps 3 through 5 until all clashes/conflicts have been resolved in the coordination model.
- C. Equipment Models: All equipment specified and intended to be used for installation shall be represented in the coordination model as a fully functional 3D component with the following characteristics:
1. Create models in a software application capable of embedding all information specific to that equipment which would typically be available in the required shop drawings and submittals.
 2. Construct the models to accurately identify all of the physical components including:
 - a. Length, width and height of equipment.
 - b. Weight of equipment.
 - c. Accurate location of all facility connection points.
 - d. Proper identification of required supports whether provided by the Subcontractor or others.
 - e. Access for maintenance and/or filter changes locations.
 - f. Clearances required for proper ventilation and/or maintenance.
 - g. OSHA clearances.
 3. Include all clearance requirements for the equipment as outlined by the equipment manufacturer and all applicable building codes. Identify clearances on a specific layer that can be turned off for coordination purposes. Identify clearances as solid planes (“no fly zones”) which will register as clashes during the coordination effort.
 4. Provide equipment model information to the Contractor in its native (*.dwg) format as well as the International Foundation Class (IFC) format (IFC format describes the behavior, relationship, and identity of a component object within a model).
- D. Record Information
1. Upon completion of coordination activities for a floor area as deemed appropriate by Contractor, a 2D drawing or series of drawings representing the floor or area will be printed for review by the Contractor and all members participating in the coordination. This will become the record coordination document.
 2. Subcontractors shall maintain their models during construction to match the ‘as-built’ condition of their installed work.

3. The Subcontractor will deliver to the Contractor, at the completion of the project, a record construction model in NavisWorks that incorporates all of the trade models, fabrication models and updated design models. The native files from each trade shall also be provided. In addition, the Subcontractor will deliver to the Contractor, an updated NavisWorks model.

E. Change Conditions

1. In that design changes are issued by bulletin, Construction Change Directive (CCD) or other method the applicable Subcontractors will make the changes required in their model/models to support the coordination process without delay.

3.2 3D MODELING

A. Order of Modeling:

1. Unless otherwise noted in the bid packages and trade contractor agreement, the sheet metal contractor shall publish a base model with the major trunk lines which will serve as the basis for the other trades to begin their individual models.

B. Stratification:

1. Each Subcontractor will be assigned specific work zone elevations (top and bottom) to run racks and mains. The assigned trades will take precedence in these areas, when traveling outside of these areas the following order of importance rules apply. Additional rules may be instituted at the first coordination meeting.
 - a. Immovable objects (equipment pads, hoods, shafts).
 - b. Graded piping routed throughout floors (waste, storm drainage, high purity).
 - c. Item coordinated with structure (duct penetrations shown on structural).
 - d. Items located in their designated area (piping zone, pipe rack, cable tray).
 - e. Items that require access (VAV's, shut off valves, fire/smoke dampers, and similar items).

C. System Models and Level of Detail:

1. The level of detail defined in each section below (Modeling Standards) is the minimum level of detail required in the model. Greater detail than the minimum should be incorporated in the model whenever inclusion of such detail will improve spatial or sequencing coordination of the Work.
2. To the extent that location can be determined from the construction documents, the model will reflect that location. The intent of this model is to show the ductwork and piping, and similar items in as true representation of the actual condition at construction completion.

3. Pre-purchased equipment shall be the responsibility of the Subcontractor assigned to receive, install and coordinate the equipment, and they shall be fully responsible for layout, 3D drawings and coordination of the pre-purchased equipment.
4. Each Subcontractor is responsible for modeling protected access zones. Access zones should be drawn at 60% shading as not to obscure the main fixture or element being protected, or shall have another similar identifying characteristic.
5. Individual model elements (such as VAV boxes, pumps, and similar items) described in further detail below shall each contain the specific and individual name assigned to it as per the design documents, following the approved naming conventions established by the Contractor's VDC.

D. Modeling Standards:

1. HVAC Sheet Metal Standards

- a. All ducts, related accessories (including but not limited to standard dampers, fire dampers, VAV boxes, diffusers, turning vanes, etc.) and HVAC equipment will be modeled.
- b. Ducts will be modeled to the outside face dimension of duct or duct insulation. Hangers must be modeled where necessary to coordinate with the work of other trades.
- c. Access zones shall be modeled for all elements requiring access including but not limited to equipment, fixtures, standard dampers, fire dampers, VAV boxes, diffusers, turning vanes, and similar items.
- d. All equipment shall be modeled to its overall height, width and depth.
- e. All access panels shall be modeled, including access zones above and below.
- f. In the event that seismic bracing for suspended elements is required by code, such bracing shall be included in the model.

2. HVAC Piping Standards

- a. All piping, related accessories (valves, air vents, drain valves, flow meters, etc.) and HVAC equipment will be modeled.
- b. Pipes will be modeled to the outside diameter of the pipe or pipe insulation. Hangers must be modeled where necessary to coordinate with the work of other trades.
- c. Equipment will be modeled to its overall height, width and depth.
- d. Access zones shall be modeled for all elements requiring access including but not limited to equipment, fixtures and valves.
- e. All access panels shall be modeled, including access zones above and below.
- f. In the event that seismic bracing for suspended elements is required by code, such bracing shall be included in the model.

3. Plumbing and Specialty Piping Standards
 - a. All plumbing, specialty piping, related accessories (valves, air vents, drain valves, flow meters etc.) and equipment will be modeled (piping 1-1/2" diameter or larger). Process piping 2" diameter or larger shall be modeled.
 - b. Pipes will be modeled to the outside diameter of the pipe or the pipe insulation. Pipe slope will be incorporated in the model. Hangers must be modeled where necessary to coordinate with the work of other trades.
 - c. Equipment will be modeled to its overall height, width and depth.
 - d. Access zones shall be modeled for all elements requiring access including but not limited to equipment, fixtures, valves and cleanouts.
 - e. All access panels shall be modeled, including access zones above and below.
 - f. In the event that seismic bracing for suspended elements is required by code, such bracing shall be included in the model.
4. Electrical Standards
 - a. All conduit/MC cabling (1- 1/2" diameter and larger), power feeds to equipment, switch gear, panels, junction box and pull station locations will be modeled. Where groups of smaller conduit totaling 1- 1/2" diameter or larger are located, a graphic representation of the overall dimension of the grouped conduit may be substituted.
 - b. Light fixtures with above-ceiling space requirements are to be included in the model and coordinated with reflected ceiling plan. All access zones or clearances to maintain light fixtures will also be modeled.
 - c. Equipment and cable tray with access zones to be included in the model along with unistrut supports. Equipment will be modeled to its overall height, width and depth.
 - d. Equipment and junction box access zones per specification and code (whichever is greater) shall be modeled.
 - e. All access panels shall be modeled, including access zones above and below.
 - f. In the event that seismic bracing for suspended elements is required by code, such bracing shall be included in the model.
5. Fire Protection (Sprinkler, Fire Alarm)
 - a. All components of the fire protection system will be modeled.
 - b. Access zones shall be modeled for all elements requiring access including but not limited to equipment, fixtures, valves and controllers.
 - c. Locate all piping, valves, fire pump, sprinkler heads, heat and smoke detectors.

- d. All access panels shall be modeled, including access zones above and below.
 - e. In the event that seismic bracing for suspended elements is required by code, such bracing shall be included in the model.
6. Concrete
- a. All concrete shall be modeled.
7. Structural Steel
- a. All structural steel shall be modeled, including but not limited to columns, beams, braces, gusset plates, connections, reinforcing plates and angles, pour stops, metal grating, seismic or secondary supports and beam penetrations.
 - b. The model elements shall contain non-graphic information that associates each element with its erection sequence as appropriate, and identifies the size of the structural element.

*****END OF SECTION 01 95 00*****

TECHNICAL SPECIFICATIONS

FOR

RENOVATE 2ND – 5TH FLOOR AT KING-SHAW HALL

**CORNELL UNIVERSITY
ITHACA, NEW YORK**

SECTION 024119

SELECTIVE DEMOLITION AND ALTERATION WORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the selective demolition and alteration work as shown on the drawings and/or specified herein, including but not limited to the following:
 - 1. Alterations, selective demolition and removals as noted on drawings and as required to accommodate new construction.
 - 2. Removal of debris.
 - 3. Protection of existing building and spaces to remain and shoring of the structure as required for structural integrity and personal safety.
 - 4. Patching and refinishing of existing surfaces damaged as a result of this work.
 - 5. Protection.

1.3 QUALITY ASSURANCE

- A. The Contractor shall comply with the requirements of all applicable Federal, State and local safety and health regulations regarding the demolition of structures including ANSI/NFPD 241-Building Construction and Demolition Operations.
- B. The Contractor shall be responsible for any damage to any adjacent structures or buildings to remain.
- C. Qualifications: Qualifications of Contractor for work of this Section shall not be less than ten (10) years of field experience in work of this nature.

1.4 RELATED SECTIONS

- A. Alteration and removal requirements for mechanical and electrical work - Mechanical and Electrical Sections.

1.5 SUBMITTALS

- A. Schedule of Demolition Operations: Submit demolition procedures and operational sequence for Architect's review prior to start of work. Submit a written request to Architect well in advance of executing any cutting or alteration which affects:
 - 1. The work of tying in or connecting to operational systems of the building, including electrical, mechanical and security systems.
 - 2. The work of the Owner or any separate Contractor.

3. The structural value or integrity of any element of the project or of adjacent structures.
 4. The integrity or effectiveness of weather-exposed and moisture-resistant elements or systems.
 5. The efficiency, operational life, maintenance, or safety of operational elements or systems.
- B. Notice of Differing Conditions: Submit a written notification if, during the work of demolition and cutting, conditions are discovered which significantly vary from those shown on the drawings. Do not commence work until approval of Architect.

1.6 SPECIAL PRECAUTION

- A. Hazardous materials may be encountered during demolition operations including asbestos; comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

1.7 JOB CONDITIONS

A. Condition of Structure

1. The Contractor for the work of this Section shall be held to have visited the site, examined the premises, determined for himself the existing conditions, character of equipment and facilities needed for the performance of the work, and all matters which may in any way affect the work before submitting a bid.
 - a. Information regarding existing construction or conditions is based on available record drawings which may or may not truly reflect existing conditions. Such information is included on the assumption that it may be of interest to the Contractor, but the Architect, Owner and their consultants do not assume responsibility for its accuracy or completeness.
 - b. Notify the Architect if, during the course of demolition, conditions are discovered which significantly vary from those shown on the drawings. Do not proceed until authorized by Architect.
2. The Contractor shall accept the condition of the site and structures as found. The Architect and Owner assume no responsibility for condition of site or structures nor the continuation of the condition existing at time of bidding or thereafter.

- B. Areas of building to be demolished or altered will be vacated and discontinued in use prior to the start of the work.

1. Surrounding areas of the building shall remain operational by the Owner.

C. Partial Removal

1. Items of savable value to the Contractor may be removed from the structure as the work progresses. Salvaged items must be transported from the site as they are removed.
2. Storage or sale of removed items on the site will not be permitted.

- D. Explosives: The use of explosives will not be permitted.

E. Traffic

1. Conduct demolition operations and the removal of debris to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities.

2. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

F. Utilities

1. Refer to Division 22 and 26 of the specifications for special requirements concerning utilities and services.
2. Maintain any existing utilities required to remain; keep in service and protect against damage during demolition operations.
3. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to the governing authorities.
4. Disconnect and seal any abandoned utilities before starting demolition operations. Coordinate all work with local utility companies having jurisdiction.

1.8 SCHEDULING

- A. Before commencing any alteration or demolition work, submit for review by the Architect, and approval of the Owner, a schedule showing the commencement, the order, and the completion dates for the various parts of this work.
- B. Before starting any work relating to existing utilities (electrical, sewer, water, heat, gas, fire lines, etc.) that will temporarily discontinue or disrupt service to the structures to remain, notify the Architect and the Owner 7 days in advance and obtain the Owner's approval in writing before proceeding with this phase of the work.

PART 2 PRODUCTS

Refer to Part 3 - Execution, for Product Requirements

PART 3 EXECUTION

3.1 PROTECTION

- A. Take full precautions to protect workmen, passersby or any other persons from falling debris and other hazards of demolition operations.
- B. Execute demolition work to ensure protection of existing portions of building to remain against damages which might occur from falling debris or other cause. Do not interfere with use of adjacent occupied buildings and areas. Maintain free, safe passage to and from occupied adjacent buildings.
- C. Materials Placement: Do not load structure with weight that will endanger, overload or cause excessive deflection of the existing structure, or that will damage finished surfaces adjacent to and/or supported by the existing structure, except portions being removed.
- D. Construction Operations: Do not employ any construction operation, equipment or vehicles that will endanger, overload or cause excessive deflection of the existing structure, or that will damage finished surfaces adjacent to and/or supported by the existing structure, except portions being removed.

- E. Take precautions to guard against movement, settlement, damage, or collapse of any part of building, sidewalks, adjacent property or street passages; be liable for any such movement, settlement or collapse. If such damage does accidentally occur, Contractor shall repair promptly at no cost to Owner.
- F. Provide the necessary safeguards to prevent accidents, to avoid all necessary hazards and protect the public, the work and property at all times, including Saturdays, Sundays, and holidays.
- G. Be responsible for any and all damages which may arise or occur to any party whatsoever by reason of the neglect in providing proper lights, guards, barriers, or any other safeguards to prevent damage to property, life and limb.
- H. Make such explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. Give particular attention to shoring and bracing requirements so as to prevent any damage to existing construction.
 - 1. Provide interior and exterior shoring, bracing, or support to prevent movement or settlement or collapse of structures to be demolished and adjacent facilities to remain. The Contractor's Professional Engineer shall advise on bracing, shoring, underpinning, or other structural requirements. The Contractor shall bear all responsibility for prevention of movement or other structural fault.
 - 2. The Contractor shall restore, by repair or otherwise, the portions of structure or their contents altered by the Contractor in furtherance of his underpinning and support operations. Restoration shall be completed to the conditions which existed prior to the start of the work. Any damage caused by inadequate support shall also be restored by the Contractor at no cost to the Owner.
- I. Provide, erect and maintain catch platforms, lights, barriers, weather protection, warning signs, and other items as required for proper protection of the workmen engaged in demolition and alteration operations, occupants of the building, public and adjacent property. Any damage caused by the Contractor's operations shall be promptly repaired by the Contractor at no cost to the Owner.
- J. Provide and maintain temporary protection of the existing structure designated to remain where demolition, removal, and new work are being done, connections made, materials handled, or equipment moved.
- K. Take necessary precautions to prevent dust and dirt from rising. Protect unaltered portions of the existing building affected by the operations under this Section by dustproof partitions and other adequate means.
- L. Provide adequate fire protection in accordance with local Fire Department requirements.
- M. Do not close or obstruct walkways, passageways, or stairways. Do not store or place materials in passageways, stairs, or other means of egress. Conduct operations with minimum traffic interference.
- N. Be responsible for any damage to the existing structure or contents by reason of the insufficiency of protection provided.
- O. Erect temporary covered passageways at street level as required by authorities having jurisdiction.
- P. Promptly repair damages caused to adjacent facilities by demolition operations at no cost to the Owner.

- Q. Provide and maintain weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until such openings are closed by new construction.

3.2 INSPECTION

- A. Verify that areas of demolition work are protected, and temporary dustproof partitions have been installed.
- B. Verify that construction to be removed is not load bearing or has been properly braced, framed or supported.
- C. Inspect existing conditions of the project, including elements subject to damage or to movement during demolition and cutting.
- D. After uncovering work, inspect the conditions affecting the installation or performance of the work.
 - 1. Report differing or questionable conditions to the Architect in writing; do not proceed with the work until the Architect has provided further instructions.

3.3 PREPARATION

- A. Provide adequate temporary support as necessary to ensure the structural value or integrity of the affected portion of the work
- B. Provide devices and methods to protect other portions of the project from damage.
- C. Pollution Controls
 - 1. Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.
 - a. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
 - 2. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to condition existing prior to the start of the work.
 - 3. Provide drainage for temporary water use.

3.4 DEMOLITION AND CUTTING

- A. Selectively demolish existing construction in conformance with the drawings and these specifications.
 - 1. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surface to receive installation of work by others and patching of finish surfaces.
 - 2. Do all cutting or removal so as to leave neat, true, plumb and square edges, at edges to remain. Use carborundum or diamond saw equipment for cutting masonry, concrete and stone work, where edges or surfaces are to remain.
 - 3. Do not cut or remove construction which might weaken or impair the structural integrity or strength of the structural framing or support systems which are to remain.

4. Demolish and remove materials as shown on the drawings without damage to the remaining parts of the structure or mechanical/electrical/utility systems.
5. Remove materials so as to not impose excessive loads in supporting walls, floors or framing and so as not to damage remaining undemolished portions of the structure.
6. Where portions of structures are to be removed, remaining portions shall be protected from damage and prepared to fit new construction. Damage to portions of structures to remain shall be repaired.
7. Reinforcing steel in existing structures shall be left in place, cleaned and aligned to provide tie with new work.
8. Proceed with demolition in a systematic manner.

B. Shoring

1. Design, provide, erect and maintain necessary temporary shoring, bracing, framing, or support where load bearing structural or supporting members are removed or weakened by cuts or openings or are subject to damage from demolition operations, and otherwise as required for safety or to protect finish surfaces from damage.
2. Construction and adequacy of the shoring shall be the entire responsibility of the Contractor. Any damage caused by the inadequacy of the shoring or other support shall be the responsibility of the Contractor to remedy at no additional expense to the Owner.
3. Shoring and bracing shall remain until new structural framing and/or supports are installed. Coordinate operations fully with other trades.
4. Be ready at any time to promptly provide, add to, or strengthen temporary shoring, bracing, or support for existing work, in case existing construction begins to show signs of structural stress.

3.5 WORKMANSHIP STANDARDS FOR ALTERATION AND REMOVAL WORK

- A. Cut, remove, alter, temporarily remove and replace, or relocate existing work as required for performance of the work. Perform such work required with due care, including shoring and bracing.
- B. Coordinate patching involving the various trades whether or not specifically mentioned in the respective specification Sections.
- C. Materials or items demolished and not designated to become the property of the Owner or to be reinstalled shall become the property of the Contractor and shall be removed from the Owner's property.
- D. Execute the work in a careful and orderly manner, with the least possible disturbance to the public and to the occupants of the adjacent buildings.
- E. In general, demolish masonry in small sections. Where necessary to prevent collapse of any construction, install temporary shores, struts, or bracing.
- F. Materials to be removed by existing elevators shall be put in enclosed containers.
- G. Where existing equipment and/or fixtures are indicated to be reused, repair such equipment and/or fixtures and refinish to put in perfect working order. Refinish as directed.

- H. Cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.
- I. Where utilities are removed, relocated or abandoned, cap, valve, plug, or by-pass to make complete and working installation.
- J. Restore existing pipe and duct coverings damaged by work under this Contract to original undamaged condition.
- K. Immediately restore to service and repair any damage caused by Contractor's workmen to existing pipe and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems which are not scheduled for discontinuance or abandonment.
- L. Upon completion of contract, deliver work complete. Damage that may be caused by Contractor or Contractor's workmen to existing structures designated to remain, grounds, and utilities shall be repaired by Contractor and left in as good condition as existed prior to damaging.
- M. Restore finish work of floors, walls, and ceilings remaining in place but damaged or defaced because of demolition or alteration work to condition equal that which existed at beginning of work under this Contract.
- N. Where alteration or removals expose damaged or unfinished surfaces or materials, refinish such surfaces or materials, or remove them and provide new or salvaged materials to make continuous surfaces uniform.
- O. Perform new work and restore and refinish existing work in conformance with applicable requirements of the specifications, except as follows:
 - 1. Materials for use in repair of existing surfaces, but not otherwise specified, shall conform to the highest standards of the trade involved, and be in accordance with approved industry standards, and shall be as required to match existing surfaces.
 - 2. Workmanship for repair of existing materials shall, unless otherwise specified, be equal to similar workmanship existing in or adjacent to the space where the work is being done.
 - 3. Installation of salvaged items where no similar items exist shall be done in accordance with the highest standards of the trade involved and in accordance with approved shop drawings.
- P. Materials or items designated to become the property of the Owner shall be as shown on the drawings. Remove such items with care and store them in a location at the site to be designated by the Owner.
- Q. Materials or items designated to be reinstalled shall be as shown on the drawings. Remove such items with care under the supervision of the trade responsible for reinstallation; protect and store until required. Replace materials or items damaged in their removal with similar new material.
- R. The existing building shall not be used as a workshop. Neither shall the furnishings or equipment in any room be used as work benches. Should any damage occur during the progress of the work to any furniture, fixtures, equipment, or appurtenances therein, such damage shall be repaired, replaced or made good by the Contractor without extra cost to the Owner.
- S. Where removing existing floor finish and base, remove all adhesive and leave floors and walls smooth and flush, ready to receive new finish.

- T. Finish new and adjacent existing surfaces as specified for new work. Clean existing surfaces of dirt, grease and loose paint before refinishing.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General

1. Remove from the site debris, rubbish and other materials resulting from work of this Section.
2. Burning of removed materials from demolished structures will not be permitted on the site.

- B. Removal: Transport materials removed from demolished structures and legally dispose of off-site. Pay any and all fees associated with disposal work. Leave the site in an orderly condition to the approval of the Architect.

3.7 CLEANING UP

- A. Remove debris as the work progresses. Maintain existing premises in a neat and clean condition.

END OF SECTION

SECTION 035416

CEMENT LEVELING COMPOUND

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the cement leveling compound as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. Self-leveling cement compound applied over concrete substrates; thickness shall be 3/8" minimum.

1.3 RELATED SECTIONS

- A. Concrete work - Section 033000.

1.4 QUALITY ASSURANCE

- A. Applicator: Company specializing in performing the work of this Section with a minimum of 3 years' experience and approved by the manufacturer of the product used.

1.5 SUBMITTALS

- A. Sustainability Data: For each Sustainability Focus Material in accordance with Section 018113 "Sustainable Requirements Summary".
- B. Submit catalog information and product data for material to be used.
- C. Submit approval letter as required by Article 3.1, para. B. herein.
- D. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.
- E. Submit floor elevation survey data, demonstrating verification of existing finished floor elevations, floor substrate condition, existing floor slope and areas to receive leveling treatment.

1.6 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.7 REGULATORY REQUIREMENTS

- A. Conform to New York State Building Code for combustibility or flame spread requirements.

1.8 MOCK-UP

- A. Construct a mock-up of underlayment material, 8 feet long by 8 feet wide.
- B. Locate where directed by the Architect.
- C. Approved mock-up may remain as part of the Work.
- D. Include in mock-up an area of required transition between flooring types.

1.9 JOB REQUIREMENTS

- A. Do not install underlayment until floor penetrations and peripheral work are complete.
- B. Maintain minimum ambient temperatures of 50 degrees F. 24 hours before, during, and 72 hours after installation of underlayment.
- C. During the curing process, ventilate spaces to remove excess moisture and until underlayment is dry, allow a minimum of seven (7) days.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Subject to the requirements specified herein, provide one of the following products:
 - 1. "Supercap SC500" by Laticrete.
 - 2. "K-15" made by Ardex.
 - 3. "Ultraplan 1 Plus" by the Mapei Corp. (rapid setting).
 - 4. "Novoplan 2" by the Mapei Corp. (standard setting).

2.2 MATERIALS

- A. Underlayment: One of the above listed products.
- B. Water: Potable and not detrimental to underlayment mix materials.
- C. Primer: Manufacturer's recommended type.
- D. Joint and Crack Filler: Latex based.

2.3 MIXING

- A. Site mix materials in accordance with manufacturer's instructions.
- B. Mix to achieve following characteristics:
 - 1. Density: 115 lb./cu. ft. minimum dry density.
 - 2. Compressive Strength: 4,000 psi minimum in accordance with ASTM C 109.
 - 3. Fire Hazard Classification: Flame/Smoke rating of 0/0 in accordance with ASTM E 286.
- C. Mix to self-leveling consistency.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where cement leveling compounds are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.
- B. Manufacturer's representative must inspect surfaces to receive cement leveling compound and approve those surfaces in writing to the Architect prior to start of application.
- C. Perform floor elevation survey, verifying existing finished floor elevations, floor substrate condition, existing floor slope and areas to receive leveling treatment. Areas exhibiting uneven substrate, valleys, and excessive pitch shall be leveled to meet specified criteria for installation tolerances.

3.2 PREPARATION

- A. Vacuum clean surfaces; remove any material (curing compounds, film, dirt) that would be detrimental to bond of cement leveling compound.
- B. Prime substrate in accordance with manufacturer's instructions. Allow to dry.
- C. Close floor openings.

3.3 APPLICATION

- A. Install underlayment in accordance with manufacturer's instructions.
- B. Place to minimum 3/8" thickness.
- C. Transition to existing floor or to the level indicated on the architectural flooring drawings and details to achieve alignments of differing flooring materials; use stiff mix to slope to align with existing adjacent floor.

3.4 CURING

- A. Air cure in accordance with manufacturer's instructions.

3.5 INSTALLATION TOLERANCES

- A. Finish and measure surface, so gap at any point between cement leveling compound surface and an unlevelled, freestanding, 10-foot long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

3.6 PROTECTION OF FINISHED WORK

- A. Do not permit traffic over unprotected floor underlayment surfaces and until underlayment is completely dry.

END OF SECTION

SECTION 055000

MISCELLANEOUS METALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the miscellaneous metal work as indicated on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Rough hardware.
 - 2. Metal fabrications, including steel angles, to support existing steel grating at new openings.
 - 3. Light steel framing and supports not included as part of work of other trades.
 - 4. Steel framing, bracing, supports, anchors, bolts, shims, fastenings, and all other supplementary parts indicated on drawings or as required to complete each item of work of this Section.
 - 5. Prime painting, touch-up painting, galvanizing and separation of dissimilar metals for work of this Section.
 - 6. Cutting, fitting, drilling and tapping work of this Section to accommodate work of other Sections and of concrete, masonry or other materials as required for attaching and installing work of this Section.

1.3 RELATED SECTIONS

- A. Painting - Section 099000.

1.4 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- B. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.
- C. Reference Standards: The work is subject to requirements of applicable portions of the following standards:
 - 1. "Manual of Steel Construction," American Institute of Steel Construction.
 - 2. AWS D1-1 "Structural Welding Code," American Welding Society.

3. SSPC SP-3 "Surface Preparation Specification No. 3, Power Tool Cleaning," Steel Structures Painting Council.
4. SSPC PA-1 "Painting Application Specification," Steel Structures Painting Council.
5. "Handbook on Bolt, Nut and Rivet Standards," Industrial Fasteners Institute.

1.5 SUBMITTALS

- A. Manufacturer's Literature: Submit manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for products to be used in the fabrication of miscellaneous metal work, including paint products.
- B. Shop Drawings: Shop drawings for the fabrication and erection of all assemblies of miscellaneous iron work which are not completely shown by manufacturer's data sheets. Include plans and elevations at not less than 1" to 1'-0" scale and include details of sections and connections at not less than 3" to 1'-0" scale. Show anchorage and accessory items.
- C. Welding shall be indicated on shop drawings using AWS symbols and showing length, size and spacing (if not continuous). Auxiliary views shall be shown to clarify all welding. Notes such as 1/4" weld, weld and tack weld are not acceptable.
- D. Certification: For items to be hot-dip galvanized, identify each item galvanized and to show compliance of application. The Certificate shall be signed by the galvanizer and shall contain a detailed description of the material processed and the ASTM standard used for the coating and, the weight of the coating. In addition, and as attachment to Certification, submit reports of testing and inspections indicating compliance with the provisions of this Section.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Metals
 1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
 2. Steel Plates, Shapes and Bars: ASTM A 36.
 3. Steel Bar Grating: ASTM A 1011 or ASTM A 36.
 4. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.
 5. Structural Steel Sheet: Hot rolled, ASTM A 1011; or cold rolled, ASTM A 1008, Class 1; of grade required for design loading.
 6. Steel Pipe: ASTM A 53, type and grade as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40), unless otherwise indicated.
 7. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.
 8. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

9. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.
- B. Grout: Non-shrink, non-metallic grout conforming to the requirements of Section 033000.
- C. Fasteners
1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
 2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
 3. Anchor Bolts: ASTM F 1554, Grade 36.
 4. Lag Bolts: ASME B18.2.1.
 5. Machine Screws: ASME B18.6.3.
 6. Plain Washers: Round, carbon steel, ASME B18.22.1.
 7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
 8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
 9. Lock Washers: Helical spring type carbon steel, ASME B18.21.1.
- D. Shop Paint: Shop prime all non-galvanized miscellaneous metal items using Series 88 Azeron Primer made by Tnemec, ICI Devoe "Rust Guard" quick dry alkyd shop coat No. 41403, or "Interlac 393" by International Protection Coatings.
1. If steel is to receive high performance coating as noted in Section 099000, shop prime using primer noted in Section 099000.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 PRIME PAINTING

- A. Scope: All ferrous metal (except galvanized steel) shall be cleaned and shop painted with one coat of specified ferrous metal primer. No shop prime paint required on galvanized steel or aluminum work.
- B. Cleaning: Conform to Steel Structures Painting Council Surface Preparation Specification SP 3 (latest edition) "Power Tool Cleaning" for cleaning of ferrous metals which are to receive shop prime coat.
1. Steel to get high performance coating as noted in Section 099000 shall be cleaned as per SSPC SP.6 "Commercial Blast Cleaning."
- C. Application
1. Apply shop prime coat immediately after cleaning metal. Apply paint in dry weather or under cover. Metal surfaces shall be free from frost or moisture when painted. Paint all metal surfaces including edges, joints, holes, corners, etc.
 2. Paint surfaces which will be concealed after shop assembly prior to such assembly. Apply paint in accordance with approved paint manufacturer's printed instructions, and the use of any thinners, adulterants or admixtures shall be only as stated in said instructions.

3. Paint shall uniformly and completely cover the metal surfaces, 2.0 mils minimum dry film thickness. No work shall be shipped until the shop prime coat thereon has dried.
- D. Touch-Up: In the shop, after assembly and in the field, after installation of work of this Section, touch-up damaged or abraded portions of shop prime paint with specified ferrous metal primer.
- E. Apply one shop coat to fabricated metal items, except apply two (2) coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.3 PROTECTIVE COATINGS

- A. Whenever dissimilar metals will be in contact, separate contact surfaces by coating each contact surface prior to assembly or installation with one coat of specified bituminous paint, which shall be in addition to the specified shop prime paint. Mask off those surfaces not required to receive protective coating.

2.4 WORKMANSHIP

A. General

1. Miscellaneous metal work shall be fabricated by an experienced fabricator or manufacturer and installed by an experienced tradesman.
2. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection shall be in accordance with drawings and specifications, approved shop drawings, and best practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected.
3. All work shall be accurately and neatly fabricated, assembled and erected.

- B. Shop Assembly: Insofar as practicable, fitting and assembly of work shall be done in shop. Shop assemble work in largest practical sizes to minimize field work. It is the responsibility of the miscellaneous metal subcontractor to ensure that the shop-fabricated miscellaneous metal items will properly fit the field condition. In the event that shop-fabricated miscellaneous metal items do not fit the field condition, the item shall be returned to the shop for correction.

- C. Cutting: Cut metal by sawing, shearing, or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp and free of burrs, without deforming adjacent surfaces or metals.

- D. Holes: Drill or cleanly punch holes; do not burn.

- E. Connections: Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to weather. Locate joints where least conspicuous. Unless indicated otherwise, weld or bolt shop connections; bolt or screw field connections. Provide expansion and contraction joints to allow for thermal movement of metal at locations and by methods approved by Architect.

1. Welding

- a. Shall be in accordance with AWS D1.1 Structural Welding Code of the American Welding Society and shall be done with electrodes and/or methods recommended by the manufacturer of the metals being welded.
- b. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match

finish of adjoining surfaces; undercut metal edges where welds are required to be flush.

- c. All welds on or behind surfaces which will be exposed to view shall be done so as to prevent distortion of finished surface. Remove weld spatter and welding oxides from all welded surfaces.
2. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads exposed to view shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts or adjacent metal.
- F. Operating Mechanism: Operating devices (i.e. pivots, hinges, etc.) mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.
- G. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items specified under this Section of the Specifications to be built into concrete, masonry or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.
- H. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.
- I. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.
- J. Exposed Work
 1. In addition to requirements specified herein and shown on drawings, all surfaces exposed to view shall be clean and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, tool marks, burrs, and other defects which mar appearance of finished work.
 2. Metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design.
 3. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.

2.5 MISCELLANEOUS METALS ITEMS

A. Rough Hardware

1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.
2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood connections; elsewhere, furnish steel washers.

B. Miscellaneous Light Steel Framing

1. Light steel framing, bracing, supports, framing, clip angles, shelf angles, plates, etc., shall be of such shapes and sizes as indicated on the drawings and details or as required to suit

the condition and shall be provided with all necessary supports and reinforcing such as hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly support and rigidly fasten and anchor same in place and to steel, concrete, masonry and all other connecting and adjoining work.

2. All light steel framing steel shall be furnished and erected in accordance with the applicable requirements of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" by the American Institute of Steel Construction and as specified herein.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where miscellaneous metal is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 ERECTION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry, or similar construction.
- C. Fitting Connections: Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance, and quality of welds made, and methods used in correcting welding work.
- E. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

END OF SECTION

SECTION 057000

ORNAMENTAL METALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the decorative metal railings as shown on the drawings and/or specified herein.
 - 1. Painted metal surround opening.
 - 2. Painted steel guard bar.
 - 3. Architectural grilles.

1.3 RELATED SECTIONS

- A. Miscellaneous Metals - Section 055000.
- B. Architectural Woodwork - Section 064023.
- C. Finish Hardware - Section 087100.

1.4 QUALITY ASSURANCE

- A. The contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope and type to the required work. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices and erection shall be in accordance with drawings, specifications, and approved shop drawings, and be of highest quality practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected. All work shall be accurately and neatly fabricated, assembled, and erected.
- B. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. However, do not delay job progress; allow for adjustments and fitting where taking of field measurements before fabrication might delay the work.
- C. Shop Assembly: Insofar as practicable, fitting and assembly of work shall be done in shop. Work that cannot be permanently shop assembled, shall be completely assembled, marked and disassembled in shop before shipment to ensure proper assembly in field. Shop assemble work in largest practical sizes to minimize field work. It is the responsibility of the Contractor for this work to ensure that the shop fabricated items will properly fit the field condition. In the event that shop fabricated items do not fit the field condition, the item shall be returned to the shop for correction.

1.5 SUBMITTALS

- A. Shop Drawings: Submit for all items of work, at full scale as far as practical, showing locations, layouts, materials, thicknesses, finishes, dimensions, construction, relation to adjoining construction, erection details, profiles, metal thicknesses, arrangement of components, of joining, of jointing, details of all field connections and anchorages, diagrams and details explaining provisions for thermal movement, fastening and sealing methods, support methods, metal finishes and all other details to fully illustrate the work of this Section.
- B. Samples for Verification: Submit fabricated samples (of sufficient size to fully show construction, materials and finishes) of all items of work as enumerated under paragraph 1.2 herein.
- C. Product Data: Submit manufacturer's, fabricator's and finisher's specifications and installation instructions for products used in ornamental metal work, including finishing materials and methods.

1.6 PRODUCT HANDLING

- A. Finished Materials: Protect finishes against soiling, staining or damage from scratches and abrasion. Maintain protection during construction until project completion or as otherwise directed by Architect.
 - 1. Provide wrappings, strippable coatings or other means approved by Architect.
 - 2. During construction, remove protection for visual observation of finish as directed by Architect and replace to maintain protection.

1.7 PERFORMANCE STANDARDS

- A. Structural Performance of Handrails and Railings: Provide handrails and railings complying with requirements per State of New York Code and ADA requirements.
- B. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in engineering, fabricating, and installing handrails and railing systems to prevent buckling, opening of joints, overstressing of components and connections, damage to adjoining construction, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.
 - 1. Temperature Change (Range): 120 deg F ambient, 180 deg F material surfaces.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide materials that have been selected for their surface flatness, smoothness and freedom from surface blemishes where exposed to view in the finished unit. Surfaces exposed to view that exhibit pitting, seam marks, roller marks, oil-canning, stains, discolorations, or other imperfections on the finished units will not be acceptable.

B. Aluminum

1. Comply with the following standards for the forms and types of aluminum for the required items of work.
 - a. Alloy and Temper: Provide alloy and temper as indicated or as otherwise recommended by the aluminum producer or finisher.
 - b. Aluminum Extrusions, Bars and Shapes: Alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T6.
 - c. Extruded Pipe and Tube: ASTM B 429, alloy 6063-T6.
 - d. Aluminum Plate and Sheet: Alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209, alloy 6061-T6.
 - e. Bars, Rods and Wire: ASTM B 211.
 - f. Drawn Seamless Tube: ASTM B 483, alloy 6063-T832.
 - g. Castings: ASTM B 26; alloy A356-T6.
 - h. Forgings: ASTM B 247, alloy 6061-T6.

C. Stainless Steel

1. Comply with the following standards for the forms and types of stainless steel for the required items of work.
 - a. Tubing: ASTM A 554, Grade MT 304 for interior.
 - b. Pipe: ASTM A 312, Grade TP 304 for interior.
 - c. Castings: ASTM A 743, Grade CF 8 or CF 20 for interior.
 - d. Sheet, Strip, Flat Bar and Plate: ASTM A 666, Type 304 for interior.
 - e. Bars and Shapes: ASTM A 276, Type 304 for interior.

D. Steel (Carbon) for Concealed Supports Only

1. Structural Shapes: ASTM A 36.
2. Plates (for forming or bending cold): ASTM A 283, Grade C.
3. Steel Sheets: ASTM A 366, Grade 1.
4. Shop prime with rust inhibitive primer equal to Series 88 Azerox made by Tnemec, or approved equal made by Benjamin Moore or Sherwin Williams.

E. Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

F. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of the metal to be welded, and as required for color match, strength and compatibility in the fabricated items.

G. Fasteners: Furnish basic metal and alloy, matching finished color and texture as the metal being fastened, unless otherwise indicated. Provide Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

1. Fasteners for Interconnecting Handrails and Railing Components: Furnish of basic metal and alloy, matching finished color and texture as the metal being fastened, unless otherwise indicated. Unless otherwise shown, provide Phillips flat-head screws for exposed fasteners.

2. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads. Fasteners shall be fabricated from Type 316 stainless steel.
- H. Anchors and Inserts: Either furnish inserts to be set in concrete or masonry work, or provide other anchoring devices as required for the installation of ornamental metal items. Provide toothed steel or lead shield expansion bolt devices for drilled-in-place anchors. Provide galvanized or cadmium-coated anchors and inserts for exterior installations.
 1. Provide units with exposed surfaces matching the texture and finish of the metal item anchored.
- I. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).
- J. Cast-in-Place and Preinstalled Anchors: Anchors fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete.
- K. Erosion-Resistant Anchoring Cement: Factory packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.2 FABRICATION, GENERAL

- A. Cutting: Cut metal by sawing, shearing or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp, square and free of burrs, without deforming adjacent surfaces or metals.
- B. Holes: Drill or cleanly punch holes (do not burn), so that holes will be accurate, clean, neat and sharp without deforming adjacent surfaces or metals.
- C. Connections
 1. Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to water. Locate joints where indicated on drawings. Provide connections to allow for thermal movement of metal at locations and by methods approved by Architect. For work exposed to view, use concealed fasteners (unless welded or other connections indicated) with joints accurately fitted, flush and rigidly secured with hairline contacts.
 2. Welding: Welding shall be in accordance with recommendations of the American Welding Society and shall be done with electrodes and/or methods recommended by the manufacturers of the metals being welded. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces so that joint will not be visible; undercut metal edges where welds are required to be ground flush and dressed smooth. All welds on or behind surfaces which will be exposed to view shall be done so that finished surface will be free of imperfections such as pits, runs, splatter, cracks, warping, dimpling, depressions or other forms of distortion or discoloration. Remove weld splatter and welding oxides from all welded surfaces.
 3. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads, where shown to be exposed to view, shall be flat and

countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts of adjacent metal.

- D. Operating Mechanism: Operating devices, mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.
- E. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items for architectural metal work to be built into concrete, masonry, or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.
- F. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.
- G. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.
- H. Exposed Work: In addition to requirements specified herein or shown on drawings, all surfaces exposed to view shall be clean, and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, tool marks, burrs and other defects which mar appearance of finished work. Ornamental metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.
- I. Materials used shall be of such strength, thickness and alloy that they are capable of meeting all standards and descriptions specified herein and as detailed on drawings.

2.3 SHOP FINISHING, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated.
- B. Provide colors or color matches as indicated on selected samples.
- C. Protect mechanical finishes on exposed surfaces from damage by application of strippable temporary protective covering prior to shipment.
- D. Corrosion Protection: Coat concealed surfaces which will be in contact with concrete, masonry, wood or dissimilar metals, in exterior work and work to be built into exterior and below grade walls and decks, with a heavy coat of bituminous paint. Do not extend coating onto exposed surfaces.

2.4 FINISHES

- A. Stainless Steel: TBD.
- B. Aluminum: High Performance Coating: AA-C12C42R1x, cleaned with inhibited chemicals, conversion coated with an acid-chromate-fluoride-phosphate treatment, and painted with organic coating specified below. Apply finish in strict compliance with paint manufacturer's instructions using a licensed applicator.
 - 1. Fluorocarbon Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat

containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

2. Custom color and gloss as scheduled on the drawings.

2.5 PROTECTION

- A. Provide necessary protection to all exposed surfaces of architectural metal work, so as to prevent damage, staining, discoloration, abrasion, etc., to these surfaces from time of shipment from factory to acceptance of work of this project. Protection shall be provided by wrappings, strippable coatings, or other means. After installation, remove protective paper or strippable coating and clean exposed surfaces, and then provide additional temporary protection to protect architectural metal work from damage during subsequent construction activities. Surfaces which are damaged, stained, discolored, abraded etc., shall be rejected and replaced with new materials, at no cost to the Owner.

2.6 STEEL FRAMING, BRACING, SUPPORTS AND REINFORCEMENTS

- A. Steel framing, plate reinforcing, supplementary steel framing or reinforcing, bracket assemblies, and the like required for the support, framing, reinforcing, bracing, etc., of work of this Section shall be of such sizes and shapes as indicated on the drawings, or as required to suit the conditions, and shall be provided with all necessary supports and accessory items such as inserts, hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly and rigidly fasten, anchor or attach work of this Section in place and to the concrete, masonry and other connecting and adjoining work.

2.7 HANDRAIL BRACKETS

- A. Provide CRL Short Arm Malibu Series handrail brackets, modified to attach to custom continuous stainless steel bar embed.
- B. Finish: Brushed stainless steel, type 316, #4 finish.
- C. Mounting: To suit condition. See drawings.

2.8 ARCHITECTURAL GRILLES

- A. Linear Bar Grilles at Sills: Provide stainless steel, model AG10, by Architectural Grille, satin finish. Type "A" mounting. Grille to be flush with adjacent surface. Coordinate with millwork, refer to section 064023.

2.9 METAL PANEL SURROUNDS

- A. Fabricate of aluminum as shown on drawings.
- B. Metal panels, fascias, and other sheet or plate items must read as flat and free of bow, oil-canning, or read-through of stiffeners. To this end, exposed metal faces when supported in the building shall be of such flatness that the maximum uniform bow in 2 ft. shall not exceed 1/32", and the maximum overall variation in plane between high and low point within a panel shall not exceed 1/16".
- C. Provide concealed attachment, without weld and attachment points, telegraphing thru exposed finish surface.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where ornamental metal work is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions and directions for installing anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION, GENERAL

- A. Install work of this Section square, plumb, straight, true to line or radius, accurately fitted and located, with flush, tight hairline joints (except as otherwise indicated or to allow for thermal movement), with provisions for other trades, with provisions to allow for thermal movement, with provisions to exclude water where exposed to weather, and with attachment devices as required for secure and rigid installation. It is the responsibility of the Contractor to ensure that shop fabricated architectural metal items will properly fit the field condition. In cases where the shop fabricated architectural metal items do not fit the field condition, the item shall be returned to the shop for correction.
- B. Attachments
 - 1. Unless otherwise indicated, work to be built into concrete or masonry shall be anchored with shop welded on galvanized steel strap anchors; work to be attached to concrete or masonry shall be anchored by bolts into embedded inserts or expansion shields; work attached to structural steel shall be anchored by welds or bolts; work attached to metals other than structural steel shall be anchored by bolts or screws. Power actuated fasteners not permitted unless approved by Architect. Provide all supplementary parts necessary to complete each item of work of this Section.
 - 2. All attachment devices shall be of type, size and spacing to suit condition and as approved by Architect. Provide shims, slotted holes, or other means necessary for leveling, plumbing and other required adjustments. Attachment devices for work exposed to view shall be concealed, unless indicated otherwise. Where bolts or screws are permitted in work exposed to view, they shall be oval head and counter sunk, unless otherwise noted, with projecting end cut off flush with nuts or adjacent material, and shall match adjacent surfaces.
 - 3. Do all necessary drilling, tapping, cutting or other preparations of surrounding construction in the field accurately, neatly and as necessary for the attachment and support of work of this Section, but obtain Architect's approval prior to such preparation to work of others.
- C. Tolerances: All work of this Section shall be plumb, square, level, true to radius and correctly aligned within the following limitations:
 - 1. Offset from true horizontal, vertical and design location shall not exceed 1/16" per ten (10) feet of length for any component, not cumulative.
 - 2. Maximum offset from true alignment between abutting components shall not exceed 1/32".

- D. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units at Contractor's option.
- E. Install concealed gaskets and joint fillers as the work progresses, so as to make the work soundproof or lightproof as required.
- F. Restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.
- G. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration.
- H. Field Welding: Comply with AWS Code for the procedures of manual shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary coverings and protection of adjacent work areas. Clean installed products in accordance with manufacturer's instructions before Owner's acceptance.
- B. Do not use abrasive cleaners.
- C. Remove from project site and legally dispose of construction debris associated with this work.

3.5 PROTECTION

- A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 061000

ROUGH CARPENTRY – CUPOLA (ADD ALT #1)

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Replace damaged wood below the metal cladding as necessary. Assume 20 SF of wood replacement in multiple areas. Coordinate with removal and reinstallation or replacement in Section 076000 – Metal Roofing and Flashing.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Related work is in the following sections:
 - 1. Section 076000 – Metal Roofing and Flashing

1.04 SUBMITTALS

- A. Submit the following items from the manufacturer to the Engineer for approval:
 - 1. Samples and/or manufacturer's literature for all materials specified and proposed for use on this project, each properly labeled.
 - 2. Manufacturer's installation recommendations for all materials used on this project.
 - 3. Certifications (in time to prevent delay in the work) by the producers of all materials that all materials supplied comply with all the requirements of these specifications and the appropriate standards.
- B. Shop drawings showing method of attaching wood blocking and plywood. Coordinate shop drawings with shop drawings submitted by other sections of this Specification.

1.05 PROJECT CONDITIONS

- A. Protect the existing building and its contents, exterior components not included in the work, interior finishes, and all site work against all risks associated with this work. Replace damaged components at no charge to the Owner and to the satisfaction of the Engineer using mechanics skilled in the appropriate trade including all site work. The premises, including access drives and parking areas, shall be left in a neat, clean, and safe condition at the end of each day's work.
- B. Proceed with installation only when existing and forecasted weather conditions permit masonry and related materials to be installed according to manufacturer's written instructions and industry guidelines.
- C. Protect finished work from water entry into cavity and masonry saturation.

1.06 PRE-INSTALLATION CONFERENCE

- A. Attend a preconstruction conference to be held with representatives of the Owner, the Contractor, the Engineer, and all other trades to discuss the work covered under this Section. Review methods and procedures related to carpentry installation, including attachment and installation procedures.

1.07 MOCK-UPS

- A. Mockups: Perform the following mockups on the building at locations approved by the Engineer in advance. Coordinate with other trades as required. Notify the Engineer at least 48 hrs before starting the work on each mockup. Reconstruct each mockup as many times as necessary to meet the approval of the Engineer. Do not proceed with any part of the work before the mockup is approved by the Engineer. Mockups will be used to establish both technical and aesthetic standards for the remainder of the project. Approved mockups may become part of the finished work.

- 1. Coordinate rough carpentry work as required to complete mockups in other sections.

1.08 QUALITY CONTROL

- A. Perform all work in strict accordance with all applicable laws and regulations of the building code and with all other authorities having jurisdiction. All such requirements shall take precedence over the requirements of the Specifications except where the requirements of the Specifications are more exacting or stringent.

- B. Inspection: Provide the Engineer access to the site to perform inspection of completed rough carpentry.

- C. The Contractor shall conduct a quality control program that includes, but is not limited to, the following:

- 1. Inspection of all materials to ensure that they conform to contract requirements and that all materials are new and undamaged.
- 2. Establishment of procedures for executing the work.
- 3. Inspection of work in progress to ensure that work is being done in accordance with established procedures and specific instructions, if given by the Engineer.
- 4. Inspection of all work completed, including visually examining all masonry work, and correction of all defective work.

- D. The Contractor is responsible for the correction of rough carpentry work that does not conform to the specified requirements.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials at temperatures above 40°F. Do not allow materials to freeze. In hot weather, store material in a cool place out of direct sunlight.

- B. Protect all materials in original unopened labeled containers and packaging and in compliance with manufacturer's directions.

1.10 WARRANTY

- A. Guarantee all work under this Section in a document stating that if, within 2 yrs after the Date of Substantial Completion of the Work, any of the work of this Section is found to be defective

or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so. State that the obligation of these Guarantees shall run directly to the Owner and may be enforced by the Owner against the Contractor, shall survive the termination of the Contract, and shall not be limited by conditions other than this Contract

PART 2 – PRODUCTS

2.01 GENERAL

- A. Manufacturer's products and specifications are generally referred to for identification; except as noted, products of other manufacturers meeting the requirements itemized below may be submitted for approval. The burden of proof for "equal" materials is on the Contractor, who shall bear all costs and delays involved in the Engineer's review of substitutions. Unless approved by the Engineer, obtain all materials from the same manufacturer. Check all specified items upon contract signing, and order early so the work is not delayed. Certain materials require considerable lead time for delivery.

2.02 MATERIALS LIST

- A. Lumber: Southern Yellow Pine; #2 grade or better. Lumber is generally specified in standard nominal dimensions; however, taper cuts will be required as shown on the drawings.
- B. Plywood: APA Exposure 1 rated sheathing to meet requirements of PS 1-09, made with Southern Yellow Pine, 4 ft x 8 ft; 3/4 in. thick, unless noted otherwise on the Drawings or as necessary to match existing thickness for wood decking replacement.
- C. Tapered shims: Continuous red cedar bevel siding, Grade B or better.
- D. Fasteners: All fasteners in contact with pressure-treated wood or masonry shall be stainless steel unless noted otherwise.
 - 1. For wood-to-wood connections (unless specified otherwise):
 - a. Annular ring nails in gauges as detailed or required, with length to provide a minimum of 1-1/4 in. embedment into the final piece receiving the nail points, except full depth into plywood.
 - b. Wood Screws: Wood screws in gauges as detailed or required.
 - 2. For attaching wood to solid masonry: Powers Tapper, 304 Stainless Steel, 1/4 in. dia., of sufficient lengths to penetrate 1-1/2 in. minimum. Alternate fasteners may be submitted for approval if Tapper found ineffective in certain masonry substrates.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Examine and verify all conditions and dimensions at the site in consideration of the special conditions associated with alteration of existing construction and reconstruction. Notify the Engineer immediately of any inconsistency between the field conditions and the Contract Drawings. The Engineer will determine what modifications are necessary. Correct conditions detrimental to timely and proper completion of the Work.
- B. Document and report to the Engineer all damaged construction existing prior to the start of the work.

3.02 GENERAL WORKMANSHIP

- A. Do not use powder-actuated fasteners. Provide all hardware, including nails, screws, staples, bolts, straps, hangers, anchors, etc., as required for attaching wood to wood or any other material. Use a minimum of two fasteners per length of lumber, stagger anchors for wood pieces more than 4 in. wide, and provide two anchors at the ends of each length.
- B. Mill lumber as detailed, to match adjoining roof elements, to provide smooth transitions to adjacent surfaces, and to provide slopes as shown on the drawings. Blocking is shown as nominal size; provide sloped or tapered blocking and continuous cedar shims to match insulation thickness to provide finished details as shown.
- C. Coordinate the work of this Section with the work of trades responsible for applying finish work and other items to the rough carpentry work. Furnish and install furring, blocking, and shims as required to make rough carpentry acceptable to these trades.
- D. Comply with all the relevant prescriptive requirements of the New York State Building Code unless noted otherwise on the drawings or in this Section.
- E. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- F. Fit carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- G. Produce joints that are tight, square, true, and well nailed, screwed, or bolted, with members assembled in accordance with the drawings and with applicable codes and regulations.
- H. Select and place lumber so that the best face is exposed to view when the work is completed. Do not use defective or damaged materials, such as cracked, split, warped, kinked, twisted, gouged, or severely dented lumber, regardless of how or where the defect or damage occurred. Do not use bent, cracked, or rusted connectors, regardless of how or where the damage occurred.
- I. Small amounts of crook are allowed in the lumber grades specified herein. Install horizontally oriented members with the high-side “crown” up.
- J. Do not use lumber with excessively large knots, loose knots, loose grain, excess wane, wood decay, or excessive machining defects.
- K. Discard units of material that are too small to use with minimum number of joints or optimum joint arrangement.
- L. Nailing Schedule: Conform to Table 2304.10.1 of the New York State Building Code unless noted otherwise on the drawings or in this Section. If splits occur at the ends of members when installing nails or other fasteners, then pre-bore holes to prevent splitting. Lead holes for nails shall not be larger than three-quarters of the nail diameter.
- M. Screw or bolt nailers as required to decks, walls, and parapets at spacing not over 24 in. o.c., and 16 in. o.c. at corners, unless shown otherwise on details,
- N. Countersink fasteners into wood only to depth for bolt heads to be flush. Use flat-head bolts.
- O. Securely nail other blocking and nailers at spacing not over 1 ft o.c., or as shown or required to prevent movement or uplift of any roofing or flashing attached to same.
- P. Where existing nailers are loose or displaced, or do not meet the requirements of this Section for fasteners, add such fasteners as specified for new wood work.

3.03 GENERAL PLYWOOD INSTALLATION

- A. Align the long dimension of plywood sheets transverse to the roof slope, and stagger end joints 2 ft minimum; maintain staggered joints between adjacent work areas.
- B. Provide a smooth, level plywood surface by using cedar shim stock, additional plywood, or lumber, as required to correct minor offsets and variations in the existing decking.
- C. Provide all fastener heads flush to the plywood surface. Gap all joints in plywood 1/8 in.
- D. Provide plywood where detailed. Secure vertically placed plywood with specified fasteners spaced at 6 in. o.c. along edges and provide one fastener for every 2 sq ft in the field of the sheet.

END OF SECTION

SECTION 062000

CARPENTRY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the carpentry work as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Blocking and miscellaneous wood, including wall lining for telephone and electric closets.
 - 2. Rough hardware.
 - 3. Installation only of finish hardware.
 - 4. Installation only of doors and hollow metal frames.

1.3 RELATED SECTIONS

- A. Architectural woodwork - Section 064023.
- B. Steel doors and frames - Section 081113.
- C. Wood doors - Section 081416.
- D. Finish hardware - Section 087100.

1.4 QUALITY ASSURANCE

- A. Lumber Standard: Comply with PS 20.
- B. Plywood Standard: Comply with PS 1 and American Plywood Assoc. (APA).
- C. Shop fabricate carpentry work to the extent feasible and where shop fabrication will result in better workmanship than feasible for on-site fabrication.
- D. Grade Marks: Identify lumber and plywood by official grade mark.
 - 1. Lumber: Grade stamp to contain symbol of grading agency certified by Board of Review, American Lumber Standards Committee, mill number or name, grade of lumber, species grouping or combination designation, rules under which graded where applicable, and condition of seasoning at time of manufacture.
 - a. MC-15 or KD: Maximum of fifteen (15) percent moisture content.
- E. Installation of doors, frames and hardware shall conform to the minimum standards of "Installation Guides for Doors and Hardware" of the Door and Hardware Institute.

1.5 SUBMITTALS

- A. Sustainability Data: For each Sustainability Focus Material in accordance with Section 018113 "Sustainable Requirements Summary".
- B. Pressure Treatment: Include certification by treating plant stating chemicals and process used, net amount of salts retained and conformance with applicable standards.
- C. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with governing ordinances and that treatment will not bleed through finished surfaces.

1.6 PRODUCT HANDLING

- A. Deliver carpentry materials to the site ready to use with each piece of lumber clearly marked as to grade, type and mill, and place in an area protected from the elements.
- B. Deliver rough hardware in sealed kegs and/or other containers which shall bear labels as to type and kind.
- C. Pile lumber for rough usage, when delivered to the site in stacks to insure drainage and with a minimum clearance of six (6) inches above grade. Cover stacks with tarpaulins or other watertight coverings. Store grounds and similar small sized lumber inside the building as soon as possible after delivery.
- D. Do not store seasoned lumber in wet or damp portions of the building.
- E. Protect fire retardant treated materials against high humidity and moisture during storage and erection.
- F. Remove delivered materials which do not conform to specified grading rules or are otherwise not suitable for installation from the job site and replace with acceptable materials.
- G. All items specified in Section 087100 of this specification entitled "Finish Hardware" shall be received, accounted for, stored and applied under this Section.
- H. Hardware shall be sorted and stored in space assigned by Contractor and shall be kept at all times under lock and key. The safety and preservation of all items delivered will be the responsibility of the Contractor.

1.7 JOB CONDITIONS

- A. Installer must examine the substrates and supporting structure and the conditions under which the carpentry work is to be installed and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer and the Architect.
- B. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

PART 2 PRODUCTS

2.1 WOOD MATERIAL

- A. General

1. All wood shall be sound, flat, straight, well-seasoned, thoroughly dry and free from all defects. Warped or twisted wood shall not be used.
2. For miscellaneous wood blocking, grounds, furring as required, use Utility Grade Coastal Douglas Fir or Southern Pine, free from knots, shakes, rot or other defects, straight, square edges and straight grain, air seasoned with maximum moisture content of nineteen (19) percent. Wood shall be S4S, S-Dry, complying with PS-20.
3. For closet shelving, provide 3/4" thick A-A INT-APA plywood with 1/4" thick hardwood edges, fire retardant treated as specified herein.
4. Plywood and rough carpentry for telephone and electric closets, provide 3/4" thick C-D EXT-APA plywood, fire retardant treated as specified herein.

B. Wood Treatment

1. All interior wood material specified herein shall be fire retardant treated to comply with the AWPA standard U1 to achieve a flame spread rating of not more than 25 (UL Class "FR-S") when tested in accordance with UL Test 723 or ASTM E 84. The fire-retardant chemicals used to treat the lumber must comply with FR-1 of AWPA Standard P49 and be free of halogens, sulfates and ammonium phosphate.
 - a. After treatment, kiln dry to a moisture content of fifteen (15) percent; if wood is to be painted or finished, kiln dry to a moisture content of twelve (12) percent. Treatment shall be equal to "Dricon" made by Arch Wood Protection Inc. or approved equal. Provide UL approved identification on treated materials.
2. Treated wood which is cut or otherwise damaged shall be further treated in accordance with the AWPA Standard M-4.

2.2 HARDWARE

- A. Rough Hardware for Treated Woods and Exterior Use: Hot-dipped galvanized or Type 304 stainless steel.
- B. Nails: Common steel wire, untreated for interior work as per ASTM F 1667.
- C. Bolts: Standard mild steel, square head machine bolts with square nuts and malleable iron or steel plate washers or carriage bolts with square nuts and cut washers conforming to the following:
 1. Bolts: ASTM A 307, Grade A.
 2. Nuts: ASTM A 563.
 3. Lag Screws and Bolts: ASME B 18.2.1.
- D. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2; use stainless steel for treated woods and exterior use.
- E. Wood Screws: ASME B 18.6.1.
- F. Concrete and Masonry Anchors: Standard expansion-shield self-drilling type concrete anchors where so shown or noted on the drawings, or where approved by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where carpentry is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION OF FINISH HARDWARE

- A. Hardware shall be carefully fitted and securely attached, in accordance with these specifications and the instructions of the various manufacturers.
- B. Unless otherwise noted, mount hardware units at heights established in Section 081113.
- C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.
- G. All keys used shall be construction keys which are to be tagged with fiber discs as approved, clearly labeled with identifying inscriptions and then neatly arranged in a temporary cabinet. All construction keys shall be returned to the Owner.
- H. Adjusting and Cleaning
 1. Adjust and check each operating item of hardware and each door, to ensure proper operation and function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.
 2. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make a final check and adjustment of all hardware items in such space or area. Clean and re-lubricate operating items as necessary to restore proper

function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.3 INSTALLATION OF DOORS AND FRAMES

A. Preparation

1. Remove welded-in shipping spreaders installed at factory.
2. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
3. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

B. Installation

1. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
2. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Install frames in accordance with ANSI/SDI A250.11, Recommended Erection Instructions for Steel Frames, unless more stringent requirements are specified herein.
 - b. At fire-protection-rated openings, install frames according to NFPA 80.
 - c. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - d. Install frames with removable glazing stops located on secure side of opening.
 - e. Frames set in masonry walls shall have door silencers installed in frames before grouting.
 - f. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - g. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
3. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

4. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames conforming to the requirements of sound attenuation blankets specified in Section 092900 "Gypsum Drywall."
5. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
8. Installation Tolerances: Adjust steel door frames for squareness, alignment, twist, and plumb to the tolerance given in HMMA 841 of ANSI/NAAMM, current edition.
9. Steel Doors: Fit hollow metal doors accurately in frames to the tolerances given in HMMA 841 of ANSI/NAAMM, current edition.
 - a. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
10. Glazing: Comply with installation requirements in Section 088010 "Interior Glass and Glazing" and with standard steel door and frame manufacturer's written instructions.
 - a. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

C. Wood Doors

1. Condition doors to average prevailing humidity in installation area prior to hanging.
2. Install doors in accordance with manufacturer's instructions.
3. Fit door to frames and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.
4. Clearances: Install doors to meet clearance requirements specified in Section 081416.
5. Fire-Rated Doors: Install in corresponding fire-rated frames in accordance with the requirements of NFPA No. 80. Provide clearances complying with the limitations of the authority having jurisdiction.

- D. Adjustments: Check and readjust operating finish hardware items just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

3.4 BLOCKING AND MISCELLANEOUS WOOD

A. General

1. Erect rough carpentry true to line, levels and dimensions required; squared, aligned, plumbed, and securely fastened in place.

2. Shim where required to true up furring, blocking and the like. Use wood or metal shims only.
3. Do all cutting, fitting, drilling and tapping of other work as required to secure work in place and to perform the work included herein. Do all the cutting and fitting of carpentry work, for the work of other trades as required.

B. Blocking and Miscellaneous Wood

1. Furnish and install all wood grounds, furring, blocking, curbs, bucks, nailers, etc., that may be necessary and required in connection with the carpentry and with the work described for any other trades and including required carpentry for electrical fixtures. All blocking and nailers shall be continuous wherever required, whether or not so indicated.
2. Blocking shall be as required for the proper installation of the finished work and for items in mechanical Sections as required. Blocking, edgings, stops, nailing strips, etc., shall be continuous, unless distinctly noted otherwise. Provide blocking as required to install all equipment. Provide blocking and nailers where shown or required to fasten interior sheet metal work.
3. Fastening for wood grounds, furring and blocking shall be of metal and of type and spacing as best suited to conditions. Hardened steel nails, expansion screws, toggle bolts, self-clinching nails, metal plugs, inserts or similar fastenings shall be used, of suitable type and size to draw the members into place and securely hold same.

C. Provide sheet metal blocking at typical locations as shown on the Architectural Drawings.

3.5 TELEPHONE AND ELECTRIC EQUIPMENT MOUNTING BOARDS

- A. Furnish and install 3/4" thick plywood panels to the walls of the telephone and electric equipment rooms in accordance with the requirements of the local utility company.
- B. Secure to wall using proper devices for substrates encountered, spaced twelve (12) inches o.c., maximum around the edges, 1-1/2" from corners, and in three (3) rows of three (3) each in the field. Recess fastening devices flush with the plywood surface. Adjacent panels shall be butted with 1/16" space between without lapping.

3.6 ROUGH HARDWARE

- A. Securely fasten rough carpentry together. Nail, spike, lag screw or bolt as required by conditions encountered in the field and the Contract Documents.
- B. Provide rough or framing hardware, such as nails, screws, bolts, anchors, hangers, clips, inserts, miscellaneous fastenings, and similar items of the best quality and of the proper size and kind to adequately secure the work together and in place, in a rigid and substantial manner.
- C. Secure rough carpentry to masonry with countersunk bolts in expansion sleeves or other acceptable manner, with fastenings not more than sixteen (16) inches apart. Secure woodwork to hollow masonry with toggle bolts spaced not more than sixteen (16) inches apart.
- D. Countersink bolts in nailers and other rough woodwork and include washers and nuts. Cut bolts off flush with surfaces and peen as may be required to receive finished work.
- E. Inserts to secure wood nailers to concrete shall be malleable iron threaded inserts with 3/8" diameter bolts of length to allow for countersinking. Locate at end of each nailer and at intervals not exceeding thirty (30) inches o.c.

- F. Furnish to the mason for building into the work, or attaching the work which is to be built in, anchors, bolts, wall plates bolted to masonry, corrugated wall plugs, nailing blocks, etc., which are required for the proper fastening and installation for the work or other items as called for in this Section.
- G. Detailed instructions with sketches of necessary requirements, shall be given to the masonry trade showing the location and other details of such nailing devices.

3.7 CLEANING UP

- A. General: Keep the premises in a neat, safe and orderly condition at all times during execution of this portion of the work, free from accumulation of sawdust, cut-ends and debris.
- B. Sweeping
 1. At the end of each working day, or more often if necessary, thoroughly sweep all surfaces where refuse from this portion of the work has settled.
 2. Remove the refuse to the area of the job site set aside for its storage.
 3. Upon completion of this portion of the work, thoroughly broom clean all surfaces.

END OF SECTION

SECTION 064023

ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the architectural woodwork as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Wood trim, moldings, and base.
 - 2. Wood casework and counters with special veneers.
 - 3. Hardware for casework.
 - 4. Shelf standards and brackets.
 - 5. Wood benches with upholstered cushions.
 - 6. Wood framing and rough lumber as required for work of this Section.
 - 7. Wood grounds, blocking, nailers, furring as required for work of this Section.
 - 8. All rough hardware and fastenings for work of this Section.
 - 9. Drilling concrete and masonry, drilling and/or tapping metal work, as required, for the installation of work of this Section.
 - 10. Back painting as specified herein.
 - 11. Shop finish of work of this Section, except items indicated herein to be shop primed only.

1.3 RELATED SECTIONS

- A. Carpentry - Section 062000.
- B. Caulking between architectural woodwork and any wall, floor, or ceiling joints - Section 079200.
- C. Wood doors - Section 081416.
- D. Field finishing - Section 099000.
- E. Engineered Countertops - Section 123661.

1.4 QUALITY STANDARDS

- A. The quality standards of the Architectural Woodwork Institute, "Architectural Woodwork Standards," 2nd Edition, dated October 1, 2014, and enhancements 2019 shall apply to all

workmanship including materials and installation, for architectural woodwork and by reference are made a part of this specification. All work shall conform to "Premium" grade requirements of the AWI "Architectural Woodwork Standards," unless otherwise modified herein.

- B. In the event of a dispute as to the quality grade (or grades), the Contractor shall call upon the Architectural Woodwork Institute for an inspection under AWI's Quality Certification Program which shall include a QCP Inspection and Report. The Contractor agrees to abide by the decision of this Report. The cost of said inspection and report shall be borne by the Contractor.
- C. Employ only tradesmen experienced in the fabrication and installation of architectural woodwork.
- D. Woodworking firm must be accredited by the AWI Quality Certification Program (QCP).
- E. All woodwork shall be minimum Class B;
 - 1. Flame spread index: 26-75.
 - 2. Smoke-developed index: 0-450.
- F. All woodwork shall have no added urea formaldehyde and be certified to FSC standards.

1.5 SUBMITTALS

- A. Shop Drawings
 - 1. Submit shop drawings of all woodwork specified and indicated on the drawings. Shop drawings shall indicate room plans and elevations at 3/4" equals 1'-0" scale and typical construction details at 3" equals 1'-0" scale. Shop drawings shall indicate all materials, thicknesses and finishes.
 - 2. Shop drawings shall show all finish hardware, anchors, fastenings and accessories.
 - 3. Shop drawings shall show all jointing, joint treatment and butt jointing in veneers and plastic laminate.
 - 4. Shop drawings for wood paneling must show complete elevations of rooms to receive paneling as well as panel matching required by these specifications.
 - 5. Shop drawings for cabinet work must show centerline height and horizontal location of all required internal wall blocking.
 - 6. Where architectural woodwork deviates from AWI standards noted herein, shop drawings must identify these deviations.
- B. Engineering Data
 - 1. Before any metal supports associated with the wood slat screens are fabricated, submit engineering data drawings to the Architect for review indicating how performance standards specified here shall be met. The contractor is responsible for the structural design and supports for these systems and must show proposed systems on these drawings.
 - 2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of members. Calculations and drawings must be prepared by a Structural Engineer licensed in the State of New York and shall be signed and sealed by this Engineer.

- C. Samples: Submit samples of each of the following items:
1. Plastic laminate, twelve (12) inches square, including a section of outside corner.
 2. Transparent finish for each species of wood veneer laminated to particleboard, twelve (12) inches square, for each finish specified or shown.
 3. Opaque finish wood veneer laminated to particleboard, twelve (12) inches square for each color, gloss and finish specified or shown.
 4. Each finish type of wood panel, 24" wide x 36" high.
 5. Each type and finish of each type of wood cornice, trim, molding, etc., eight (8) inches long, finish as specified.
 6. Cabinet hardware.
 7. Quartzite solid surfacing.
 8. Upholstery fabric, 8-inches square samples of each type of upholstery fabric and foam.

1.6 QUALIFICATIONS

- A. The work of this Section shall be provided by a firm having a minimum of five (5) years' experience on projects of similar size and quality to that specified and shown.

1.7 COORDINATION

- A. Coordinate the work of this Section with other appropriate Sections of the specifications to ensure proper scheduling for fabrication and installation of the work specified herein
- B. Coordinate with partition and finish trades to ensure that proper provisions are made for the installation of the work specified herein.
- C. Verify all dimensions in the field prior to fabrication of all Architectural Woodwork to ensure proper fit.

1.8 PRODUCT HANDLING

- A. All materials and work of this Section shall be protected from damage, from time of shipment from shop to final acceptance of work. Cover, ventilate, and protect work of this Section from damage caused by weather, moisture, heat, staining, dirt, abrasions, any other causes which may adversely affect appearance or use, or which may cause deterioration of finish, warping, distortion, twisting, opening of joints and seams, delamination, loosening, etc., of work of this Section.
- B. Keep all finish carpentry, millwork, and cabinet work under cover both in transit and at the premises. Do not deliver any finish carpentry, millwork or cabinet work before it is required for installation. Protect such work to avoid damage in transit, during erection and after erection until acceptance of the building; use all such methods to provide the proper protection. Remove such protection when directed by the Architect.
- C. Deliver finish carpentry, millwork, and cabinet work in a dry stable condition; protect same against injury and dampness. Do not store or install finish carpentry, millwork or cabinet work until after the concrete, masonry and plaster work are thoroughly dry.

- D. Damaged or defective items of work of this Section are subject to rejection and replacement with new by Contractor, at no cost to Owner.

1.9 JOB CONDITIONS

- A. Humidity Controls: The ambient relative humidity at the site, including both the storage and the installation areas, shall be maintained between 25% and 55% prior to delivery and through the life of the installation.
- B. Determine equilibrium moisture content and maintain required temperature and relative humidity as required for a tolerance of plus or minus one (1) percent of the specified optimum moisture content until woodwork receives specified finishes. Refer to "Guide to Wood Species Selection," AWI, for method of determining equilibrium moisture content values.
- C. Examination of Substrate and Conditions: The installer must examine the substrate and the conditions under which the work of this Section is to be performed and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with work under this Section until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- D. Areas to receive architectural woodwork must be fully enclosed with windows and/or curtain wall installed and glazed, exterior door in place, HVAC systems operational and temporary openings closed. Any plaster, wet grinding and concrete work shall be fully dry.
- E. Architectural woodwork shall be allowed to come to equilibrium on site for 7 days prior to installation.

PART 2 PRODUCTS

2.1 MILLWORK ELEMENTS

- A. WOOD PANELING: AWI Premium Grade, select Maple with custom stain, slip matched, matching adjoining veneers and free from cat's eyes, bird's eyes, burls, curls or cross grains. Veneer core, particle or plywood core, no urea formaldehyde, FSC and LEED approved fire retardant. Particleboard cores. Transparent finish, AWI Premium Grade, Factory Finish System no. TR-6.
- B. WOOD SLAT PANEL: Solid wood slat adhered to wood veneer panel.
- C. WOOD BASE: AWI Premium Grade, select Maple with custom stain. Where indicated on drawings, face of wood base shall be flush with wall above.
- D. BENCHES: Solid wood and wood veneer panels and upholstered cushions as indicated. Upholstery by Maharam Fabrics with Durablock and Nanotex treatment.
 - 1. Seats: To be loose cushion effect. Seat cushions to be high-density foam wrapped in thin layer of low-density foam and muslin.
 - 2. All foam in seats shall be encapsulated with "Therma Block" wrapping made by DuPont, type as required by upholstery conditions encountered.
 - 3. Upholstery Fabric: See Finishes Schedule for fabric selection.
- E. COUNTERTOPS: Refer to Section 123661.
- F. Repurposed: Reconfigure existing quartz countertop slabs for layouts indicated in drawings. Refinish material.

- G. ADJUSTABLE SHELVING ON STANDARDS: Rakks C and D style standards with non-ferrous countersunk screws. Rakks heavy duty brackets, models BR2-12 and BR2-18 with retaining pin option BR-RP. Finish: Clear anodized aluminum.

2.2 BASIC REQUIREMENTS

- A. Wood Moisture Content: Provide kiln-dried (KD) lumber with an average moisture content range of nine (9) to twelve (12) percent for exterior work and six (6) to eleven (11) percent for interior work.
- B. Measurements: Before proceeding with woodwork required to be fitted to other construction, obtain field measurements and verify all dimensions of shop drawing details as required for accurate fit.
- C. Compatibility of Grain and Color: Architect reserves the right to select materials for best compatibility between visually related members and veneers.
- D. Machine and sand woodwork to comply with requirements of Standards for specified grade.
- E. Fabricate woodwork to dimensions, profiles and details shown. Rout or groove back of flat trim members, kerf backs of other wide flat members except plywood or veneered members.
- F. Miter joints by joining, splining and gluing to comply with requirements for the specified grade.
- G. Inspect each piece of lumber and plywood or each unit of woodwork after drying; do not use twisted, warped, bowed or otherwise damaged or defective wood.

2.3 GENERAL - MATERIALS

- A. Softwood lumber shall conform to the requirements of the latest edition of American Lumber Standards Simplified Practice Recommendation R-16. Grades shall conform to the grading rules of the Association having jurisdiction and shall bear the official grade and trademark of the Inspection Bureau of the Association and a mark of mill identification.
- B. Framing and Rough Lumber: No. 1 KD grade Southern Pine or Dense Construction grade Douglas Fir, having extreme fiber in bending stress of at least 1700 psi, surfaced four sides (S4S). Provide fire retardant treatment meeting requirements of Section 062000.
- C. Grounds, Blocking, Nailers, Furring: Southern Pine, Douglas Fir or Sitka Spruce, grade to suit particular purpose and to be straight, square edged, straight grained, surfaced four sides (S4S), and which will retain nails and screws without splitting. Provide fire retardant treatment.
- D. Wood Veneers and Lumber: Provide AWI Premium Grade materials and workmanship. For species not listed in the AWS comply with the following:
 - 1. Provide AWS Lumber Grade Premium and AWS Grade AA Veneer, book-matched, minimum 6-inch face veneer width. Kiln dry to 6-8 percent moisture content. Components shall be free of defects and sapwood. Match adjacent pieces for color and grain pattern.
 - 2. Single-Source Requirement for Wood Veneers and Solids: Intent is to provide wood which matches as closely as possible throughout the project. Provide wood veneers and solids from the same distributor, and from the same flitches and solids sources to the greatest extent possible.
- E. Lumber: AWI Section 3 with the following requirements:

1. Hardwood for Transparent Finish: Premium Grade, Rift sliced/sawn Maple with custom stain matching adjoining veneers unless otherwise shown or specified, and free from cat's eyes, bird's eyes, burls, curls or cross grains.
 2. Hardwood for Opaque Finish: Any hardwood which, when finished, will not show any grain, imperfection or other surface defects when used with the opaque finish specified.
- F. Plywood: AWI Section 4; Veneer core, particleboard, or plywood core unless otherwise specified, and with the following requirements:
1. Hardwood: Premium Grade, face veneers as shown or specified
 2. Particleboard: Premium Grade, fire retardant for wall paneling only equal to Duraflake FR and Duraflake for cabinets. In addition, particleboard and MDF shall be certified to the following EPP CPA 3-08 formaldehyde emission limits:
 - a. Particleboard meets 0.18 ppm.
 - b. MDF meets 0.21 ppm.
 3. Edges: Banded with hardwood in accordance with Premium Grade Standards.
- G. Wood Species and Cut for Transparent Finish: Rift sliced/sawn Maple (WD1 & WD2).
1. Architect's control samples for transparent finish, veneer grain and figure characteristics are available for review at the office of the Architect.
- H. Veneer Matching Requirements
1. Matching Between Adjacent Veneer Leaves: Book match and architectural end match.
 2. Matching Within Individual Panel Faces: Balance and Center Match.
 3. Method of Matching Panels: Blueprint-matched panels and components
 4. Sequence match wall panels throughout the space or room.
- I. Finishing (Wood)
1. Transparent Finish for Paneling, Casework and Trim
 - a. AWI Factory Finish System "Conversion Varnish", System 5, Transparent.
 - b. AWI Premium Grade.
 - c. Stain: To match Architect sample.
 - d. Degree of Sheen: Satin.

2.4 PLASTIC LAMINATE

- A. Face Sheets: NEMA Publication LD3, Grade GP50, Type I, 0.05" thick, as manufactured by Abet Laminati, Formica, or WilsonArt. Color, pattern and finish as selected by the Architect.
- B. Backing Sheets: Non-decorative, high-pressure plastic laminate, NEMA LD3, Grade BK20, 0.02" thick.
- C. Edges: Finish with plastic laminate to match face and applied before face sheets are applied, unless otherwise shown or specified.

2.5 METAL

A. Steel

1. Structural Steel Shapes and Plates: ASTM A 36.
2. Stainless Steel
 - a. Comply with the following standards for the forms and types of stainless steel for the required items of work.
 - 1). Tubing: ASTM A 554, Grade MT 304.
 - 2). Pipe: ASTM A 312, Grade TP 304.
 - 3). Castings: ASTM A 743, Grade CF 8 or CF 20.
 - 4). Sheet, Strip, Flat Bar and Plate: ASTM A 666, Type 304.
 - 5). Bars and Shapes: ASTM A 276, Type 304.
3. Hot-Rolled Carbon Steel Sheets: Commercial quality, ASTM A 569, may be used for concealed parts only.
4. Finishes
 - a. Primer for Unexposed Metal: Zinc chromate primer.

B. Ornamental Metal: See Section 057000.

2.6 MISCELLANEOUS PRODUCTS

A. Fasteners

1. Wood Screws: FS FF-S-111, type, size, material and finish as required for the condition of use.
2. Nails: FS FF-N-105, type, size, material and finish as required for the condition of use.
3. Anchors: Type, size, material and finish as required for the condition of use.
4. Staples: Upholstery type staples of sufficient strength to hold fabric taut in place without sagging.

B. Adhesives

1. For Laminating Plastic Laminate Surfaces: Urea resin, Type II, as recommended by fabricator.
2. For All Other Uses: Polyvinyl acetate resin emulsion or other type as recommended by the fabricator.

2.7 BUILT-IN CABINETS, BOOKCASES, AND WOODWORK WITH WOOD VENEER FINISH

- A. Construction: Details of cabinet and woodwork construction shall conform to design as detailed on the drawings and shall be constructed in accordance with AWI Section 10, Premium Grade.
- B. Finishing: All work shall be factory pre-finished. No field finishing will be permitted, except minor retouching that is necessary after installation to leave work in perfect condition. Field touch-up shall be accomplished using the same finishes as originally applied at the factory. All finishes shall be free from runs, sags and other visual defects. All wood shall be thoroughly hand smoothed and hand sanded to remove all traces of machine and tool marks. All steel or

other metal components shall be deburred, thoroughly cleaned and degreased prior to finishing. Requirements for surface preparation shall be in accordance with AWI Standards specified. Surfaces shall be finished as follows:

1. Wood Species and Cut for Exposed Surfaces: As specified hereinabove.
 - a. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
 - b. Matching of Veneer Leaves: Book match.
 - c. Vertical Matching of Veneer Leaves: End match.
 - d. Veneer Matching within Panel Face: Running match.
 - e. Veneer Matching within Room: Provide casework veneers in each room or other space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.
 2. Semiexposed Surfaces: Provide surface materials indicated below:
 - a. Surfaces Other Than Drawer Bodies: Compatible species to that indicated for exposed surfaces, stained to match.
 - b. Drawer Sides and Backs: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
 - c. Drawer Bottoms: Hardwood plywood.
 3. All wood veneer surfaces shall be given transparent finish as specified herein.
 4. Backing Veneer: Provide backing veneer, of same thickness and strength as face veneer for balanced construction, where plywood surface not exposed, not semi-exposed, or not to be finished. Note that interior surface of cabinets, closets, are to be finished.
- C. Edge Banding: All visible edges of case and body members fabricated from plywood shall be banded. Transparent finished wood veneer panels shall be banded with wood species to match face veneers. Edge banding on wood veneer wall panels shall be inconspicuous with face veneers running over edge of banding, and "swiped" per details.

2.8 CABINET HARDWARE

- A. Architectural Woodwork Hardware: Provide the following items, or their approved equal, as required:
1. Hinges: Hafele concealed hinges.
 2. Catches: Magnetic; top and bottom.
 3. Pulls: Hafele 124.02.444 6 in. Satin aluminum tab.
 4. Locks: Directed by the Architect.
 5. Drawer Slides (24" maximum width): Accuride, Model 7434, full extension, 100 lb. capacity.
 - a. Drawer Slides (16" maximum width) Easy Close: Accuride Model 3832C, full extension, 100 lb. capacity.
 6. Shelf Supports: Pin and grommet system equal to No. 282.01.701 pin and 282.50.704 grommet made by Hafele.
 7. Finish: satin polished, oil rubbed.

8. Closet Hardware: Oval wardrobe rails, chrome plated steel with center bracket and wall support brackets made by Hafele or approved equal.

2.9 ADJUSTABLE SHELF STANDARDS AND BRACKETS

- A. Standards: Rakks C and D style standards with non-ferrous countersunk screws.
- B. Brackets: Rakks heavy duty brackets, models BR2-12 and MR2-18 with retaining pin option BR-RP; matte black finish.

2.10 WOOD FOR CAPS, TRIM, BASES, MOLDINGS AND FRAMES

- A. Quality Standard: For the following types of interior architectural woodwork, comply with indicated standards as applicable.
 1. Standing and Running Trim: AWI Section 6.
 2. Miscellaneous Millwork: AWI Section 6.
- B. Woodwork for Transparent Finish: Except as otherwise indicated, comply with the following:
 1. Grade: Premium.
 2. Species of Solid Wood: Maple.

2.11 FABRICATION - GENERAL

- A. Provide lumber framing for architectural woodwork, complete with all bracing and fastening devices as required for a rigid installation, and as required to sustain the imposed loads.
- B. Do all fabrication from field measurement with provision for scribing as required to meet built-in conditions.
- C. Coordinate the work of this Section with the work of other trades.
- D. Fabricate units in largest practicable sections. Assemble in the shop for trial fit, disassemble for shipment and reassemble with concealed fasteners.
- E. Maintain relative humidity and temperature during fabrication, storage and finishing operations matching that of the areas of installation.
- F. Details indicate the required type and quality of construction. Modifications to conform to manufacturer's standards will be considered providing they comply with the Contract Documents, maintain the profiles shown and subject to acceptance by the Architect.
- G. Reinforcing shown is minimum. Provide additional reinforcing as required to ensure a rigid assembly. Exposed surfaces shall be free from dents, tool marks, warpage, buckle, glue and open joints, or other defects affecting serviceability or appearance. Accurately fit all joints, corners and miters. Conceal all fasteners. Make threaded connections up tight so that threads are entirely concealed.
- H. Factory finish all items where possible. Defer final touch-up, cleaning and polishing until after delivery and installation.
- I. Comply with AWI, Premium Grade standards for sanding, filling countersunk fasteners, back priming and similar preparations for the finishing of architectural woodwork, as applicable to each unit of work.

- J. Prepare all countersunk wood screw attachments for wood plugs. Wood plugs shall match surrounding species and grain direction; putty filling is not acceptable.

2.12 FABRICATION - SPECIFIC ITEMS

A. Casework

1. Include all preparations for mechanical, electrical, telephone and plumbing work required.
2. Provide cabinet hardware for casework as shown.
3. Provide dust panels in body webs and between drawer units.
4. Provide wood veneers for exposed surfaces as specified herein before.
5. Hollow core doors will not be permitted.
6. Provide matching veneers for edge treatments of case body members where transparent finishes are indicated or specified.
7. Provide drawers with slides as specified. Drawers shall not rest on web body frames.
8. Provide wood veneers for transparent finish, of matching and continuing grain, for drawer and door edges.

B. Closet and Storage Shelving

1. Provide closet and storage shelving in accordance with AWI Section 600, Custom Grade, unless otherwise shown or specified.
2. Exposed edges shall have hardwood edge bands.

- C. Standing and Running Trim: Provide standing and running trim of the sizes, profiles, species and finish as specified or shown and complying with AWI Section 6, Premium Grade.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where architectural woodwork is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 FRAMING

- A. Use specified framing lumber, sizes and spacing as indicated on drawings and as required to support loads.
- B. Framing shall be cut square on bearings, closely fitted, accurately set to required lines and levels, rigidly secured in place at bearings and connection with nails, lag screws and/or bolts as required by conditions.

3.3 GROUNDS, BLOCKING, NAILERS AND FURRING

- A. Provide all wood grounds, blocking, nailers, furring, and the like for work of this Section, where shown and where required, dressed to size indicated or required to suit the condition. Install

grounds, blocking, nailers, furring, etc., rigidly, in proper alignment, trued with a long straight edge.

3.4 ROUGH HARDWARE

- A. Provide all rough hardware, such as nails, screws, bolts, anchors, hangers, clips and similar items. Hardware shall be of the proper size and kind to adequately secure the work together and in place, in a rigid and substantial manner. Use galvanized hardware at exterior walls, and at other locations where subject to moisture or where water will be present.
- B. Secure wood to concrete and to solid masonry with countersunk bolts in expansion sleeves or other approved manner, to steel with countersunk bolts, to hollow masonry and to drywall with heavy duty countersunk toggle bolts. Space fastenings not more than sixteen (16) inches apart. Hardened cut nails, power-driven fastenings, or other suitable devices may be used where approved by the Architect.
- C. Connections and fastenings shall be made in such manner as will compensate for swelling and shrinkage and shall permit the work to remain permanently in place without any splitting or opening of joints.

3.5 INSTALLATION OF CABINET FINISH HARDWARE

- A. All items of finish hardware furnished under this Section shall be carefully fitted and secured in place as part of the work of this Section. Locations and positioning of hardware shall be subject to the Architect's approval. Care shall be taken not to mar or damage hardware, or other work. Install doors plumb and true. Hardware shall be fitted to ensure operation without forcing.
- B. After preliminary fitting of hardware, remove trim for painting and finishing work; after that, reinstall the hardware in a permanent manner.
- C. Upon completion of the work, before final acceptance of the building by the Owner, the Contractor shall, in the presence of the Architect, show that all hardware is in satisfactory working order; fit all keys in their respective locks and, upon acceptance of the work, shall tag and deliver all keys to the Architect and Owner.
- D. When directed by the Owner, at any time during the first year after the completion of the Contract, the Contractor shall return to the building and adjust and refit the work and hardware, and leave such items in satisfactory working order.

3.6 GENERAL INSTALLATION

- A. Wall anchorage and general installation procedures for cabinetry work shall conform to AWI Section 10, Article entitled "EXECUTION", Sub-Article 6.1 with all related sub-paragraphs.
- B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops), and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offset in revealed adjoining surfaces.
- C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

3.7 WOOD SLAT SCREEN WALL

A. Anchors and Fasteners:

1. Face Nailing: Confine face nailing to inconspicuous locations. Set nails. Fill holes in exposed and semi-exposed surfaces to conceal nail locations.
2. Anchorage to Drywall Construction: Anchor work to framing/anchor plates with toggle bolts or tapping sheet metal screws; space screws to limit loads to 50 pounds withdrawal or 80 pounds shear per anchor. Where fastening to unreinforced gypsum board is necessary, limit loads to 20 pounds withdrawal or 40 pounds shear per anchor.
3. Anchorage to Concrete: Anchor work with bolts and expansion shields.

3.8 TRIM, MOLDINGS, ETC.

- A. Install with minimum number of joints possible, using full-length pieces for each run. Stagger joints in adjacent and related members. Cope at returns, miter corner.
- B. Joints of all trim and/or moldings shall be set tight, miter exterior angles and cope interior angles. Joints, except end joints less than twelve (12) feet apart, will not be permitted in straight runs of trim and/or moldings.
- C. Secure all trim and/or moldings with glue and blind nail with finishing nails. Set exposed nail heads in finished work and putty. Sand all work to remove any tool marks and irregularities.
- D. Wood shall receive finish as specified in Section 099000 - Painting.

3.9 CABINET WORK AND MILLWORK

A. General

1. Materials and workmanship shall conform to the Quality Standards of the Architectural Woodwork Institute specified herein and to the drawings.
2. Cabinet work and millwork shall be performed by experienced cabinet work and millwork company, having craftsmen skilled in their trade.
3. Fabricate all cabinet work and millwork completely in the shop, in complete and/or as large units as practical, leaving only fitting, assembly, installation and a minimum of fabrication and finishing to be done at the building. Assembled work shall be rigidly secured and permanently fastened together with concealed fasteners.
4. Afford Architect every facility for inspection of work at shop or mill at such times as the Architect may select.
5. As far as practicable, use concealed fastenings for joining and assembling the work. Where this is impossible, the means of securing shall be placed in inconspicuous places and methods of joining and assembling submitted for Architect's approval prior to fabrication.
6. Mill all finish wood accurately to detail, with clean cut moldings, profiles and lines, machined, sanded smooth, housed, jointed, blocked, put together in the best manner, with provision for swelling and shrinkage, and to ensure the work remaining in place without warping, splitting or opening of joints.
7. Cut trim to dimensions and profiles shown, from solid stock.

8. Make all trim and the like in single lengths wherever possible; joints mitered, glued and splined. Continuous members shall have tight flush joints, doweled or splined and glued.
 9. Make all joints hairline tight, fitted accurately and joined with hardwood splines or dowels, glued together, or by other method approved by Architect. Use screws, not nails, for fastenings.
 10. Gluing shall, where practicable, be by the hot plate press method and glued surfaces shall be in close contact throughout. Glue stains on finished work will not be permitted.
 11. Cover surface fastenings, where permitted, with matching wood plugs or wood putty. Finish exposed edges of plywood with matching solid stock. Lock miter external corners; tongue and groove internal corners to allow for contraction and expansion.
 12. Machine sand with grain, finish with hand sanding, leave exposed surfaces free from machine or tool marks that will show through the finish.
 13. Work which adjoins drywall, concrete, or other finish shall be fitted and scribed in a careful manner and ample allowance shall be given for cutting and scribing.
 14. Erect work true to lines, levels and dimensions, square, aligned and plumb, securely and rigidly fastened in place.
- B. Cabinet Work: Provide all items of cabinet work indicated on drawings and as herein specified.
1. Tops, sides, backs, bottoms, dividers, shelves, fronts, doors and drawer fronts shall be of plywood or flakeboard core, with the specified wood veneer or plastic laminate as indicated on drawings.
 2. Drawer sides and backs shall be 1/2" thick solid clear selected white birch, suitable for clear finish. Drawer bottom shall be 3/8" thick plywood with clear selected white birch veneers, suitable for clear finish.
 3. Cabinet doors and drawers shall be flush mounted.
 4. Adjustable shelves in cabinets shall have grommets spaced 2" o.c.
 5. Fixed shelves shall be dadoed into side supports and glued.
 6. Shelves shall be 3/4" thick for spans up to 30"; for spans in excess of 30" to 48" shelves shall be 1" thick.
 7. All cabinets shall have closed top, sides, bottom, and back with veneers to match face work. Cabinets to fit accurately into indicated locations; scribe moldings permitted only where indicated.
 8. Countertops, counters, counter fronts, shelves, etc., indicated on drawings to have plastic laminate, shall have plastic laminate shop applied to 3/4" thick core, with plastic laminate backing sheet on underside or back of countertops, counters and shelves. Plastic laminate shall be pressure laminated to core with laminate at external corners. Provide concealed wood framing to support plastic laminate counters, securely fastened to wall and to underside of counters.
- C. Countertops shall be installed to support a minimum concentrated live load of 150 lbs. acting downward at mid span at outer edge of counter without causing deformation and damage.

3.10 WOOD BASES

- A. Provide plywood backing, or continuous sheet metal backer, toggle bolted to substrate if substrate not suitable for securing wood base.
- B. Machine wood bases from specified wood, to profiles indicated on drawings.
- C. Set base level and plumb. Where indicated on drawings, face of wood base shall be flush with wall above. Glue wood base to substrate or to plywood backing, and screw or nail wood base to substrate or to plywood backing with countersunk wood screws or with finishing nails, recess wood screw heads, and spackle with wood putty, set and spackle nails with wood putty. Do not nail or fasten wood base to floor. Ends of wood base shall be either splined or ship lapped.
- D. Where no wood backing occurs, screw apply base at each stud with screw countersunk and wood putty applied and sanded smooth and flush with base.

3.11 WOOD DOOR FRAMES

- A. Where indicated on drawings, provide wood frames and bucks for wood doors. Bucks shall be braced, set straight and plumb and have anchors for building into adjoining construction; space anchors not over two (2) feet apart (one foot from corners). Machine wood frames from specified solid wood to profiles indicated on drawings. Set frames plumb, level, square; securely attached to adjoining construction. Wood frames, bucks and trim shall conform to details.

3.12 PAINTING AND FINISHING

- A. General: All painting and finishing work of this Section shall be shop applied, unless otherwise noted, as specified below. All painting and finishing shall match approved samples. Field finish painting, where specified below, shall be by painting Subcontractor, as specified for in Painting Section.
- B. Schedule of Painting and Finishing
 - 1. Shop Primer On:
 - a. Ferrous metal work.
 - 2. Shop Natural Finish On:
 - a. Wood cabinets with wood veneers.
- C. Back-Painting: All work of this Section in contact with concrete or masonry or other moisture areas and all concealed surfaces of cabinet and millwork, shall be back-painted with one (1) coat of oil-based paint prior to installation, shop applied where practicable.
- D. Field Touch-Up: Field touch-up shall be the responsibility of the installing Subcontractor and shall include the filling and touch-up of exposed job made nail or screw holes, refinishing of raw surfaces resulting from job fitting, repair of job inflicted scratches and mars, and final cleaning up of the finished surfaces.

3.13 CLEAN UP AND PROTECTION

- A. Clean Up: At regular intervals during the course of the work, all debris and excess material shall be cleaned up and removed from the site. Upon completion of installation, clean all spaces of debris caused by woodwork installation.

- B. Protection: Protect all woodwork from marring, defacement of other damage until final completion and acceptance of the project by the Owner. Repair or replace all defective units prior to final inspection as directed by the Architect. Any units that cannot be satisfactorily repaired in the opinion of the Architect shall be replaced with new units of same original design, at no additional cost to the Owner.

END OF SECTION

SECTION 066400

PLASTIC PANELING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the plastic paneling as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Fiberglass-reinforced plastic (FRP) panels.
 - 2. Moldings.

1.3 RELATED SECTIONS

- A. Gypsum Drywall - Section 092900.

1.4 QUALITY ASSURANCE

- A. Installer: A firm with at least three years' experience in work of the type required by this section and which is acceptable to the manufacturers of the primary materials.
- B. Source: Provide plastic panels that are the products of one manufacturer. Provide secondary materials, moldings and accessories that are acceptable to the panel manufacturer.
- C. In-Place Samples: Before beginning primary work of this section, provide typical in-place samples of each item and type of work at locations acceptable to the Architect and obtain the Architect's acceptance of visual qualities.
 - 1. Size of Sample: Not less than 32 square feet.
 - 2. Intent of Sample: The intent of the in-place sample is to obtain approval of a typical installation as early as possible so that problems, if any, can be corrected before the problem is repeated.
 - 3. Sample Disposition: Acceptable in-place samples may be incorporated into the finished work. Protect and maintain acceptable in-place samples throughout the work of this section to serve as criteria for acceptance of the work
- D. Burning Characteristics: Provide materials whose surface burning characteristics, when tested in compliance with ASTM E 84 are classified as Class A or Class 1.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations for each material used. Provide certifications stating that materials comply with requirements.

- B. Initial Selection Samples: Submit minimum 3" x 3" samples showing complete range of colors, textures, and finishes available for each material used.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from all possible damage. Sequence deliveries to avoid delays, but minimize on-site storage.

PART 2 PRODUCTS

2.1 FIBERGLASS-REINFORCED PANELING

- A. Products: Provide "Standard FRP" as manufactured by Marlite, or comparable product by Crane Composites, Inc., Glasteel Fiberglass Reinforced Panels, Division of Stabilit America, Inc., Nudo Products, Inc., or approved equal.
- B. Panel Characteristics: Provide one of the specified products having the following characteristics:
 - 1. Thickness: 3/32".
 - 2. Texture: Smooth.
 - 3. Panel Size: 4' x 8'.
 - 4. Colors: Provide panels and matching moldings and rivets; S 100G White.
- C. Moldings: Provide vinyl moldings as recommended and approved by the panel manufacturer.
- D. Panel Fasteners: Provide nylon rivets recommended by manufacturer for installing reinforced plastic panels to gypsum drywall and metal stud substrates. Do not use any metal in rivets.
- E. Accessories: Provide all necessary sealants, components and accessories as recommended by panel manufacturer for a complete, sanitary, easy-to-clean installation. Use only sanitary, mold inhibiting USDA approved silicone sealant.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Pre-Installation Examination Required: The Installer shall examine previous work, related work, and conditions under which this work is to be performed and notify Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means Installer accepts substrates, previous work, and conditions.
- B. Manufacturer's Instructions: Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this section.
- C. Installation: Mechanically attach panels to substrates indicated using non-metallic rivets at spacing recommended by panel manufacturer. Provide expansion clearance at all panel edges as required by manufacturer, but make sure moldings cover panel edges. Gaps are not permitted.
 - 1. Trim and Molding: Provide moldings at all edges, joints, seams and corners. Provide moldings having the easiest to clean shapes and profiles available.

2. Sealing: Seal all edges, joints, seams, and corners as the work progresses.
- D. Tolerances: The following allowable installed tolerances are allowable variations from locations and dimensions indicated by the Contract Documents and shall not be added to allowable tolerances indicated for other work.
1. Allowable Variation from True Plumb, Level, and Line: $\pm 1/8$ " in 20'-0".
 2. Allowable Variation from True Plane: 1/8" in 10'-0".

3.2 CLEANING AND PROTECTION

- A. Cleaning: Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully cleaned or repaired.
- B. Protection: Provide temporary protection to ensure work is without damage or deterioration at time of final acceptance. Remove protections and re-clean as necessary immediately before final acceptance.

END OF SECTION

SECTION 068300

COMPOSITE PANELING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the composite paneling as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. Decorative textured wall and ceiling panels.

1.3 RELATED SECTIONS

- A. Carpentry - Section 062000.
- B. Gypsum Drywall - Section 092900.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualification: At least 5 years' experience fabricating and installing comparable work, employing skilled mechanics under competent supervision for all phases of the Work.
- B. Fire performance characteristics: Provide wall panels fabricated from fire rated materials tested in accordance with ASTM-E84 for Class 1 characteristics listed below:
 - 1. Flame spread 25 or less
 - 2. Smoke developed: 150 or less.

1.5 SUBMITTALS

- A. Shop Drawings/Product Data
 - 1. Base drawings on field measurements.
 - 2. Show dimensioned elevations with cable support system, cutout sizes and locations, anchor locations, relation to adjacent work; large scale joint and mounting details; materials type, weight/thickness, design, color; and other data necessary to fabricate and install work and coordinate work with affected trades.
- B. Samples: Two 12" x 12" (minimum) panels in selected finish, showing seam, edge, and cutout conditions.
- C. Certification
 - 1. Acoustical Performance: Certified reports of acoustical performance tests conducted and/or witnessed by a recognized, independent, testing agency. Tests shall have been done by specified methods or recognized equivalent. Sound absorption tests shall be not

more than three years old. Reports on earlier tests are acceptable if it can be established to the Architect's satisfaction, that they are valid indications of compliance with Project requirements.

2. Fire Hazard: Evidence of compliance with regulatory agency and specifications requirements. Minimum Class C finish with flame spread index no greater than 200 and smoke-developed index no greater than 450.

D. Cleaning and Maintenance Instructions: Recommendations for Owner maintenance and cleaning per Section 017300 requirements. Identify cleaning/spotting products generically or by trade name.

E. Manufacturer Qualifications: List comparable installations with 3-year (minimum) service histories. Describe installations and give Owner/building manager names and addresses.

1.6 REFERENCES

A. ASTM C 423, Test for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM E 84, Test for Surface Burning Characteristics of Building Materials.

1.7 DELIVERY, STORAGE AND HANDLING

A. Allow materials to become acclimated to Project conditions before installation, if necessary to prevent sag and distortion during service life.

1.8 PROJECT CONDITIONS

A. Work areas shall be at or near ambient occupancy temperature and relative humidity.

B. HVAC: Operate HVAC system to maintain occupancy level temperature and relative humidity conditions (25-55 percent) in the area of installation from 48 hours prior to delivery of panels to the installation area through remainder of construction period.

C. Materials must be acclimated in an environment of 65-75°F (18-24°C) with maintained relative humidity levels of 25-55% for at least 48 hours prior to beginning the installation.

D. Lighting: Permanent project lighting, including any special lighting used to highlight the panels, must be operational during installation

E. Painting, dust-raising activities, and work that introduces dampness shall be completed.

PART 2 PRODUCTS

2.1 DECORATIVE TEXTURED WALL AND CEILING PANELS

A. Provide composite paneling manufactured by Soelberg Industries, or approved equal.

1. Pattern: 09 Grande Collection, MARE, pattern direction horizontal.

2. Thickness: 1-1/8".

3. Cor Material: MDF.

4. Installation: Horizontal.

5. Finish: 3D laminate; see Finish Schedule.

2.2 ACCESSORIES

- A. Back Mounting Accessories: Manufacturer's standard or recommended accessories for securely mounting panels of type and size indicated to substrates provided, and complying with the following requirements:
1. Metal panel clip and base support bracket system consisting of 2-part panel 'Z' clips, with one part of each clip mechanically attached to back of panel and the other part to wall substrate, designed to support panels laterally; and base support brackets designed to support full weight of panels; with both designed to allow panel removal.

2.3 FABRICATION

- A. Fabricate wall panels to comply with requirements indicated for design, dimensions, detail, finish and sizes, all based on required field-verified dimensions.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where composite paneling is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. General: Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, scribed to fit adjoining work accurately at borders and at penetrations. Comply with panel manufacturer's printed instructions for installation of panels using type of mounting accessories indicated or, if none indicated, as recommended by manufacturer.
- B. Construction Tolerances
1. Variation from Plumb and Level: +/- 1/16".
 2. Variation of Joints from Hairline: Not more than 1/16".
- C. Remove and replace panels that are damaged and are unacceptable to Architect.

3.3 ADJUSTING AND CLEANING

- A. Visually inspect all exposed surfaces for scratches or blemishes. Protection of wall panels from damage by other trades after installation shall be the responsibility of the General Contractor.

END OF SECTION

SECTION 071400

FLUID-APPLIED WATERPROOFING – CUPOLA (ADD ALT #1)

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Provide reinforced fluid-applied waterproofing as shown on the Drawings, including primer, waterproofing, reinforcing fleece and top coat of paint. Coordinate with existing coating removal in Section 099001 – Exterior Cupola Painting and metal repairs in Section 076000 – Metal Flashing.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 061000 – Rough Carpentry
- B. Section 076000 – Metal Roofing and Flashing
- C. Section 079201 – Joint Sealants
- D. Section 099001 – Exterior Cupola Painting

1.04 PERFORMANCE REQUIREMENTS

- A. General: Provide installed waterproofing membrane system that remains watertight, does not permit the passage of water, and resists code required uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide waterproofing materials that are compatible with one another under service conditions and required application, as demonstrated by waterproofing manufacturer based on testing and field experience.

1.06 SUBMITTALS

- A. Submit the following items from the manufacturer.
 - 1. Samples and/or manufacturer's literature for all materials specified and proposed for use on this project, each properly labeled.
 - 2. Manufacturer's installation recommendations for all materials used on this project.
 - 3. Certifications (in time to prevent delay in the work) by the producers of all materials that all materials supplied comply with all the requirements of these specifications and the appropriate standards.
 - 4. Maintenance requirements for waterproofing system.
- B. Qualification Data: Submit evidence that the Contractor is approved by each of the waterproofing system manufacturers for the system(s) in which they intend to install.

1. The waterproofing work specified herein and indicated on the drawings shall be installed by a firm that can furnish supporting evidence of experience and approved by the system manufacturer for a period of not less than 3 yrs.
- C. Adhesion test results for waterproofing system applied to proposed substrates.
 - D. Inspection Report: Copy of waterproofing system manufacturer's inspection report of completed waterproofing installation.
 - E. Color samples of proposed finish coat. Provide Owner will full range of color options; custom color may be required.
- 1.07 PROJECT CONDITIONS
- A. Protect the existing building and its contents, exterior components not included in the work, interior finishes, and all site work against all risks associated with this work. Replace damaged components at no charge to the Owner and to the satisfaction of the Engineer using mechanics skilled in the appropriate trade, including all site work. The premises, including access drives and parking areas, shall be left in a neat, clean, and safe condition at the end of each day's work.
 - B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit waterproofing system to be installed according to manufacturer's written instructions and warranty requirements.
- 1.08 PRE-INSTALLATION CONFERENCE
- A. Prior to beginning work on the submittals or the mock-ups, a qualified technical representative from the waterproofing contractor and waterproofing system manufacturer shall attend a pre-work meeting at the site with the contractor and Engineer to review project scope, submittals, and schedule.
- 1.09 MOCKUPS
- A. Mockups: Perform the following mockups on the building, at locations approved by the Engineer in advance. Coordinate with other trades as required. Notify the Engineer at least 48 hrs before starting the work on each mockup. Reconstruct each mockup as many times as necessary to meet the approval of the Engineer. Do not proceed with any part of the work before the mockup is approved by the Engineer. Mockups will be used to establish both technical and aesthetic standards for the remainder of the project. The approved mockup sample may become part of the final installation.
 1. 5 LF of fluid-applied waterproofing installation at steps and top of base including integration with one existing finial base.
 2. 3 LF of fluid-applied waterproofing installation at base of dome and top of cornice including integration with one existing finial.
 3. Top of dome and integration with mini cupola.
- 1.10 QUALITY CONTROL
- A. Source Limitations: Obtain all components for waterproofing system from, or approved by, waterproofing system manufacturer.
 - B. Adhesion Tests: Complete tensile bond strength tests of membrane to substrate using an Elcometer Adhesion Tester or manual pull test. Contractor shall perform tests at the beginning of the Work, and at intervals as required to assure specified adhesion with a minimum of one

test per 100 sf of the installation. Test results shall be submitted to the Engineer and the Waterproofing Manufacturer. Contractor shall immediately notify the Engineer and Waterproofing Manufacturer in the event bond test results are below specified values.

- C. Evaluate moisture content of substrate materials. Contractor shall determine substrate moisture content throughout the work and record with Daily Inspection Reports or other form of reporting acceptable to the Engineer, and Waterproofing Manufacturer.
- D. Fire-Test-Response Characteristics: Provide waterproofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by Underwriters Laboratories (UL), FM Global (FMG), or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E108, for application and slopes indicated.
- E. The Contractor shall conduct a quality control program that includes, but is not limited to, the following:
 - 1. Inspection of all materials to ensure that they conform to contract requirements and that all materials are new and undamaged.
 - 2. Establishment of procedures for executing the work.
 - 3. Inspection of work in progress to ensure that work is being done in accordance with established procedures and specific instructions, if given by the Engineer.
 - 4. Inspection of all work completed, including visually examining all joints for proper geometry and adhesion, and correction of all defective work.
 - 5. Control of overrun and protection of adjacent surfaces to not receive waterproofing.
- F. The Contractor is responsible for the correction of fluid applied waterproofing work that does not conform to the specified requirements.

1.11 PROTECTION, HANDLING, AND STORAGE

- A. Deliver waterproofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.12 WARRANTY

- A. Waterproofing Contractor's Warranty: The Waterproofing Contractor shall supply the Owner with a minimum two-year workmanship warranty. In the event any work related to the waterproofing is found to be defective within two years of Substantial Completion, the Waterproofing Contractor shall remove and replace such at no additional cost to the Owner.

The Waterproofing Contractor's warranty obligation shall run directly to the building owner, and a copy the waterproofing signed warranty shall be sent to the waterproofing system's manufacturer.

1. The duration of the Waterproofing Contractor's two-year warranty shall run concurrent with the waterproofing system's manufacturer's twenty-year total system warranty.
- B. Waterproofing Systems Manufacturer's Warranty: The waterproofing system manufacturer shall guarantee areas to be in a watertight condition, for a period of twenty years, from the date of final acceptance of the waterproofing system. The warranty shall be a twenty-year no dollar limit, nonprorated total system labor and material warranty. Total system warranty shall include all waterproofing materials, related components, and accessories. The manufacturer shall repair defects in materials and workmanship as promptly after observation as weather and site conditions permit.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Manufacturer's products and specifications are generally referred to for identification; except as noted, products of other manufacturers meeting the requirements itemized below may be submitted for approval. The burden of proof for "equal" materials is on the Contractor, who shall bear all costs and delays involved in the Engineer's review of substitutions. Check all specified items upon contract signing, and order early so the work is not delayed.

2.02 FLUID APPLIED WATERPROOFING MEMBRANE SYSTEM

A. Fluid-Applied Waterproofing Membrane System:

1. Two-component cold fluid-applied reinforced polyurethane waterproofing membrane with a 360° needle punched nonwoven 165 g/m² polyester reinforcing fleece, for a finished dry-film membrane thickness of 0.070 in. nominal per ply, conforming to ASTM C836. Kemper Kemperol 2K FR system listed as basis of design; Sika RoofProf 641 is possible alternate.
 - a. Primer: as recommended by manufacturer
 - b. Kemperol 2K FR resin with Kemperol 165 polyester reinforcing fleece by Kemper System. Provide in white color.
 - c. Color Match Coating: Provide two coats of urethane based paint with low-gloss finish from Sherwin Williams or Benjamin Moore. Color match finish coat to paint coating selected by Owner; coordinate with work in Section 099001 – Exterior Cupola Painting.

B. Fluid-Applied Waterproofing Membrane Accessories:

1. Preparation:
 - a. Polyurethane Sealant (for moving cracks and any cracks wider than 1/16 in.): Refer to requirements in Section 07 90 00 – Joint Sealants.
 - b. Membrane Reinforcement (for all cracks): 4 in. wide polyester reinforcing fleece set in liquid resin.
2. Membrane Flashing: As required by manufacturer.

3. Membrane Termination Seal: As required by manufacturer.

PART 3 – EXECUTION

3.01 FLUID-APPLIED WATERPROOFING

A. General Installation Requirements:

1. Follow all manufacturers' safety recommendations for the installation, storage, protection, and transport of all materials. Use personal safety equipment recommended by the manufacturer at all times during installation. Provide adequate ventilation of workplaces.
2. Promptly remove from the site all materials or incomplete waterproofing exposed to moisture and/or any work rejected by the Engineer.
3. Comply with manufacturer's recommendations for all application procedures, workmanship, and materials handling. Do not work in rain, snow, winds gusting over 30 mph, temperatures below 40°F, or presence of any water.
4. Do not dilute primers, solvents, cements, adhesives, coatings, or sealants. Keep containers closed except when removing materials from them. Do not allow petroleum extracts or oil in any form to contact the membrane materials or their components.
5. Stir all liquid components before each use to thoroughly combine components as recommended by the manufacturer.
 - a. Apply liquids in a smooth, even coating without globs. Use pump cans to dispense cleaning fluids.
 - b. Protect materials from heat, sparks, and flame. Volatile solvents can produce explosive and poisonous mixtures.
6. Workmen and all others that walk on the membrane shall wear clean soft-soled shoes so as not to damage materials. Equipment shall have no sharp edges and shall be clean and free of any materials that are harmful to the waterproofing materials.
7. Complete membrane flashing work concurrently with membrane installation daily.
8. Do not allow wrappers and packaging materials to be included in the waterproofing system.
9. Complete an entire area of waterproofing, including membrane and flashing, in a single working day. If rain threatens during the day, or in an emergency, protect the unfinished exposed waterproofing and flashing components.
10. Provide paint coating over membrane within 48 hours of waterproofing system application.

B. Preparation of Membrane Substrates:

1. Examine substrates, areas, and conditions for compliance with the requirements affecting performance of the roofing system. Notify the Engineer of any discrepancies.
2. Prepare substrate surfaces as recommended by the manufacturer of the materials being applied, except as modified in this Section. Assume metal substrates must be prepared by removing any deposits of dust and oxidation and mechanically abrading

to bare metal. The surface must be clean and free from grease which, if present, must be removed with a solvent wipe or wash with detergent, rinse and dry.

3. Cover adjacent surface not to be treated. Tape off immediately adjacent surfaces. Apply wax based coating as necessary to adjacent surface to prevent coating from staining adjacent services; remove wax based coating at completion of work.
4. Continually remove all dust and debris from all substrate surfaces by sweeping and blowing with compressed air and/or vacuuming.

C. Primer Application:

1. Comply with the manufacturer's most-recent printed specifications and recommendations for primer application.

D. Waterproofing Membrane Installation:

1. Mix and apply the fluid-applied waterproofing membrane in accordance with the manufacturer's instructions. Install membrane only on dry primed substrates with no debris or dust on the surfaces.
2. Protect all areas where the membrane has been installed. Allow membrane to cure 48 hrs before using the area as a work surface. Movement of materials and equipment across installed membrane is not acceptable.
3. Apply the first layer of resin evenly on the primed substrate at the approximate to form a continuous monolithic coating over horizontal and vertical surfaces, including previously reinforced areas.
4. Apply dry polyester fabric onto wet resin mix, ensuring that the smooth side of the fabric faces up. Using a medium nap roller or brush, work the resin into the fleece to completely saturate the entire fabric; the fleece should be light opaque amber without white spots. White spots are indications of unsaturated fleece or lack of adhesion and should be corrected before the resin cures.
 - a. Fleece Seams: Overlap fabric a minimum of 2 in. at all side joints and 4 in. at all end joints.
 - b. Temporary Membrane Tie-Offs: Clean installed membrane with methyl ethyl ketone (MEK) after resin has cured. Allow solvents to evaporate before proceeding with new resin.
 - c. Membrane Waterproofing Terminations: Provide a continuous bead of the specified resin, angled to shed water.
5. Top Coat: Apply a second layer of liquid resin mix on top of the fleece at the approximate rate of 2 gal per 100 sq ft, resulting in a glossy appearance. Roll all excess resin forward onto unsaturated fabric. The correct amount of resin will completely saturate the fleece, and no white color will be visible.
6. Provide two coats of urethane paint per manufacturer's instructions. Urethane paint must be provided within 48 hours of waterproofing top coat application.

E. Cleanup

1. Dispose of all thoroughly mixed cured resin in a safe and legal manner.

2. Uncured resin is a hazardous material – do not throw away. Handle in accordance with local, state, and federal regulations.
3. Promptly remove from the site all used brushes and rollers at the end of each day. Do not place used mops in trash containers.

3.02 PROTECTION AND CLEANING

- A. Protect waterproofing system from damage and wear during remainder of construction period.
- B. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 076000

METAL ROOFING AND FLASHING – CUPOLA (ADD ALT #1)

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following work at the cupola:
 - 1. Resecure metal at seams.
 - 2. Replace damaged metal including metal with pitting or holes. Include the following locations:
 - a. Remove and replace mini-cupola dome
 - b. Remove and replace the mini-cupola base and top two rolled sections.
 - c. Additional 5 SF. Assume additional metal is decorative.
 - d. Remove and replace two damaged upper cornice pieces.
 - e. Remove and replace one damaged column capital.
 - f. Remove and replace two lower roof edge sections and five rolled stepped trim sections and returns.
 - 3. Remove and reinstall the center of the mini-cupola.
 - 4. Remove and reinstall finials to provide continuous waterproofing below.
 - 5. Removed existing interior screen at louvers and provide painted metal back panel. Integrate with metal at sill.
 - 6. Provide finials to replicate original at base; assume similar to existing dome level finials.
 - 7. Coordinate work with existing coating removal and installation of waterproofing and paint coating in Sections 071400 – Fluid-Applied Waterproofing and Section 099001 – Exterior Cupola Painting.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 061000 - Rough Carpentry
- B. Section 071410 – Fluid-Applied Waterproofing.
- C. Section 079201 – Joint Sealants.
- D. Section 099001 – Exterior Cupola Painting

1.04 SUBMITTALS

- A. Submit the following items from the manufacturer to the Engineer for approval:
1. Samples and/or manufacturer's literature for all materials specified and proposed for use on this project, each properly labeled.
 2. Manufacturer's installation recommendations for all materials used on this project.
 3. Certifications (in time to prevent delay in the work) by the producers of all materials that all materials supplied comply with all the requirements of these specifications and the appropriate standards.
- B. Contractor Qualifications:
1. The Contractor performing the metal flashing work shall have a minimum of 10 yrs' experience in comparable metal flashing work, including experience working on a minimum of three buildings listed in the National Register of Historic Places in the last 5 yrs and Contractor must employ workers skilled in the restoration processes and operations indicated. Provide a list with building name and address, architect, general contractor, and appropriate subcontractors and foreman with phone numbers and contact person.
- C. Field Survey: Prior to the start of the any repair work, conduct a survey of the existing metal cladding after the existing paint removal is complete. Coordinate survey with the Engineer so that they can be present at the beginning of the survey. As a minimum, record the following information:
1. Dimensions of all metal panel types, jointing layout, and scaled elevation drawings. Dimensions of existing finials and lower finial base.
 2. Submit elevation drawings showing areas of deteriorated metal cladding, including areas of corrosion, holes, pitting, ponding water, and missing fasteners.
 3. Photographic Documentation: Provide photographic documentation of damage locations.
 4. Approval of field documentation is required before repair work can begin. Field documentation must be submitted prior to the Shop Drawings required in Para. 1.04.D.
- D. Shop drawings based on field measurements by the Contractor and coordinated with Shop Drawing requirements of other Sections. Show the following:
1. Scaled drawings of replacement pieces and finials. Document the following:
 - a. Exact profile and lengths
 - b. Method of attachment
 - c. Joints, termination and transition details.

1.05 PROJECT CONDITIONS

- A. Protect the existing building and its contents, exterior components not included in the work, interior finishes, and all site work against all risks associated with this work. Replace damaged components at no charge to the Owner and to the satisfaction of the Engineer using mechanics skilled in the appropriate trade, including all site work. The premises, including access drives

and parking areas, shall be left in a neat, clean, and safe condition at the end of each day's work.

- B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit the flashing to be installed according to industry standards or manufacturer's written instructions.

1.06 PRE-INSTALLATION CONFERENCE

- A. Attend a preconstruction conference to be held with representatives of the Owner, the Contractor, the Engineer, and all other trades to discuss the work covered under this Section. Review methods and procedures related to metal roofing and flashing installation, including substrate acceptability, panel layout and attachment, coordination with work of other trades, installation procedures, and protection from damage.

1.07 MOCKUPS

- A. Mockups: Perform the following mockups on the building at locations approved by the Engineer in advance. Coordinate with other trades as required. Notify the Engineer at least 48 hrs before starting the work on each mockup. Reconstruct each mockup as many times as necessary to meet the approval of the Engineer. Do not proceed with any part of the work before the mockup is approved by the Engineer. Mockups will be used to establish both technical and aesthetic standards for the remainder of the project. Approved mockups may become part of the finished work.

1. Replacement metal at each unique location identified.
2. Remove and reinstallation of mini-cupola sections.
3. Removal and reinstallation of existing upper finials
4. Installation of one lower finial
5. One louver back panel.

1.08 QUALITY CONTROL

- A. Perform all work in strict accordance with all applicable laws and regulations of the building code and with all other authorities having jurisdiction. All such requirements shall take precedence over the requirements of the Specifications except where the requirements of the Specifications are more exacting or stringent.
- B. Inspection: Provide the Engineer access to the site to perform inspection of completed metal roofing and flashing work. Roofing and flashing materials cannot be covered until the Engineer has completed inspection and any issues that were identified have been addressed.
- C. The Contractor shall conduct a quality control program that includes, but is not limited to, the following:
 1. Inspection of all materials to ensure that they conform to contract requirements and that all materials are new and undamaged.
 2. Establishment of procedures for executing the work.
 3. Inspection of work in progress to ensure that work is being done in accordance with established procedures and specific instructions, if given by the Engineer.

4. Inspection of all work completed, including visually examining all metal roofing and flashing for correct attachment, panel layout, expansion provisions, fully soldered seams, etc. and correction of all defective work.
- D. The Contractor is responsible for the correction of metal flashing work that does not conform to the specified requirements.

1.09 SPECIAL QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

- A. All persons who will perform soldering on the project will be required to pass a soldering test. Previously passing an SGH soldering test on a different project does not entitle a worker to solder on this project.
- B. Personnel will be retested from time to time as determined by the Engineer.
- C. To become approved, each worker shall, in the presence of the Engineer, satisfactorily solder 1 lf of a vertical soldered lock joint and 1 lf of a vertical soldered rivet joint.
- D. Schedule soldering test with the Engineer sufficiently in advance of work to prevent delays. No soldering work on the project will be accepted prior to a worker passing the soldering test.
- E. Three failed tests will result in a worker being prevented from soldering on the project for the duration of the project.

1.10 WARRANTY

- A. Guarantee all work under this Section in a document stating that if, within 2 yrs after the Date of Substantial Completion of the Work, any of the work of this Section is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so. State that the obligation of these Guarantees shall run directly to the Owner and may be enforced by the Owner against the Contractor, shall survive the termination of the Contract, and shall not be limited by conditions other than this Contract.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Manufacturer's products and specifications are generally referred to for identification; except as noted, products of other manufacturers meeting the requirements itemized below may be submitted for approval. The burden of proof for "equal" materials is on the Contractor, who shall bear all costs and delays involved in the Engineer's review of substitutions. Check all specified items upon contract signing, and order early so the work is not delayed.

2.02 MATERIALS

- A. Galvanized Steel: Match existing which is presumed to be galvanized steel.
1. Galvanized Steel Sheet: ASTM A 653M G90 coating designation, structural quality. Thickness to match existing; minimum 0.022 in unless otherwise noted. Match existing surface texture.
- B. Solder: ASTM B32, Class 50A or 50B, Bar Form, 50% block tin and 50% pig lead.
- C. Rivets for Metal Flashing Connections:

1. For Galvanized Steel: Solid stainless steel 3/16 in. dia. flat-head rivets of proper length for the material being fastened; available from JAY-CEE Sales and Rivet Inc.
 2. At locations where use of solid rivets is not possible (only with pre-approval by Engineer): all-stainless steel 3/16 in. dia. flat-head blind rivets of proper length for the material being fastened; Hanson Rivet & Supply Co. Inc., or approved equal.
- D. Fasteners and Accessories:
1. Use hot-dip galvanized steel fasteners (ASTM A153A, ASTM F2329) or Series 300 stainless steel fasteners.
 2. Nails are to be 12 ga, with minimum 1/4 in. dia. flat head, annular threaded, with needle point, and of sufficient length to obtain 1-1/4 in. embedment into blocking, and for full depth into plywood.
 3. Anchors for Attaching Metal Flashing to Masonry: 1/4 in. dia. Nylon Nailin with stainless steel drive pin by Powers Fasteners. Provide in lengths to obtain 1-1/2 in. penetration into masonry backup. Unless otherwise shown on the Drawings, provide in stone with minimum 3 in. edge distance.
- E. Sealant: As specified in Section 079201 – Joint Sealants.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify all site conditions and dimensions by field measurements in consideration of the special conditions associated with alterations of existing construction and reconstruction. Notify the Engineer immediately of any inconsistency between field conditions found during demolition and those shown in the Contract Drawings. The Engineer will determine what modifications or additional repairs are necessary.
- B. Inspect all existing metal roofs and flashings to remain for open seams, holes, or other defects in the metal. The Engineer will determine what repairs are necessary.

3.02 GENERAL METAL INSTALLATION

- A. Except as called for in this Section, comply with all recommendations of the current edition of Revere's "Copper and Common Sense" Standards for Details. Completed metal shall be straight, flat, and without buckles, dents, scratches, or other blemishes.
- B. Form sheet metal on a bending break. Perform shaping, trimming, and hand seaming in the shop as far as practicable, with the proper sheet-metal-working tools. Make the angle of the bends and the folds for interlocking the metal with full regard for expansion and contraction to avoid buckling or other deformation in service. All lines and arisses shall be straight and crisp except where thickness of metal dictates radius bend, and all exposed edges shall be hemmed 1/2 in. minimum.
- C. Soldering:
 1. Immediately prior to soldering, mechanically clean all metal to be soldered with steel wool or by other acceptable means, apply flux, and pre-tin. Clean metal again if it is not soldered on the same work day.

2. Lap metal and fully sweat all flashing corners, end dams, and joints with solder for permanently waterproof connections. Maintain continuity of flashings and watertightness at all jogs, steps, transitions, corners, and similar areas.
 3. Reinforce all metal flashing corners as required; rivet and solder all flashing corners for permanently waterproof connections. Space rivets at 1 in. o.c. in staggered pattern unless otherwise noted.
 4. Perform all soldering slowly with well-heated heavy (10 lbs/pr) irons with properly tinned, clean, blunt tips. Do not use torches. Apply enough heat to sweat the solder completely through the full width of the seam. Close clinch lock seams gently with a block of wood and mallet, then flux and show at least one full inch of continuous and evenly flowed solder. Whenever possible, do all soldering in a flat position. All sloped and vertical seams shall be laced and soldered a second time.
 5. After soldering, immediately remove all traces of acid of flux with an appropriate neutralizer, followed by repeated washing and scrubbing.
- D. Isolate all dissimilar metals with bond-breaker tape.
- E. Arrange work sequence to avoid use of newly completed work for storage, walking surface, and equipment movement. Protect work from mechanical damage. Notify the Engineer immediately if anyone abuses or damages flashing components.
- F. Detail expansion joints in all flashing pieces to provide a watertight connection, and allow for expansion/contraction of the metal at each joint as shown on the Drawings. Unless shown otherwise on the Drawings, provide expansion joints at 20 ft o.c. and at 2 ft away from all changes in flashing direction (each side) and from all terminations of flashing.
- G. Space rivets at 1 in. o.c. in staggered pattern unless otherwise indicated.
- H. Provide backer plate as required at flashing transitions and corners.

3.03 METAL FLASHING INSTALLATION

- A. Provide metal flashing systems as shown on the approved Shop Drawings. Coordinate metal flashing details with other Shop Drawings.
- B. Hook Strips: Provide continuous hook strips where indicated on the Drawings, fastened 6 in. o.c. into substrate in staggered pattern. Crimp the formed hook of metal flashing onto the hook strip, forming a 3/4 in. loose lock, and overlapping the hook strip at least 1/2 in.
- C. Cleats: Provide 2 in. wide metal cleats at 12 in. o.c., two fasteners per cleat, where shown on the Drawings. Crimp the formed hook of the metal flashing into the cleat, overlapping the cleat at least 1/2 in.
- D. At typical lap joints, overlap flashing pieces 6 in. minimum and fill lap with sealant.

END OF SECTION

SECTION 078100

SPRAYED FIRE-RESISTIVE MATERIALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the sprayed fire-resistive materials as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. Spray-on fireproofing for structural steel and metal decking.
 - 2. Seal coat over fireproofing in special areas.
 - 3. Preparation of surfaces.
 - 4. Field quality control.

1.3 RELATED SECTIONS

- A. Construction and Demolition Waste Management and Disposal – Section 017419
- B. Sustainable Design Requirements - Section 018113.
- C. Construction Indoor Air Quality Management – Section 018119.
- D. Structural steel – Section 051200.
- E. Metal decking – Section 053100.
- F. Firestops and smoke seals – Section 078413.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

- A. The Owner requires the Contractor to implement practices and procedures to meet the project's environmental performance goals, which include achieving LEED v4 Silver Certification. Refer to Section 018113 (Sustainable Design Requirements) for the project's target certification level and specific certification requirements. The Contractor shall ensure that the requirements related to the project's sustainability design goals are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the Project's sustainability goals and LEED certification.
- B. USGBC is working on the LEEDv4.1 rating system which is currently in beta. USGBC provides the option of upgrading individual v4 credits to v4.1. The project will be pursuing the v4.1. of select credits on a case by case basis, such as the material credits as noted in Section 018113.

1.5 LEED SUBMITTALS

- A. For all permanently installed products and materials related to the work of this Section, submit product and material documentation to comply with and contribute to the Project's LEED requirements, as specified in Section 018113 (Sustainable Design Requirements). For installed products and materials of this Section complete the appropriate LEED reporting forms.

1.6 SUBMITTALS

- A. LEED Product Submittal Form: Include the cover form in each product submittal including product description, cost, LEED attribute, etc.
- B. Product Data: For each fire-resistive product specified.
- C. Shop Drawings: Submit structural framing plans indicating the following:
 - 1. Locations and types of surface preparations required before applying sprayed fire-resistive material.
 - 2. Extent of sprayed fire-resistive material for each construction and fire-resistance rating, including the following:
 - a. Applicable fire-resistive design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
 - 3. Identify restrained and unrestrained assemblies on shop drawings, show required thickness of fireproofing for each assembly.
- D. Product Certificates: Signed by manufacturer of sprayed fire-resistive material certifying that the products furnished comply with requirements.
- E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- G. If primer is to be used steel and/or metal deck, submit certifications by supplier of primer that primer is compatible with materials, and will not impair the required performance of the installed fireproofing. Such certification shall be accompanied by evidence that the primer was successfully used in conjunction with the fireproofing material in a UL test applicable to the construction. Submit certification prior to application of primer.
 - 1. Coordinate with Section 051200 – Structural Steel and 053100 – Metal Deck, and Structural Drawings prior to application of primer.
- H. Product Test Reports: Indicate that physical properties of proposed sprayed fire-resistive materials comply with specified requirements based on comprehensive testing of current product formulations by a qualified testing and inspecting agency according to requirements specified in "Quality Assurance" Article.
- I. Code Compliance: Proposed product must comply with prevailing Building Code and be approved by those individuals having jurisdiction.

- J. Letter from manufacturer stating that the UL Design selected for the project is not load restricted.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer certified, licensed, or otherwise qualified by sprayed fire-resistive material manufacturer as having the necessary experience, staff, and training to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its sprayed fire-resistive materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.
- B. Submit data indicating that products containing no detectable asbestos as determined according to the method specified in 40 CFR, Part 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."
- C. Mockups: After processing of initial submittals and before delivery and installation of fireproofing materials, prepare a sample installation of fireproofing work, approximately 100 sq. ft. in area; providing an example of each type required, applied on each different substrate, to produce each different rating as required and reasonably representative of entire sprayed on fireproofing work, for joint approval by representative of fire resistant material manufacturer and Owner. Work in other areas shall not proceed until mock-up has been completed. Mock-up work which remains in compliance with requirements and is in undamaged and acceptable condition may be retained as final work in place.
- D. Recycled Content in Spray-On Fireproofing: Spray-on fireproofing shall contain a minimum of 75% (combined) post-industrial/post-consumer recycled content. The percentage of recycled content is based on the weight of the component materials. In areas subject to impact or vibration (e.g., mechanical rooms) provide high density fireproofing products. The fireproofing materials shall be formulated with a mold inhibitor.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; shelf life, if applicable; and fire-resistance ratings applicable to Project.
- B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.
- C. Store materials inside, under cover, aboveground, so they are kept dry until ready for use. Remove from Project site and discard materials that have deteriorated.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply sprayed fire-resistive material when ambient or substrate temperatures are 40 deg F. or lower, unless temporary protection and heat is provided to maintain temperatures at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of sprayed fire-resistive material to achieve a minimum of four air changes per hour. Use natural means or, where this is inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.10 SEQUENCING

- A. Sequence and coordinate application of sprayed fire-resistive materials with other related work specified in other Sections to comply with the following requirements:

1. Provide temporary enclosures for interior applications to prevent deterioration of fire-resistive material due to exposure to unfavorable environmental conditions.
2. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
3. Do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material. Fireproofing shall be considered dry when the moisture content is 6% or less.
4. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
5. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
6. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, tested, and corrections have been made to defective applications.
7. Protect permanently exposed walls, floor or special surfaces.

1.11 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty, executed by Contractor and cosigned by Installer, agreeing to repair or replace sprayed fire-resistive materials that fail within the specified warranty period.
 1. Failures include, but are not limited to, cracking, flaking, eroding in excess of specified requirements; peeling; and delaminating of sprayed fire-resistive materials from substrates due to defective materials and workmanship within the specified warranty period.
 2. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.
- C. Warranty Period: Three (3) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

- A. General: For concealed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated in this Article for material composition and physical properties representative of installed products.
 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- B. UL design listings must state that the loading was determined by Allowable Stress Design Method or Load and Resistance Factor Design Method. UL design listings requiring a load restriction factor will not be allowed.

- C. Material Composition: As follows:
1. Cementitious sprayed fire-resistive material consisting of factory-mixed, dry formulation of gypsum or Portland cement binders and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.
- D. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property listed as follows:
1. Dry Density: 15 lb./cu. ft. for average and individual densities regardless of density indicated in referenced fire-resistive design, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination."
 2. Thickness: Provide minimum average thickness required for fire-resistive design shown on approved submittals.
 - a. Fireproofing shall be of thicknesses and density to meet the requirements of the _____ Building Code.
 3. Bond Strength: 430 lbf/sq. ft. per ASTM E 736.
 4. Compressive Strength: 5.21 lbf/sq. in. as determined in the laboratory per ASTM E 761. Minimum thickness of sprayed fire-resistive material tested shall be 0.75 inch and minimum dry density shall be as specified, but not less than 15 lb./cu. ft.
 5. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
 6. Deflection: No cracking, spalling, delamination, or the like per ASTM E 759.
 7. Effect of Impact on Bonding: No cracking, spalling, delamination, or the like per ASTM E 760.
 8. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of sprayed fire-resistive material is 0.75 inch, maximum dry density is 15 lb./cu. Ft., test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.
 9. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Flame Spread: 10 or less.
 - b. Smoke Developed: 0.
 10. Fungal Resistance: No observed growth on specimens per ASTM G 21.
- E. Products: Subject to compliance with requirements, provide products by one of the following:
1. Cementitious Sprayed Fire-Resistive Material
 - a. Monokote Type MK-10HB; GCP Applied Technologies.
 - b. Cafco 300HS; Isolatek International Corp., Cafco Products.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS FOR EXPOSED FIREPROOFING

- A. General: For exposed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated for material composition and for minimum physical properties of each product listed, measured by standard test methods referenced with each property.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- B. UL design listings must state that the loading was determined by Allowable Stress Design Method or Load and Resistance Factor Design Method. UL design listings requiring a load restriction factor will not be allowed.
- C. Cementitious Sprayed Fire-Resistive Material: Factory-mixed, dry, cement aggregate formulation, chloride-free formulation of Portland cement binders, additives, and inorganic aggregates, mixed with water at Project site to form a slurry or mortar for conveyance and application, complying with the following requirements:
 - 1. Dry Density: Values for average and individual densities as required for fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination," but with an average density of not less than 22 lb./cu. ft.
 - 2. Bond Strength: 2000 psf minimum per ASTM E 736.
 - 3. Compressive Strength: 100 psi per ASTM E 761.
 - 4. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
 - 5. Deflection: No cracking, spalling, delamination, or the like per ASTM E 759.
 - 6. Effect of Impact on Bonding: No cracking, spalling, delamination, or the like per ASTM E 760.
 - 7. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. per ASTM E 859.
 - 8. Combustion Characteristics: Passes ASTM E 136.
 - 9. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Flame Spread: 10 or less.
 - b. Smoke Developed: 0.
 - 10. Fungal Resistance: No observed growth on specimens per ASTM G 21.
 - 11. For exterior applications of sprayed fire-resistive material, provide manufacturer's formulation approved for surfaces exposed to the exterior.
- D. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Cement-Aggregate Cementitious Sprayed Fire-Resistive Material:
 - a. Pyrocrete 239; Carboline Co., Fireproofing Products Div.

- b. Monokote Type Z106HY; GCP Applied Technologies.
- c. F4; Promat Firetemp.
- d. Cafco 400, Isolatek International Corp; Cafco Products.

2.3 AUXILIARY FIRE-RESISTIVE MATERIALS

- A. General: Provide auxiliary fire-resistive materials that are compatible with sprayed fire-resistive materials and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistive designs indicated.
- B. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of sprayed fire-resistive material, used where required by manufacturer to ensure proper bond.
- C. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire-resistive designs indicated and fire-resistive product manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive sprayed fire-resistive material.
- D. Sealer for Sprayed Fire-Resistive Material in Elevator Shafts and Open Area Plenums: Transparent-drying, water-dispersible protective coating by manufacturer of fire-resistive material.
 - 1. Product: Subject to compliance with requirements, provide "Firebond Concentrate" by GCP Applied Technologies, or similar product recommended by the manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, to determine whether they are in satisfactory condition to receive sprayed fire-resistive material. A substrate is in satisfactory condition if it complies with the following:
 - 1. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fire-resistive material with substrate under conditions of normal use or fire exposure.
 - 2. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.
- B. Do not proceed with installation of fire-resistive material until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances that could impair bond of fire-resistive material, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.
- B. For exposed applications, repair substrates to remove any surface imperfections that could affect uniformity of texture and thickness in finished surface of sprayed fire-resistive material. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

- C. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintenance of adequate ambient conditions for temperature and ventilation.

3.3 INSTALLATION

- A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to convey and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- B. Install metal lath, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by fire-resistive material manufacturer. Attach lathing accessories where indicated or required for secure attachment to substrate.
- C. Coat substrates with adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by fire-resistive material manufacturer for material and application indicated.
- D. Extend fire-resistive material in full thickness over entire area of each substrate to be protected.
- E. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by method recommended by the manufacturer.
- F. Where sealers are used, apply products that are tinted to differentiate them from the sprayed fire-resistive material over which they are applied.
- G. Maintain ambient conditions during installation and for cure period following installation, as recommended by manufacturer. Provide ventilation and avoid excessive rate of drying.
- H. Fireproofing to the underside of roof deck assemblies shall be done only after roofing application is complete, all roof mounted mechanical equipment is in place, and the roof is watertight.
- I. No fireproofing shall be applied prior to completion of concrete work on steel decking.
- J. Installation Sequence of Fireproofing: All patching and repairing of sprayed fireproofing, due to cutting by other trades or testing and inspection, shall be performed under this Section.
- K. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing and inspecting of completed applications of sprayed fire-resistive material will take place in successive stages, in areas of extent and using methods as follows. Do not proceed

with application of fire-resistive material for the next area until test results for previously completed applications of fire-resistive material show compliance with requirements.

1. For each 1000-sq. ft. area, or partial area, on each floor, testing and inspecting agency will evaluate the following characteristics. Tested values must equal or exceed values indicated and values required for approved fire-resistance design.
 - a. Thickness for Floors, Roofs, and Walls: From the average of 10 measurements from a 144-sq. in. sample area, with sample width of not less than 6 inches per ASTM E 605.
 2. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.
 3. For each 10,000 sq. ft. area, or partial area, on each floor, testing and inspection agency will evaluate the following characteristics. Tested values must equal or exceed values indicated and values required for approved fire resistance design.
 - a. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: Cohesion and adhesion at frequency and from sample size indicated for determining thickness of each type of construction, per ASTM E 736.
 4. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination."
 5. When testing discovers applications of fire-resistive material not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.
- C. Remove and replace applications of fire-resistive material where test results indicate that they do not comply with specified requirements for cohesion and adhesion or for density, or both.
 - D. Apply additional fire-resistive material per manufacturer's written instructions where test results indicate that thickness does not comply with specified requirements.
 - E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING, PROTECTING, AND REPAIR

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Cure exposed sprayed fire-resistive material according to product manufacturer's written recommendations to prevent premature drying.
- C. Protect fire-resistive material, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at the time of Substantial Completion.

- D. Coordinate application of fire-resistive material with other construction to minimize the need to cut or remove fire protection. As installation of other construction proceeds, inspect fire-resistive material and patch any damaged or removed areas.
 - 1. Patch and repair fireproofing where Owner's Testing Agency has performed tests.
- E. Repair or replace work that has not been successfully protected.

END OF SECTION

SECTION 078413

FIRESTOPS AND SMOKESEALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the firestops and smoke seals as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
 - 4. Sealant joints in fire-resistance-rated construction.
 - 5. Penetrations at each floor level in shafts and/or stairwells.
 - 6. Construction joints, including those between top of fire rated walls and underside of floors above.

1.3 RELATED SECTIONS

- A. Interior joint sealers - Section 079201.
- B. Drywall - Section 092900.
- C. Piping penetrations - Division 22.
- D. Duct penetrations - Division 23.
- E. Cable and conduit penetrations - Division 26.

1.4 REFERENCES

- A. ASTM E 814 "Standard Method of Fire Tests of Through-Penetration Firestops."
- B. UL 1479, UBC 7-5 (Both are same as A. above).
- C. ASTM E 119 "Standard Method of Fire Tests of Building Construction and Materials."

- D. UL 263, UBC 7-1 (Both are same as C. above).
- E. UL 2079 "Tests For Fire Resistance of Building Joint Systems."
- F. ASTM E 1399 "Test For Dynamic Movement Conditions."
- G. ASTM E 1966 (Same as E. above).
- H. ASTM G 21 "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi."
- I. Test Requirements: ASTM E 2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus."
- J. Inspection Requirements: ASTM E 2174, "Standard Practice for On-site Inspection of Installed Firestops."
- K. Published Through-Penetration Systems by recognized independent testing agencies.
 - 1. UL Fire Resistance Directory, Volume II of current year.
 - 2. Warnock Hersey Certification Listings, current year.
 - 3. Omega Point Laboratories, current year.
- L. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.

1.5 SUBMITTALS

- A. Submit manufacturer's product literature for each type of firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance, limitation criteria, test data and indication that products comply with specified requirements.
- B. Submit shop drawings detailing materials, installation methods, and relationships to adjoining construction for each firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspection agency evidencing compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, for proposed UL listed (or equal) firestop and smoke seal assembly required for the Project.
- C. Material Safety Data Sheets: Submit MSDS for each firestop product.
- D. Submit qualifications of firestop installer, including letter from firestop manufacturer of products proposed to be installed, wherein manufacturer approves or recognizes as trained/ or certifies installer for installation of that manufacturer's products.
- E. Engineering Judgment: For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

1.6 QUALITY ASSURANCE

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire and the passage of smoke and other gases.

- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.
- C. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM E 814 or UL 1479. The F-rating must be a minimum of one (1) hour, but not less than the fire resistance rating of the assembly being penetrated. T-rating, when required by code authority, shall be based on measurement of the temperature rise on the penetrating item(s). The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.
 - 1. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - a. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
 - b. T-Rating: When penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
 - c. W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.
 - 2. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - a. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.
- D. Firestopping products shall be asbestos free and free of any PCBs.
- E. Do not use any product containing solvents or that requires hazardous waste disposal.
- F. Do not use firestop products which after curing, dissolve in water.
- G. Do not use firestop products that contain ceramic fibers.
- H. Firestopping Installer Qualifications: Firestop application shall be performed by a single firestopping contractor who specializes in the installation of firestop systems, whose personnel to be utilized have received specific training and certification or approval from the proposed respective firestop manufacturer, and firestop installer shall have a minimum of three years' experience (under present company name) installing firestop systems of the type herein specified.
 - 1. All firestopping shall be FM approved firestop designs for penetrations installed by an FM Approved firestop contractor.
- I. Mock-Up: Prepare job site mock-ups of each typical Firestop System proposed for use in the project. Approved mock-ups will be left in place as part of the finished project and will constitute the quality standard for the remaining work.
- J. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.

3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
 - K. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of less than or equal to 1 as determined by ASTM G 21.
 - L. Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post-installed." Provide cast-in-place firestop devices prior to concrete placement.
 - M. Firestop systems do not reestablish the structural integrity of load bearing partitions or assemblies or support live loads and traffic. Installer shall consult the Structural Engineer prior to penetrating any load bearing assembly.
- 1.7 DELIVERY, STORAGE AND HANDLING
- A. Deliver materials in manufacturer's original unopened containers with manufacturer's name, product identification, lot numbers, UL or Warnock Hersey labels, and mixing and installation instructions, as applicable.
 - B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturer.
 - C. All firestop materials shall be installed prior to expiration of shelf life.
- 1.8 PROJECT CONDITIONS
- A. Verify existing conditions and substrates before starting work
 - B. Do not use materials that contain solvents, show sign of damage or are beyond their shelf life.
 - C. During installation, provide masking and drop cloths as needed to prevent firestopping products from contaminating any adjacent surfaces.
 - D. Conform to ventilation requirements if required by manufacturer's installation instructions or Material Safety Data Sheet.
 - E. Weather Conditions: Do not proceed with installation of firestop products when temperatures are in excess or below the manufacturer's recommendations.
 - F. Schedule installation of firestop products after completion of penetrating item installation but prior to covering or concealing of openings.
 - G. Coordinate this work as required with work of other trades.
- 1.9 SEQUENCING AND SCHEDULING
- A. Pre-Installation Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 - B. Sequence: Perform work of this and other sections in proper sequence to prevent damage to the firestop systems and to ensure that their installation will occur prior to enclosing or concealing work.
 - C. Install all firestop systems after voids and joints are prepared sufficiently to accept the applicable firestop system.
 - D. Do not cover firestop systems until they have been properly inspected and accepted by the authority having jurisdiction.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide products of one of the following manufacturers:
1. Hilti, Inc.
 2. Metacaulk.
 3. Nelson.
 4. Specified Technologies Inc.
 5. 3M.
 6. Tremco.
 7. U.S. Gypsum Co.

2.2 FIRESTOPPING, GENERAL

- A. **Compatibility:** Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
- B. **Accessories:** Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
1. Permanent forming/damming/backing materials including the following:
 - a. Semirefractory fiber (mineral wool) insulation.
 - b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Joint fillers for joint sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.
- C. **Applications:** Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.
- D. Smoke seals at top of partitions shall be flexible to allow for partition deflection.
- E. Polypropylene Sleeves (PP): (For cast-in device options.)

2.3 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.

- B. Intumescent, Latex Sealant: Single-component, Intumescent, latex formulation.
- C. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
- D. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum or polyethylene foil on one side.
- E. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.
- F. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.
- G. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- H. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.
- I. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/gunnable sealant, unless firestop system limits use to non-sag grade for both opening conditions.
- J. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic or polypropylene sleeve lined with an intumescent strip, an extended rectangular flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- K. Fire Rated Cable Management Devices: Factory-assembled round metallic sleeve device for use with cable penetrations, containing an integrated smoke seal fabric membrane that can be opened and closed for re-penetration.
- L. Drop-In Firestop Devices: Factory-assembled devices for use with combustible or noncombustible penetrants in cored holes within concrete floors. Device shall consist of galvanized steel sleeve lined with an intumescent strip, an extended rectangular flange attached to one end of the sleeve for fastening to concrete floor, and neoprene gasket.
- M. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- N. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
- O. Blocks/Plugs: Intumescent flexible block/plug suitable for reuse in re-penetration of openings. Blocks shall allow up to 12" of unreinforced annular space.
- P. Tub Box Kit: Cast-in place pre-formed plastic tub box kit with three support legs for use with drain piping assembly associated with bathtub installations.

2.4 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.
 - 1. Sealant Colors: Color of exposed joint sealants as selected by the Architect.
- B. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.
 - 1. Additional Movement Capability: Provide sealant with the capability to withstand 33 percent movement in both extension and compression for a total of 66 percent movement.
- C. Multi-Component, Non-Sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.
 - 1. Additional Movement Capability: Provide sealant with the capability to withstand 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated.
- D. Single-Component, Non-Sag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

2.5 MINERAL FIBER/CERAMIC WOOL NON-COMBUSTIBLE INSULATION (FIRE SAFING)

- A. Provide min. 4 pcf Thermafiber as manufactured by Thermafiber Co., min. 4 pcf FBX Safing Insulation as manufactured by Fibrex, or approved equal to suit conditions and to comply with fire resistance and firestop manufacturer's requirements.
- B. Material shall be classified non-combustible per ASTM E 119.

2.6 MIXING

- A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions with Installer present, for compliance with requirements for opening configuration, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:

1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form release agents from concrete.
- B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 CONDITIONS REQUIRING FIRESTOPPING

A. Interior Walls and Partitions

1. Construction joints between top of fire rated walls and underside of floors above, shall be firestopped.
2. Firestop system installed shall have been tested by either UL or Omega Point, including exposure to hose stream test and including for use with steel fluted deck floor assemblies.
3. Firestop system used shall allow for deflection of floor above.

B. Penetrations

1. Penetrations include conduit, cable, wire, pipe, duct, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.
2. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces in accordance with ASTM E 814.
3. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall of opening.

- C. Provide firestopping to fill miscellaneous voids and openings in fire rated construction in a manner essentially the same as specified herein before.

3.4 INSTALLING THROUGH PENETRATION FIRESTOPS

- A. General: Comply with the through penetrations firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

- C. Install fill materials for through penetration firestop systems by proven techniques to produce the following results:
 - 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.5 INSTALLING FIRE RESISTIVE JOINT SEALANTS

- A. General: Comply with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool no sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.6 INSTALLING FIRESAFING INSULATION

- A. Install fire safing insulation utilizing welded or screw applied galvanized steel impaling pins and retaining clips; space clips or pins 24" o.c. maximum.
- B. Completely fill voids in areas where safing insulation is required. At spandrel conditions/floor edges, depth of insulation top to bottom shall be at least four (4) inches.
- C. Cover top of all safing insulation with firestop sealant or spray.

3.7 FIELD QUALITY CONTROL

- A. Inspecting agency employed and paid by the Owner will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.
- B. Inspecting agency will report observations promptly and in writing to Contractor, Owner and Architect.
- C. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.
- D. Where deficiencies are found, Contractor must repair or replace firestopping so that it complies with requirements.

3.8 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which openings and joints occur.
- B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to product firestopping complying with specified requirements.

END OF SECTION

SECTION 079200

JOINT SEALERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the joint sealers work as shown on the drawings and/or specified herein, including but not necessarily limited to the following:
 - 1. Flashing reglets and retainers.
 - 2. Exterior wall joints not specified to be sealed in other Sections of work.
 - 3. Interior wall joints not specified to be sealed in other Sections of work, including caulking to fill between architectural woodwork and any wall, floor and/or ceiling imperfections.
 - 4. Control and expansion joints in walls.
 - 5. Joints at wall penetrations.
 - 6. Joints between items of equipment and other construction.
 - 7. All other joints required to be sealed to provide a positive barrier against penetration of air and moisture.

1.3 RELATED SECTIONS

- A. Construction and Demolition Waste Management and Disposal – Section 017419
- B. Sustainable Design Requirements - Section 018113.
- C. Construction Indoor Air Quality Management – Section 018119.
- D. Sealant at paving - Section 321411.
- E. Roofing - Division 7.
- F. Firestop sealants – Section 078413.
- G. Glazing sealants - Section 088000.
- H. Sealant within drywall construction - Section 092900.
- I. Sealant at tile work - Section 093000.

1.4 QUALITY ASSURANCE

- A. Qualification of Installers: Use only personnel who are thoroughly familiar, skilled and specially trained in the techniques of sealant work, and who are completely familiar with the published recommendations of the sealant manufacturer.
- B. Pre-Construction Field Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to project joint substrates according to the method in ASTM C 794 and C 1521 that is appropriate for the types of Project joints.
- C. Perform testing per ASTM C 1248 on interior and exterior sealants to determine if sealants or primers will stain adjacent surfaces. No sealant work shall start until results of these tests have been submitted to the Architect and he has given his written approval to proceed with the work.

1.5 SUBMITTALS

- A. Shop Drawings: Submit shop drawings showing all joint conditions, indicating relation of adjacent materials, all sealant materials (sealant, bond breakers, backing, primers, etc.), and method of installation.
 - 1. Submit joint sizing calculations certifying that movement capability of sealant is not being exceeded.
- B. Samples: Submit the following:
 - 1. Color samples of sealants, submit physical samples (not color chart).
 - 2. Sealant bond breaker and joint backing.
- C. Product Data: Submit manufacturer's technical information and installation instructions for:
 - 1. Sealant materials, indicating that material meets standards specified herein.
 - 2. Backing rods.
- D. Submit manufacturer's certification as required by Article 1.6 herein.
- E. Submit results of testing required in Article 1.4 herein.

1.6 MANUFACTURER'S RESPONSIBILITY AND CERTIFICATION

- A. Contractor shall require sealant manufacturer to review the Project joint conditions and details for this Section of the work. Contractor shall submit to the Architect written certification from the sealant manufacturer that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vaportight seals (as applicable), and that materials supplied meet specified performance requirements.

1.7 ENVIRONMENTAL CONDITIONS

- A. Temperature: Install all work of this Section when air temperature is above forty (40) degrees F. and below eighty (80) degrees F., unless manufacturer submits written instructions permitting sealant use outside of this temperature range.
- B. Moisture: Do not apply work of this Section on surfaces which are wet, damp, or have frost.

1.8 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section, before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.
- C. Storage
 - 1. Store sealant materials and equipment under conditions recommended by their manufacturer.
 - 2. Do not use materials stored for a period of time exceeding the maximum recommended shelf life of the material.
 - 3. Material shall be stored in unopened containers with manufacturers' name, batch number and date when shelf life expires.

1.9 GUARANTEE

- A. Provide a written, notarized guarantee from the manufacturer stating that the applied sealants shall show no material failure for a period of twenty (20) years.
- B. Contractor to provide a written, notarized, guarantee stating that the applied sealants shall show no failure due to improper installation for a period of five (5) years.
- C. Guarantee shall be in a form acceptable to the Owner and executed by an authorized individual.
- D. Include in guarantee provision, agreement to repair and/or replace, at Contractor's expense, sealant defects which develop during guarantee period, because of faulty labor and/or materials.

PART 2 PRODUCTS

2.1 SEALANT MATERIALS

- A. Exterior Wall Sealant: Provide one (1) part non-sag sealant equal to "DOWSIL 790" or "DOWSIL 795" made by The Dow Chemical Company, "Silpruf SCS 2000" or "LM SCS 2700" made by G.E., "Spectrem 1" or "Spectrem 3" made by Tremco or "Sonolastic 150" by Sonneborn conforming to the minimum standards of ASTM C 920, Type S, Grade NS, Class 50.
- B. Interior Sealant: Provide a one (1) part acrylic based sealant conforming to ASTM C 834, equal to ""AC-20+ Silicone" made by Pecora, Masterseal NP 520 by BASF or equal made by Tremco.
- C. Interior Construction adhesive: "Green Choice" by Titebond.
- D. Colors: Colors selected from manufacturer's standard selection.

2.2 MISCELLANEOUS MATERIALS

- A. Back-Up Materials: Provide back-up materials and preformed joint fillers, non-staining, non-absorbent, compatible with sealant and primer, and of a resilient nature, equal to "HBR" made by Nomaco Inc. or approved equal, twenty-five (25) percent wider than joint width. Materials impregnated with oil, bitumen or similar materials shall not be used. Provide back-up materials only as recommended by sealant manufacturer in writing.

- B. Provide bond breakers, where required, of polyethylene tape as recommended by manufacturer of sealant.
- C. Provide primers recommended by the sealant manufacturer for each material to receive sealant. Note that each exterior joint must be primed prior to sealing.
- D. Provide solvent, cleaning agents and other accessory materials as recommended by the sealant manufacturer.
- E. Materials shall be delivered to the job in sealed containers with manufacturer's original labels attached. Materials shall be used per manufacturer's printed instructions.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where joint sealers are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with instructions and recommendations of the manufacturer and in accordance with ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions required by this Project where more stringent installation requirements are specified herein, such requirements shall apply.
- B. Sample Section of Sealant
 - 1. During sealant installation work in exterior wall, the manufacturer of sealant shall send his representative to the site, under whose supervision a section of the wall (used as "control section") shall be completed for purposes of determining performance characteristics of sealant in joints. Architect shall be informed of time and place of such installation of control section.
 - 2. Control section shall be installed according to specification given herein and shall not be considered as acceptable until written acceptance is provided by the Architect.
 - 3. Accepted control section shall be standard to which all other sealant work must conform.
- C. Supervision: The Contractor shall submit to the Architect written certification from the sealant manufacturer that the applicators have been instructed in the proper application of their materials. The Contractor shall use only skilled and experienced workmen for installation of sealant.
- D. Apply sealant under pressure with a hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed. Neatly point or tool joint to provide the contour as indicated on the drawings.
- E. Preparation and Application
 - 1. Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease, water, surface dirt and frost. Sealant must be applied to the base surface. Previously applied film must be entirely removed.

2. Stone, masonry and concrete surfaces to receive sealant shall be cleaned where necessary by grinding, water blast cleaning, mechanical abrading, or combination of these methods as required to provide a clean, sound base surface for sealant adhesion.
 - a. Do not use any acid or other material which might stain surfaces.
 - b. Remove laitance by grinding or mechanical abrading.
 - c. Remove loose particles present or resulting from grinding, abrading, or blast cleaning by blowing out joints with compressed air, oil and water free, or vacuuming joints prior to application of primer or sealant.
3. Clean non-porous surfaces such as metal and glass chemically. Remove protective coatings on metallic surfaces by solvent that leaves no residue and is compatible with sealant. Use solvent and wipe dry with clean, dry lint free paper towels. Do not allow solvent to air dry without wiping. Clean joint areas protected with masking tape or strippable films as above after removal of tape film.
4. Do not seal joints until they are in compliance with drawings or meet with the control section standard.
5. Joint Size and Sealant Size: Joints to receive sealant shall be at least 1/4" wide. In joint 1/4" to 3/8" wide, sealant shall be 1/4" deep. In joints wider than 3/8" and up to 1" wide, sealant depth shall be one half the joint width. For joints wider than 1", sealant depth shall be as recommended by the sealant manufacturer. Depth of joint is defined as distance from outside face of joint to closest point of the filler.
6. Primer: Thoroughly clean joints and apply primer to all surfaces that will receive sealant. Apply primer on clean, dry surfaces, and prior to installation of joint backing. Completely wet both inner faces of the joint with primer. Mask adjacent surfaces of joint with non-staining masking tape prior to priming. Apply primer with clean brush and only when temperature is above 45 deg. F.
7. Joint Backing: In joints where depth of joint exceeds required depth of sealant, install joint backing (after primer is dry) in joints to provide backing and proper joint shape for sealant. Proper shape for sealant is a very slight "hourglass" shape, with back and front face having slight concave curvature. Use special blunt T-shaped tool or roller to install joint backing to the proper and uniform depth required for the sealant. Joint backing shall be installed with approximately twenty-five (25) percent compressions. Do not stretch, twist, braid, puncture, or tear joint backing. Butt joint backing at intersections.
8. Bond Breaker: Install bond breaker smoothly over joint backing so that sealant adheres only to the sides of the joint and not backing.
9. Sealant Application: Apply sealant in accordance with the manufacturer's application manual and manufacturer's instructions, using hand guns or pressure equipment, on clean, dry, properly prepared substrates, completely filling joints to eliminate air pockets and voids. Mask adjacent surfaces of joint with non-staining masking tape. Force sealant into joint in front of the tip of the "caulking gun" (not pulled after it) and force sealant against sides to make uniform contact with sides of joint and to prevent entrapped air or pulling of sealant off of sides. Fill sealant space solid with sealant.
10. Tooling: Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 5A in ASTM C 1193. Finished joints shall be straight, uniform, smooth and neatly finished. Remove masking tape immediately after

tooling of sealant and before sealant face starts to "skin" over. Neatly remove any excess sealant from adjacent surfaces of joint, leaving the work in a neat, clean condition.

11. Replace sealant which is damaged during construction process.

3.3 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed, and cured sealant joints as follows:

- a. Perform 5 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
- b. Perform one test for each 5,000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

- a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

- a. Whether sealants filled joint cavities and are free of voids.
- b. Whether sealant dimensions and configurations comply with specified requirements.
- c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

END OF SECTION

SECTION 079201

JOINT SEALANTS – CUPOLA (ADD ALT #1)

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Remove and replace any sealant between components, including perimeter sealant around windows and louvers. Include 250 LF of sealant replacement in Base Bid.
 - 2. Provide sealant at louver back pans.
 - 3. Provide other miscellaneous sealant joints where indicated on the Drawings.
 - 4. Provide backer rod at miscellaneous locations to fill gaps.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 04 05 00 – Exterior Masonry.
- B. Section 071400 – Fluid-Applied Waterproofing.
- C. Section 076000 – Metal Roofing and Flashing
- D. Section 099001 – Exterior Cupola Painting

1.04 SUBMITTALS

- A. Certifications by the producers of all materials that all materials supplied comply with all the requirements of the referenced standards and that all materials are suitable for the use specified herein.
- B. Samples of all materials specified, each properly labeled, and/or manufacturer's product data and installation recommendations.
- C. Written explanation to decipher code numbers used on material containers to record manufacturing dates.
- D. Color chart of all available colors for each type of sealant.
- E. Reports for tests made within 3 yrs of the submittal date showing compliance with ASTM C920, and the standards that C920 references, including C793 and C719, using the substrates and procedures contained in this section.
- F. Manufacturer's recommendations for adhesive and chemical compatibility based on laboratory test with jobsite materials. Laboratory test reports from the sealant manufacturer for adhesion-in-peel tests showing adequate adhesion to the various substrates used on this project before and after seven days' water immersion, along with the manufacturer's recommendations for cleaning and priming each substrate.

1.05 PROJECT CONDITIONS

- A. Protect the existing building and its contents, exterior components not included in the work, interior finishes, and all site work against all risks associated with this work. Replace damaged components at no charge to the Owner and to the satisfaction of the Engineer using mechanics skilled in the appropriate trade, including all site work. The premises, including access drives and parking areas, shall be left in a neat, clean, and safe condition at the end of each day's work.

1.06 PRE-INSTALLATION CONFERENCE

- A. Prior to beginning work on the submittals or the mock-ups, a qualified technical representative from the sealant contractor shall attend a pre-work meeting at the site with the contractor and Engineer to review project scope, submittals, and schedule.

1.07 MOCKUPS:

- A. Mockups: Perform the following mockups on the building at locations approved by the Engineer in advance. Coordinate with other trades as required. Notify the Engineer at least 48 hrs before starting the work on each mockup. Reconstruct each mockup as many times as necessary to meet the approval of the Engineer. Do not proceed with any part of the work before the mockup is approved by the Engineer. Mockups will be used to establish both technical and aesthetic standards for the remainder of the project. Approved mockups may become part of the finished work.

1. Coordinate joint sealant work as required to complete mockups in other sections.

1.08 QUALITY CONTROL

- A. The Contractor shall conduct a quality control program that includes, but is not limited to, the following:

1. Inspection of all materials to ensure that they conform to contract requirements and that all materials are new and undamaged.
2. Establishment of procedures for executing the work.
3. Inspection of work in progress to ensure that work is being done in accordance with established procedures and specific instructions, if given by the Engineer.
4. Inspection of all work completed, including visually examining all joints for proper geometry and adhesion, and correction of all defective work.

- B. The Contractor is responsible for the correction of sealant work that does not conform to the specified requirements.

1.09 WARRANTY

- A. Guarantee all work under this Section in a document stating that if, within 2 yrs after the Date of Substantial Completion of the Work, any of the work of this Section is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so. State that the obligation of these Guarantees shall run directly to the Owner and may be enforced by the Owner against the Contractor, shall survive the termination of the Contract, and shall not be limited by conditions other than this Contract

PART 2 – PRODUCTS

2.01 GENERAL

- A. Manufacturer's products and specifications are generally referred to for identification; except as noted, products of other manufacturers meeting the requirements itemized below may be submitted for approval. The burden of proof for "equal" materials is on the Contractor, who shall bear all costs and delays involved in the Engineer's review of substitutions. Check all specified items upon contract signing, and order early so the work is not delayed.

2.02 MATERIALS LIST

- A. Sealant: Neutral-cure silicone sealant meeting ASTM C920, Type S, Grade NS, Class 25. Non-staining. Provide standard manufacturer's colors.
- B. Primers: Provide manufacturer's recommended primer for selected sealant and substrates. Assume use of primer unless field testing shows successful adhesion without primer.
- C. Backer Rod: Closed-cell polyethylene rod. The diameter of the rod is to be approximately 25% in excess of joint width except that quarter round (for fillet joints) shall not be oversized. Surface skin of rod shall be continuous and unbroken and of sufficient thickness to preclude outgassing and formation of voids in the overlying sealant.
- D. Bond-Breaker Tape (release tape): 0.006 in. thick polyethylene, to which sealant does not bond, adhesive-backed on one side, width as required.
- E. Reticulated Foam Weeps: Open-cell, 30 ppi polyurethane foam block, color to match sealant, size: 1/2 in. by 1/2 in. by 1 in. or as required by joint geometry.
- F. Surface Cleaner: Denatured alcohol (DNA) or as required to obtain adequate adhesion.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify all site conditions and dimensions by field measurement in consideration of the special conditions associated with the work. Notify the Engineer immediately of any inconsistency between the conditions found and those shown in the Contract Drawings.

3.02 JOINT CONSTRUCTION

- A. Configure the sealant joints as shown on the Drawings. Avoid three-sided adhesion at all sealant joints.
- B. Configure the joints as shown on the Drawings. At fillet (triangular) joints, extend the sealant at least 3/8 in. onto the substrate beyond the bond breaker tape or backer rod and at least 5/8 in. onto the substrate perpendicular to the tape or rod. The minimum thickness between the edge of the tape or rod and the surface of the sealant joint shall be 1/4 in. Do not prepare or seal over masonry that is less than twenty-one days old or that was repointed within twenty-one days.
- C. For typical butt sealant joints, place the backer rod or bond breaker so the sealant depth measured at the center of the joint after tooling is one-half of the sealant joint width, with a minimum depth of 1/4 in. and a maximum depth of 1/2 in. Avoid three-sided adhesion at all sealant joints.

- D. For wet seal joints, tool sealant to a fillet shape to thoroughly “wet” contact surfaces and slope sealant face to promote drainage away from glass. The edge of the wet seal along the glass shall be continuous and uniform, shall not be less than 1/4 in. or more than 3/16 in. above the window frame, and shall lap fully onto the edge of the window frame.
- E. Provide sealant weeps so that their spacing does not exceed 24 in. o.c. unless shown otherwise on the Drawings.

3.03 SURFACE PREPARATION

- A. Do not install sealant until the masonry has first been cleaned. Remove all dirt or other foreign substances, including existing sealant remnants, from surfaces to receive sealant. All surfaces shall be dry before preparation begins. The solvent cleaning preparation is to be done immediately before insertion of the final backer rod or bond breaker and after any temporary rods or seals are removed.
- B. Solvent Cleaning for Metal Surfaces: Use two clean, white, soft, lint-free cotton cloths and clean, fresh DNA and other solvents as required to clean metal flashing and other nonporous surfaces. Wet one cloth with solvent and wipe surface vigorously. Use second cloth to clean surface before solvent evaporates. Pump solvent from cans onto first cloth. Do not dip cloth in solvent to avoid contamination of solvent. Repeat this two-cloth procedure until surface does not discolor cloth, and repeat at least once. Do not solvent clean at temperatures below 45°F.

3.04 BACKUP MATERIAL INSTALLATION

- A. Unless noted otherwise, provide clean, dry backup rod or quarter round rod, in or over all joint openings against dry substrates. Remove all wet materials from the job site. Replace any backer rod not sealed over by the end of each day and solvent clean surfaces again.
- B. Change rod sizes as frequently as required by the variation in the joint width. Do not twist rods together. Butt ends of rods tightly. Provide a full range of rod sizes at the site of all sealant work.
- C. Do not touch with fingers or otherwise contaminate the substrate surfaces while inserting the backer rod or bond breaker tape.
- D. Do not rupture the skin of the closed-cell backer rod during installation. Do not cut rod lengthwise as substitute for smaller diameter rod. Remove any rod containing punctures and solvent clean the surfaces again.

3.05 PRIMER APPLICATION

- A. Apply primer to all substrates, except glass, after backer rod installation. Apply primer to clean, dry substrates at ambient temperatures above 45°F.
- B. Pour primer into a clean container for use. Do not pour more than a 10 min. supply into container to prevent deterioration.
- C. Replace cap on primer can immediately after pouring. Remove from the site any primer that contains a white precipitate or that has thickened.
- D. Apply primer with a clean brush. Do not apply primer to exposed surfaces beyond sealant. Mask all surfaces before priming, except where surface irregularities will allow the primer to wick beneath the masking tape. Use only one coat of primer. Do not apply primer in a thick layer, which will form a white, powdery film. Remove any films with a clean, dry, lint-free cloth and repair in accordance with manufacturer's written recommendations.
- E. Allow primer to dry. Do not allow primer to become wet before sealant application.

3.06 SEALANT APPLICATION

- A. Inspect each cartridge or container of sealant before use and verify that the production date is within six months of the date of application. Remove from the site all sealant more than six months old. Each applicator shall understand the method of coding the production date on the cartridge.
- B. Mask all exposed surfaces, not masked for priming, along joint before applying sealant.
- C. Recheck correct backer rod and bond breaker tape positioning before applying sealant.
- D. Apply sealant only to clean, dry, primed surfaces (where required) at ambient temperatures above 45°F. Seal joints within 10 hrs of primer application.
- E. Fill all joints solidly and continuously with sealant, neatly applied with a standard caulking gun in a continuous motion, using a slight pressure. Push the sealant bead ahead of the nozzle; do not drag the nozzle.
- F. Within 5 min. of sealant application and before skin develops on sealant, dry tool the joint surface with a concave tool to ensure intimate contact with substrate and to eliminate air bubbles. Do not use any liquid for tooling. Provide a smooth, uniform finished surface.
- G. Mate joints formed from different-colored sealants before skin forms on the sealant.
- H. Remove masking tape within 10 min. of tooling. Avoid contaminating adjacent surfaces with excess sealant. Remove all traces of smears and droppings on metal or glass surfaces promptly, using a solvent recommended by the sealant manufacturer that will not damage or discolor the building surfaces. Remove smears and droppings on porous surfaces by mechanical means after the initial cure of the sealant.
- I. Coordinate work with other trades to prevent contamination of fresh sealant by dust or other debris.

3.07 JOBSITE TESTS

- A. During project sealant application, test adhesion of exterior perimeter sealant joints at the rate of one test per 100 ft of installed sealant, minimum of one test for each application. Three weeks after installation, cut a tab on a joint and test adhesion similar to that described above. Patch test areas in accordance with manufacturer's instructions. If application is not acceptable to the Engineer, conduct additional testing as directed by the Engineer.

END OF SECTION

SECTION 081113

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the steel doors and frames work as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Interior hollow metal doors and frames for fire-rated and unrated door openings.
 - 2. Trimmed openings.
 - 3. Interior hollow metal vision panels.
 - 4. Preparation of metal doors and frames to receive finish hardware, including reinforcements, drilling and tapping necessary.
 - 5. Preparation of hollow metal doors to receive glazing where required.
 - 6. Furnishing anchors for building into drywall.
 - 7. Factory prime painting of work of this Section.

1.3 RELATED SECTIONS

- A. Installation of doors and frames - Section 062000.
- B. Wood Doors - Section 081416.
- C. Finish Hardware - Section 087100.
- D. Interior Glass and Glazing - Section 088010.
- E. Gypsum Drywall - Section 092900.
- F. Painting and Finishing - Section 099000.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, compliance with standards referenced herein, sound and fire-resistance ratings, and finishes for each type of door and frame specified.
- B. Shop Drawings: Show fabrication and installation of doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, reinforcement for surface applied hardware, dimensions of profiles and hardware preparation,

location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessories.

- C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Drawings.
 - 1. Coordinate glazing frames and stops with glass and glazing requirements.
- D. Oversize Construction Certification: For door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit certification of a testing agency acceptable to authorities having jurisdiction that each door and frame assembly has been constructed to comply with design, materials, and construction equivalent to requirements for labeled construction.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing custom steel doors and frames similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.
- C. Source Limitations: Obtain custom steel doors and frames through one source from a single manufacturer.
- D. Fire-Rated Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.
 - 1. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40" or less above the sill.
 - 2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-protection-rated door assemblies except for size.
 - 3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating as required by prevailing Building Code in 30 minutes of fire exposure.
- E. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.
- F. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.
- G. Fire rated assemblies must have UL approved label.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palleted, wrapped, or crated to provide protection during transit and Project site storage. Do not use nonvented plastic.

- B. Inspect doors and frames, on delivery, for damage. Minor damage may be repaired provided refinished items match new work and are approved by Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames under cover at building site. Conform to the requirements of ANSI/SDI A250.11 for site storage unless more stringent requirements are noted herein. Place units on minimum 4-inch high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

PART 2 PRODUCTS

2.1 FABRICATION - GENERAL

- A. Fabricate hollow metal units to be rigid, neat in appearance and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible. Metallic filler to conceal manufacturing defects is not acceptable.
- B. Unless otherwise indicated, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.
- C. Prepare hollow metal units to receive finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with Finish Hardware Schedule and templates provided by hardware suppliers. Comply with applicable requirements of ANSI A115 "Specifications for Door and Frame Preparation for Hardware."
- D. Locate finish hardware as shown on final shop drawings in accordance with locations noted herein.

2.2 MANUFACTURERS

- A. Provide products manufactured by Steelcraft, Curries, Ceco Door Products, Fleming or approved equal meeting these specifications.

2.3 FRAMES

- A. Materials
 - 1. Frames for interior openings shall be either commercial grade cold-rolled steel conforming to ASTM A 1008, Type B or commercial grade hot-rolled steel conforming to ASTM A 1011, Commercial Steel, Type B. Metal thickness shall be not less than sixteen (16) ga. for frames in openings 4'-0" or less in width; not less than fourteen (14) ga. for frames in openings over 4'-0" in width.
- B. Design and Construction
 - 1. All frames shall be welded units with integral trim, of the sizes and shapes shown on approved shop drawings. Knock-down frames are not permitted.
 - 2. All finished work shall be strong and rigid, neat in appearance, square, true and free of defects, warp or buckle. Molded members shall be clean cut, straight and of uniform profile throughout their lengths.
 - 3. Jamb depths, trim, profile and backbends shall be as shown on drawings.

- a. Frames at drywall partitions shall be formed with double return backbends to prevent cutting into drywall surface.
4. Welded frames shall have corners mitered and reinforced and faces of welded frames shall be continuously back welded full depth and width of frame conforming to NAAMM Standard HMMA-820; face joints shall be hairline.
5. Minimum depth of stops shall be 5/8".
6. Frames for multiple or special openings shall have mullion and/or rail members which are closed tubular shapes having no visible seams or joints. All joints between faces of abutting members shall be securely welded and finished smooth.
 - a. Mullions shall have 16 ga. internal steel stiffeners welded not less than 4" o.c.
7. Hardware Reinforcements
 - a. Frames shall be mortised, reinforced, drilled and tapped at the factory for fully-templated mortised hardware only, in accordance with approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates.
 - b. Minimum thickness of hardware reinforcing plates shall be as follows (contractor shall provide larger and thicker plates as required to accommodate weight of door):
 - 1). Hinge and pivot reinforcements - seven (7) ga., 1-1/4" x 10" minimum size.
 - 2). Strike reinforcements - twelve (12) gauge.
 - 3). Flush bolt reinforcements - twelve (12) gauge.
 - 4). Closer reinforcements - twelve (12) gauge.
 - 5). Reinforcements for surface mounted hardware - twelve (12) gauge.
8. Floor Anchors
 - a. Provide adjustable floor anchors, providing not less than two (2) inch height adjustment.
 - b. Minimum thickness of floor anchors shall be fourteen (14) gauge.
9. Jamb Anchors
 - a. Frames for installation in stud partitions shall be provided with steel anchors of suitable design, not less than eighteen (18) gauge thickness, securely welded inside each jamb as follows:
 - 1). Frames up to 7'-6" height - four (4) anchors.
 - 2). Frames 7'-6" to 8'-0" height - five (5) anchors.
 - 3). Frames over 8'-0" height - five (5) anchors plus one additional for each 2'-0" or fraction thereof over 8'-0".
 - b. Frames to be anchored to previously placed concrete or masonry shall be provided with minimum 3/8" concealed bolts set into expansion shields or inserts at six (6) inches from top and bottom and twenty-four (24) inches o.c. Reinforce frames at anchor locations with sixteen (16) gauge sheet steel stiffeners welded to frame at each anchor.
10. Anchors in exterior frames and in masonry walls shall be hot dip galvanized per ASTM A 153.
11. Frames for installation in masonry wall openings more than 4'-0" in width shall have an angle or channel stiffener factory welded into the head. Such stiffeners shall be not less

than twelve (12) gauge steel and not longer than the opening width and shall not be used as lintels or load bearing members.

12. Dust cover boxes (or mortar guards) of not thinner than twenty-six (26) gauge steel shall be provided at all hardware mortises on frames to be set in masonry or plaster partitions.
 13. Ceiling Struts: Minimum 3/8" thick x 2" wide steel.
 14. All frames shall be provided with a steel spreader temporarily attached to the feet of both jambs to serve as a brace during shipping and handling.
 15. Loose glazing stops shall be of cold rolled steel, not less than twenty (20) gauge thickness, butted at corner joints and secured to the frame with countersunk cadmium-or zinc-plated screws. Interior frames may be provided with snap-on glazing stops.
 16. Drill stops to receive three (3) silencers on strike jambs of single door frames and two (2) silencers on heads of double-door frames.
- C. Finish: After fabrication, all tool marks and surface imperfections shall be removed, and exposed faces of all welded joints shall be dressed smooth. Frames shall then be chemically treated to insure maximum paint adhesion and shall be coated on all surfaces with one coat of rust-inhibitive baked-on alkyd primer standard with the manufacturer which is fully cured before shipment to a dry film thickness of 2.0 mils.

2.4 HOLLOW METAL DOORS

- A. Materials: Doors shall be made of commercial quality, level, cold rolled steel conforming to ASTM A 1008, Commercial Steel, Type B and free of scale, pitting or other surface defects. Face sheets for interior doors shall be not less than eighteen (18) gauge. The zinc alloy coating shall be a dull matte surface treated for paint adhesion.
- B. Design and Construction
1. All doors shall be of the types and sizes shown on the approved shop drawings, and shall be fully welded seamless construction with no visible seams or joints on their faces or vertical edges. Minimum door thickness shall be 1-3/4".
 2. All doors shall be strong, rigid and neat in appearance, free from warpage or buckles. Corner bends shall be true and straight and of minimum radius for the gauge of metal used.
 3. Face sheets shall be stiffened by continuous vertical formed steel sections spanning the full thickness of the interior space between door faces. These stiffeners shall be not less than twenty-two (22) gauge spaced not more than six (6) inches apart and securely attached to face sheets by spot welds not more than five (5) inches o.c. Spaces between stiffeners shall be sound deadened and thermal insulated the full height of the door with an inorganic non-combustible batt type material.
 4. Door faces shall be joined at their vertical edges by a continuous weld extending the full height of the door. All such welds shall be ground, filled and dressed smooth to make them invisible and provide a smooth flush surface.
 5. Top and bottom edges of all doors shall be closed with a continuous recessed steel channel not less than fourteen (14) gauge, extending the full width of the door and spot welded to both faces..
 6. Edge profiles shall be provided on both vertical edges of doors as follows:

- a. Single-acting swing doors - beveled 1/8" in two (2) inches.
- b. Double acting swing doors - rounded on 2-1/8" radius.
- c. No square edge doors permitted.

7. Hardware Reinforcements

- a. Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only in accord with the approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware (or hardware, the interrelation of which is to be adjusted upon installation - such as top and bottom pivots, floor closers, etc.) is to be applied, doors shall have reinforcing plates.
- b. Minimum gauges for hardware reinforcing plates shall be as follows (contractor shall provide larger and thicker plates as required to accommodate weight of door):
 - 1). Hinge and pivot reinforcement - seven (7) gauge.
 - 2). Reinforcement for lock face, flush bolts, concealed holders, concealed or surface mounted closers - twelve (12) gauge.
 - 3). Reinforcements for all other surface mounted hardware - sixteen (16) gauge.

8. Glass Moldings and Stops

- a. Where specified or scheduled, doors shall be provided with hollow metal moldings to secure glazing by others in accordance with glass opening sizes shown on drawings.
- b. Fixed moldings shall be securely welded to the door on the security side.
- c. Loose stops shall be not less than twenty (20) gauge steel, with mitered corner joints, secured to the framed opening by cadmium or zinc-coated countersunk screws spaced eight (8) inches o.c. Snap-on attachments will not be permitted. Stops shall be flush with face of door.

C. Finish: After fabrication, all tool marks and surface imperfections shall be dressed, filled and sanded as required to make all faces and vertical edges smooth, level and free of all irregularities. Doors shall then be chemically treated to insure maximum paint adhesion and shall be coated, on all exposed surfaces, with manufacturer's standard rust-inhibitive alkyd primer as specified for frames which shall be fully cured before shipment.

D. Flatness: Doors shall maintain a flatness tolerance of 1/16" maximum, in any direction, including in a diagonal direction.

2.5 LABELED DOORS AND FRAMES

- A. Labeled doors and frames shall be provided for those openings requiring fire protection ratings as scheduled on drawings. Such doors and frames shall be labeled by Underwriters' Laboratories or other nationally recognized agency having a factory inspection service.
- B. If any door or frame specified by the Architect to be fire-rated cannot qualify for appropriate labeling because of its design, size, hardware or any other reason, the Architect shall be so advised before fabricating work on that item is started.

2.6 HARDWARE LOCATIONS

- A. The location of hardware on doors and frames shall be as noted in "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames" of the Door Hardware Institute unless otherwise required by prevailing Handicapped Codes.

2.7 CLEARANCES

A. Fabricate doors and frames to meet edge clearances as follows:

1. Jambs and Head: 1/8" plus or minus 1/16".
2. Meeting Edges, Pairs of Doors: 1/8" plus or minus 1/16".
3. Bottom: 3/4" if no threshold, 3/8" at threshold.

B. Fire rated doors shall have clearances as required by NFPA 80.

2.8 MANUFACTURING TOLERANCES

A. Manufacturing tolerance shall be maintained within the limits given in HMMA 841 of ANSI/NAAMM, current edition.

2.9 PREPARATION FOR FINISH HARDWARE

A. Prepare door and frames to receive hardware:

1. Hardware supplier shall furnish hollow metal manufacturer approved hardware schedule, hardware templates, and samples of physical hardware where necessary to insure correct fitting and installation.
2. Preparation includes sinkages and cut-outs for mortise and concealed hardware.

B. Provide reinforcements for both concealed and surface applied hardware:

1. Drill and tap mortise reinforcements at factory, using templates.
2. Install reinforcements with concealed connections designed to develop full strength of reinforcements.

2.10 REJECTION

A. Hollow metal frames or doors which are defective, have hardware cutouts of improper size or location, or which prevent proper installation of doors, hardware or work of other trades, shall be removed and replaced with new at no cost.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where steel doors and frames are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Refer to Section 062000 for installation procedures for all work of this Section.

END OF SECTION

SECTION 081214

TRIMLESS DOOR FRAMES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the trimless door frames as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Flush steel door jamb systems of the following types:
 - a. Adjustable split-jamb door frames. (EZYJamb Classic Adjust - EZC)
 - 2. Flush-finish accessory products:
 - a. Architectural door hardware. (Rocyork)

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each product specified.
- B. Shop Drawings: Submit shop drawings showing details of each opening, including elevations, frame profiles, accessories and attachment.
- C. Schedule: Submit a door frame schedule indicating number and location of each frame, matching door numbering on the Drawings.

1.4 QUALITY ASSURANCE

- A. Manufacturing: Product manufactured under both ISO9001 and ISO14001 - 2015 EMS policy.
- B. Source Limitations: Obtain metal frames through one source from a single manufacturer.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Storage and Handling: Comply with manufacturer's recommendations for storage and handling. Protect from weather damage.

1.6 WARRANTY

- A. Warranty: Provide manufacturer's standard limited warranty against defects in manufacturing.

PART 2 PRODUCTS

2.1 BASIC REQUIREMENTS

- A. Basis-of-Design Manufacturer: EzyJamb, 1700 Boulter Industrial Pkwy, Webster, NY 14850. Toll Free: 888-399-5262. Fax: 585-545-3010. Web: www.ezyjamb.com
- B. Alternate Manufacturer : DÖRR Industries Inc., 1985, rue A.R. Décary, Quebec (Quebec), Canada G1N 3Z8; Phone : 1-418-683-0700, e-mail : info@industriesdorr.com , URL : <http://www.industriesdorr.com> . Or approved equal.

2.2 TRIMLESS INTERIOR DOOR FRAMES

- A. Adjustable Split-Jamb Door Frames: EZYJamb Classic Adjust – EZC, or approved equal complying with the following.
 - 1. Material: 20 gauge galvanized steel, two-piece with perforated flanges.
 - 2. Depth: 1-3/4" thick doors.
 - 3. Fire Rating for 1-3/4" Thick Doors: Up to 90 minutes; Intertek listed.
 - 4. Hardware:
 - a. Invisible Door Hinges for 1-3/4" Thick Doors: See hardware schedule.
 - b. Surface-Applied Hinges: 4" surface applied, stainless steel. See hardware schedule.
 - c. Door Strikes for 1-3/4" Thick Doors: See hardware schedule.
- B. Architectural Door Hardware: Rocyork premium quality door hardware of the following types:
 - 1. Refer to the door hardware schedule.
- C. Flush Finish Pocket Door System: SlideSet by Studco Building Systems, with head jamb or full height detail as applicable.
- D. Flush Finish Pocket Door Trim: Cavkit by EZYJamb, fabricated from EZYreveal and EZYcap to trim and cap the plaster edges around the door penetration.

2.3 FABRICATION

- A. Fabricate frames and accessories accurately, with true lines and profiles.
- B. Fabricate frames to receive specified hardware.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine substrates for compliance with requirements for installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install trimless door frames in accordance with manufacturer's instructions and approved submittals including the following:
 - 1. Install frames plumb and square.

2. Use door as a template when available to ensure proper alignment and clearances.
 3. Install frames securely using fasteners suitable for substrate.
 4. Leave frames ready for taping and application of drywall compound.
 5. Repair frames damaged during installation.
 6. Replace frames which cannot be successfully repaired.
- B. Install accessory products in accordance with manufacturer's instructions and approved submittals including the following:
1. Install products plumb and square.
 2. Install products in proper relationship to adjacent construction.
 3. Repair products damaged during installation.
 4. Replace products which cannot be successfully repaired.

3.3 CLEANING AND PROTECTION

- A. Clean frames as recommended by manufacturer. Protect from damage until acceptance.

END OF SECTION

SECTION 081416

WOOD DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the wood doors as shown on the drawings and/or specified herein, including but not limited to, the following:
 - 1. Solid core flush wood doors.
 - 2. Fire rated flush wood doors with vision panel.
 - 3. Sliding Pocket wood door.

1.3 RELATED SECTIONS

- A. Installation of wood doors - Section 062000.
- B. Architectural woodwork - Section 064023.
- C. Hollow metal frames - Section 081113.
- D. Trimless Door Frames – Section 081214.
- E. Finish hardware - Section 087100.
- F. Interior glass and glazing - Section 088010.
- G. Demountable Partitions - Section 102219.

1.4 SUBMITTALS

- A. Product Data: Submit door manufacturer's product data, specifications and installation instructions for each type of wood door.
 - 1. Include details of core and edge construction and trim for openings.
 - 2. Include factory finish specifications.
 - 3. Include certifications to show compliance with specifications.
 - 4. Include certification to show compliance with AWI and WDMA requirements specified herein.
- B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for finishing and other pertinent data.

1. Include requirements for veneer matching.
- C. Submit the following
1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
- 1.5 QUALITY ASSURANCE
- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
 - B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated"; latest edition "Premium" grade and WDMA "Extra Heavy Duty" Performance Level.
 1. Only manufacturers that are certified and listed by AWI to be QCP qualified are acceptable for this project.
 2. Provide letter of licensing for Project indicating that doors comply with requirements of grade specified.
 - C. Fire Rated Wood Doors: Doors complying with Category A, Positive Pressure or Neutral Pressure testing standards per UBC 7-2-1997 and UL 10-C (UBC 7-2-1994 and UL 10B) that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated on Door Schedule, based on testing according to NFPA 252.
 1. Conform to prevailing Code requirements to determine which pressure standard (Positive or Neutral) is required.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Comply with requirements of referenced standard and manufacturer's written instructions.
 - B. Package doors individually in plastic bags or cardboard cartons.
 - C. Mark each door on top and bottom rail with opening number used on Shop Drawings.
- 1.7 PROJECT CONDITIONS
- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
- 1.8 WARRANTY
- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) in excess of permitted standard noted in Article 2.5 herein, or show telegraphing of core construction in face veneers.
 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Solid Core Flush Wood Doors: Life of installation.

PART 2 PRODUCTS

2.1 SOLID CORE FLUSH WOOD DOORS

- A. Provide AWI PC-5 Premium Grade hot pressed 5-ply solid core particleboard doors, 1-3/4" thick, conforming to standards specified herein. Subject to meeting standards specified herein, the following manufacturers are acceptable: VT Industries, Masonite, Oregon Doors, Mohawk or approved equal.
 - 1. Basis of Design: VT- Industries – Heritage Architectural Doors.
 - 2. Core shall consist of a formed flat panel consisting of wood particles bonded together with synthetic resins or other added binder, with an average density of 30 to 32 lbs. per cubic foot. The material shall meet or exceed the requirements of ANSI A208.1, Grade 1-LD-2 covering mat formed particleboard with face screw holding of 124 lbs., modulus of rupture of minimum 700 psi and modulus of elasticity of not less than 148,000 psi.
 - 3. Core shall be capable of satisfying this WDMA TM-7 cycle slam test for 1 million slams for surface mounted hardware. Where the manufacturer's core does not meet this criteria, stiles and rails must measure a minimum of 5-1/2" and must be fabricated of hardwood.
 - a. Surface mounted hardware must be installed with minimum 1-1/4" screw penetrations using threaded to the head screws; coordinate with Section 087100.
- B. Cross Bands: Shall be 1/16" thick hardwood extending full width of door and laid with grain at right angles to face veneers. Cross bands and faces shall be laminated to the core with Type I MF or PVA glue.
- C. Stiles, Rails: Stile and rail shall be a minimum of 1-3/8" solid hardwood or structural composite lumber (after trimming) laminated to the core. Stiles and rails must be securely glued to the core with no voids allowed. Stiles and rails must be capable of screw holding of 550 lbs. per WDMA TM-10.
- D. Vertical door edge must be capable of screw holding of 550 lbs. per WDMA TM-10; horizontal door edge must be capable of screw holding of 400 lbs. per WDMA TM-10.
- E. Doors with transparent finish to have center balanced, book matched, veneer per finish schedule. Veneer to conform to AWI, "AA" grade veneer with minimum 3" wide leaf. Minimum veneer thickness shall be not less than 1/50" after sanding.
 - 1. Veneers shall be continuous, or end matched at transoms.
 - 2. Wood doors to be from the same supplier and flitch as is identified in Section 064023 or to be a close match to the Architect's control sample for wood veneer panels. Matching to be same as for wood veneer paneling in Section 064023.
- F. Doors shall have hinge loading capacity of 500 lbs. per WDMA TM-8.
- G. Where glass lites are noted, factory cut openings. Trim openings with solid hardwood moldings of same type of wood as face veneer. Lite openings in 20-minute rated doors shall have manufacturer's 20-minute approved hardwood system.

2.2 FIRE RATED WOOD DOORS

- A. Provide mineral core 1-3/4" thick solid core wood doors conforming to standards specified herein, manufactured by one of the manufacturers noted above. Stile construction on both stiles shall conform to the following:

1. Stile edge screw withdrawals when tested in accordance with ASTM D 1037-78 shall exceed 650 lbs. This applies to both stiles.
 2. Stile edge split resistance when tested in accordance with ASTM D 143-52 (78) Modified must exceed 950 lbs. This applies to both stiles.
- B. Door to have face finish as specified above in Article 2.1.
1. Where the core is free of urea formaldehyde, provide a layer of veneer over the substrate prior to application of finish veneer to prevent telegraphing of patterns from the adhesive.
- C. Blocking: For surface mounted hardware only, provide composite blocking designed to maintain fire resistance of door but with improved screw-holding capability of same thickness as core and with minimum dimensions as follows:
1. 5-inch top rail blocking.
 2. 5-inch bottom rail blocking.
 3. 1 – 5" x 18" lock block at cylinder or mortise locksets.
 4. 2 – 5" x 18" lock blocks at exit devices.
- D. Pairs: Provide fire-rated pairs with fire-retardant stiles that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

2.3 SHOP FINISH

- A. Transparent Finish: Finish in the shop with clear satin catalyzed polyurethane finish conforming to AWI System "Catalyzed Polyurethane Transparent".

2.4 FABRICATION

- A. Prefit and premachine wood doors at the factory.
- B. Comply with the tolerance requirements specified herein. Machine doors for hardware requiring cutting of doors. Comply with final hardware scheduled and door frame shop drawings, and with hardware templates and other essential information required to ensure proper fit of doors and hardware.
- C. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in the factory.
- D. Doors shall be factory sized to door opening so that trimming and fitting are not required in the field.
- E. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances unless otherwise indicated.
1. Three-degree bevel or bevel to suit frame sizes indicated, with 3/16" prefit in width, +0/-1/32" tolerances. Prefit top of door 1/8" + 1/16"/-0" and undercut as required by floor condition. Undercut shall not exceed 1/8" from bottom of door to top of finished floor; where threshold occurs undercut shall not exceed 1/8" from bottom of door to top of threshold.
 2. Comply with requirements in NFPA 80 for fire-rated doors.

- F. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3 unless otherwise noted. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Provide concealed intumescent seals at fire-rated pairs of doors meeting the requirements of U.L. 10 C.
- G. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kinds of doors required.

2.5 SOURCE QUALITY CONTROL

- A. Once installed, maximum allowable warp, bow, cut or twist in doors shall be 1/16" as measured by the 1/16-inch feeler gauge and a straight-edge extending from corner to corner of the door face at stiles, top and bottom rails and along both diagonals.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Refer to Section 062000 for installation of wood doors.

END OF SECTION

SECTION 083113

ACCESS DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the access doors as indicated on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Frameless recessed panel access doors at drywall ceilings and walls.
 - 2. GFRG access panels and doors.
 - 3. Framed flush panel access doors at tile walls.
 - 4. GFRG access panels at drywall ceilings and walls.
 - 5. Provide access doors and frames for access from occupied spaces to the following, where indicated or required, and as directed by the trades of Divisions 21, 22, 23 and 26. All doors are to be submitted to the Architect for review of location and access door type.
 - a. All shutoff or balancing valves.
 - b. Fire dampers, as required.
 - c. Points of duct access.
 - d. Pull boxes.
 - e. Controls of mechanical and electrical items.
 - f. Masonry shafts for pipes and conduits, as required.
 - g. Pipe spaces, if required.
 - h. Inlets of fans.
 - i. Fusible link and splitter damper at filter bank.
 - j. Automatic damper and motor.
 - k. Equipment not otherwise accessible.

1.3 RELATED SECTIONS

- A. Drywall - Section 092900.
- B. Ceramic tile - Section 093000.
- C. Valves and connections - Division 22.

1.4 QUALITY ASSURANCE

- A. For actual installation of the work of this Section, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the skills required.

- B. Fire-Resistance Ratings: Wherever a fire-resistance classification is shown, or for construction where access doors are installed, provide required access door assembly with panel door, frame, hinge and latch from manufacturers listed in Underwriters' Laboratories, Inc. "Classified Building Materials Index" for the rating shown.
 - 1. Provide UL label on each access panel.
 - 2. Provide flush, key operated cylinder lock; Best interchangeable core SFIC.
- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units which may vary slightly from sizes shown or scheduled.

1.5 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 MATERIALS AND FABRICATION

- A. See architectural drawings for locations, panel type used and size.
- B. Provide access door assembly manufactured by Milcor Inc, or equal made by Nystrom Inc., Karp Associates, Inc. or approved equal. Assembly shall be an integral unit complete with all parts and ready for installation.
- C. Fabricate units of continuous welded steel construction. Grind welds smooth and flush with adjacent surfaces. Provide attachment devices and fasteners of the type required to secure access panels to the types of supports shown.
- D. Frames for Masonry and Tile Wall Only (Flush Panel Units, FPU)
 - 1. Fabricate frame from sixteen (16) gauge steel. Provide frame with exposed flange not less than one (1) inch wide around perimeter of frame for the following construction:
 - a. Exposed masonry.
 - b. Tile finish.
 - 2. For installation in masonry construction, provide frames with adjustable metal masonry anchors.
- E. Frameless Units for Drywall Surfaces (Recessed Panel Units, RPU): Provide access doors without exposed frames for drywall adhered to recessed panel.
- F. Panels: Fabricate from fourteen (14) gauge steel, with concealed spring hinges set to open to 175 degrees. Provide removable pin type hinges of the quantity required to support the access panel sizes used in the work. Finish with manufacturer's factory applied baked enamel prime coat applied over phosphate protective coating on steel.

2.2 GFRG ACCESS PANELS AND DOORS

- A. Provide "Hinged Square Corner" access panels with fully concealed hinges made from glass-fiber-reinforced gypsum (GFRG) as manufactured by Castle Access Panels & Forms Inc., or

equivalent product of Wind-Lock, Formglas, IntexForms, or approved equal; sizes as indicated on the drawings.

1. Provide access panels architecturally designed to blend seamlessly with drywall ceiling and wall construction. Coordinate work with Section 092900, "Gypsum Drywall." Provide paint finish as specified in Section 099000.
2. Panels shall be Class A rated, with a flame spread and smoke developed index of 0 in accordance with ASTM E 84.

2.3 ACCESSORIES

A. Locking Devices

1. For non-rated access doors, provide Interchangeable cores
2. For fire rated doors, provide locks as described in paragraph 1.4, B. herein.

- ### B. Inserts and Anchorage:
- Furnish inserts and anchoring devices which must be built into masonry for the installation of access panels. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

PART 3 EXECUTION

3.1 INSPECTION

- #### A.
- Examine the areas and conditions where access doors are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 COORDINATION

- #### A.
- Coordinate all work with the mechanical trades to ensure proper locations and in a timely manner to permit orderly progress of the total work.
- #### B.
- Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.
- #### C.
- Adjust hardware and panels after installation for proper operation.
- #### D.
- Remove and replace panels or frames which are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 084113

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the aluminum entrances and storefronts as indicated on the drawings and/or specified herein, including the following:
 - 1. Exterior entrance systems.
 - 2. Interior storefront systems.

1.3 RELATED SECTIONS

- A. Sealants - Section 079200.
- B. Finish hardware - Section 087100.
- C. Glass and glazing - Section 088000.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.
- B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of work. Provide plans, elevations, and details of anchorages, connections and accessory items. Provide installation templates for work installed by others. Show interfaces and relationships to work of other trades.
- C. Field Measurements: Take necessary field measurements before preparation of shop drawings and fabrication. Do not delay progress of job. If field measurements are not possible prior to fabrication, allow for field cutting and fitting.
- D. Initial Selection Samples: Submit samples showing complete range of colors, textures, and finishes available for each material used.
- E. Verification Samples: Submit representative samples of each material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide samples having minimum size of 144 sq. in.
- F. Calculations: Provide professionally prepared calculations and certification of performance of this work. Indicate how design requirements for loading and other

performance criteria have been satisfied; refer to Article 1.5, para. D for further description.

- G. Test Reports: Provide certified test reports for specified tests.

1.5 QUALITY ASSURANCE

- A. Source: For each material type required for work of this Section, provide primary materials that are products of one manufacturer. Provide secondary or accessory materials that are acceptable to manufacturers of primary materials.
- B. Installer: A firm with a minimum of three years' experience in type of work required by this Section and which is acceptable to manufacturers of primary materials.
- C. Design Criteria: Drawings indicate sizes, member spacings, profiles, and dimensional requirements of work of this Section. Minor deviations will be accepted in order to utilize manufacturer's standard products when, in the Architect's sole judgment, such deviations do not materially detract from the design concept or intended performances.
- D. Engineering: Provide services of a Professional Engineer, registered in the jurisdiction in which the Project will be built, to design and certify that work of this Section meets or exceeds performance requirements specified.

1.6 TESTS AND PERFORMANCE REQUIREMENTS

- A. Manufacturer's Standard Tests: Provide manufacturer's standard test data showing compliance with specified requirements.
- B. Testing and performance data applies to exterior assemblies.
- C. Test Sequence: Test sequence is optional, except that air infiltration tests shall precede water resistance tests.
- D. Air Infiltration Test: Test unit in accordance with ASTM E 283, as follows:
 - 1. Static Air Pressure Difference: 6.24 psf for fixed storefront units, and 1.567 psf for doors.
 - 2. Performance: Maximum air leakage shall not exceed Code requirements.
- E. Water Leakage Test: Test fixed framing system in accordance with ASTM E 331.
 - 1. Test Pressure: 6.24 psf.
 - 2. Performance: No leakage as defined in test method at specified test pressure.
- F. Uniform Load Deflection Test: Test units in accordance with ASTM E 330, at following static air pressure difference (Design Wind Pressure), or loads prescribed by code for this project site, whichever is greater. Apply pressure first to exterior side (positive) and then interior side (negative).
 - 1. Design Wind Pressure: ASCE-7 or Building Code, whichever is more restrictive.
 - 2. Test Procedure: Procedure A as specified in ASTM E 330.
 - 3. Performance: Deflection in each member measured at locations of greatest deflection shall not exceed $L/175$ at specified Design Wind Pressure.

G. Uniform Load Structural Test: Test units in accordance with ASTM E 330 at following static air pressure difference. Apply high-pressure load first on one side and then on other side. At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or activating mechanisms.

1. Static Air Pressure: Minimum 1.5 times the Design Wind Pressure.

2. Permanent Deformation in Any Member: Not to exceed 0.2% of member span.

H. Condensation Resistant Factor: See drawings.

I. Thermal Movement: Provide storefront systems that allow for expansion and contraction of members throughout an ambient temperature range of 120 deg F.

J. Seismic Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9, "Earthquake Loads," whichever are more stringent.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Store under cover and protect from weather damage.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.8 WARRANTIES

A. Provide written warranty, signed by manufacturer, agreeing to repair or replace work that exhibits defects in materials or workmanship. "Defects" is defined to include, but not limited to, leakage of water, abnormal aging or deterioration, abnormal deterioration or fading of finishes, and failure to perform as required. Include requirement for removal and replacement of covering and connected adjacent work.

1. Warranty Period: Three (3) years from date of Substantial Completion; except finish shall be warranted for a period of fifteen (15) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/PRODUCTS

A. Provide storefronts and entrance systems of one of the following manufacturers that meet or exceed requirements of these specifications:

1. Kawneer Company, Inc.
2. Wausau Metals Corporation.
3. EFCO.

B. Products:

1. Exterior frame system shall be equal to Series 451UT, manufactured by Kawneer Company, Inc.; or approved equal manufacturer listed above.

2. Doors for exterior application shall be "Insulpour 250T Narrow Stile" manufactured by the Kawneer Co. Inc. or approved equal manufacturer listed above.

2.2 MATERIALS AND ACCESSORIES

- A. Aluminum Members: Provide 6063-T5 alloy and temper as recommended by manufacturer for strength, corrosion resistance, and application of required finish. Comply with ASTM B 221 for extrusions, and ASTM B 209 for sheet/plate. Provide 0.125" thick extrusions for door stiles and storefront framing. Provide 0.050" thick aluminum for glazing moldings.
- B. Fasteners: Provide non-magnetic stainless steel fasteners, warranted by manufacturer to be non-corrosive and compatible with aluminum components.
- C. Concealed Flashing: Dead-soft stainless steel, 26 gauge minimum, or extruded aluminum 0.062" minimum, of an alloy and type selected by manufacturer for compatibility with other components.
- D. Brackets and Reinforcements: Non-magnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123.
- E. Concrete/Masonry Inserts: Cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 123.
- F. Bituminous Coatings: Cold-applied asphalt mastic compounded for 30-mil thickness per coat.
- G. Compression Weatherstripping: Manufacturer's standard replaceable stripping of molded neoprene or PVC gaskets complying with ASTM D 2287.
- H. Sliding Weatherstripping: Manufacturer's standard replaceable stripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing.

2.3 HARDWARE

- A. Provide hardware units as indicated, scheduled, or required for operation of each door. Refer to Section 087100, Finish Hardware for hardware description.

2.4 FABRICATION

- A. Sizes and Profiles: Required sizes for door and frame units, including profile requirements, are indicated on Drawings. Any variable dimensions are indicated, together with maximum and minimum dimensions required to achieve design requirements and coordination with other work.
- B. Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.
 1. Preglaze door and frame units to greatest extent possible, in coordination with installation and hardware requirements.
 2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.

3. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work in manner which prevents damage to exposed finish surfaces. For hardware, perform these operations prior to application of finishes.
- C. Welding: Comply with recommendations of American Welding Society to avoid discoloration; grind exposed welds smooth and restore mechanical finish.
 - D. Reinforcing: Install reinforcing as necessary for performance requirements; separate dissimilar metals with bituminous paint or other separator to prevent corrosion.
 - E. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.
 - F. Fasteners: Conceal fasteners.
 - G. Provide EPDM/vinyl blade gasket weatherstripping in bottom exterior door rail, adjustable for contact with threshold.
 - H. At interior doors and other locations without weatherstripping, provide neoprene silencers on stops to prevent metal-to-metal contact.
 - I. Provisions shall be made in the framing for minimum edge clearance, nominal edge cover, and nominal pocket width for the thickness and type of glazing installed, and shall be in accordance with the FGMA Glazing Manual.
 - J. Pocket glazed framing shall provide:

	<u>Insulating Glass</u>
1. Nominal edge cover (or bite) framing only	1/2"
2. Min. nominal edge clearance	1/4"
3. Min. face clearance	5/32"

2.5 STOREFRONT FRAMING

- A. General: Provide inside-outside matched resilient flush glazed system with provisions for glass replacement. Shop fabricate and preassemble frame components where possible.
- B. Thermal-Break Construction: Fabricate exterior aluminum storefront framing system with integrally concealed, low conductance thermal barrier, located between exterior materials and exposed interior members, in manner which eliminates direct metal-to-metal contact. Provide manufacturer's standard construction which has been in use for similar projects for at least three years.
- C. For glass and glazing, refer to Section 088000.

2.6 ALUMINUM DOORS

- A. Aluminum entrance doors shall be thermally broken narrow stile factory-glazed aluminum doors, manufactured by same manufacturer as storefront framing.
- B. Aluminum entrance doors shall be stile and rail type swing doors. Aluminum shall be extruded aluminum conforming to ASTM B 221, 0.125" thick for door stiles and 0.050" thick for glazing molding.

1. Sections shall be of sizes and profiles indicated; shall present straight, sharply defined lines and arrises; and shall be free from defects impairing strength, durability, and appearance.
 2. Fasteners where exposed shall be aluminum stainless steel or plated steel conforming to ASTM B 633.
- C. Each door shall be factory glazed set in neoprene glazing gasket, refer to Section 088000 for glass.
- D. Doors shall meet the following resistance to corner racking when tested by the Dual Moment Load Test.
1. Test section shall consist of a standard top door corner assembly. Side rail section shall be 24" long and top rail section shall be 12" long.
 2. Anchor "top rail" positively to test bench so that corner protrudes 3" beyond bench edge.
 3. Anchor a lever arm positively to "side rail" at a point 19" from inside edge of "top rail." Attach weight support pad at a point 19" from inner edge of "side rail."
 4. Test section shall withstand a load of 235 lbs. on the lever arm before reaching the point of failure, which shall be considered a rotation of the lever arm in excess of 45 deg.
- E. For door hardware, refer to Section 087100.
- F. Door bottom rail of exterior doors shall have an EPDM blade gasket sweep strip applied with concealed fasteners.
- G. Corner construction shall consist of mechanical clip fastening, SIGMA deep penetration and fillet welds. Glazing stops shall be hook-in type with EPDM glazing gaskets.
- H. The door weatherstripping on a single acting offset pivot or butt hung exterior door and frame (single or pairs) shall be thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
- I. The door weatherstripping on a double acting, center pivoted door and frame (single or pairs) shall be pile cloth. The door bottom rail shall be weathered with an EPDM blade gasket sweep strip applied with concealed fasteners.
- J. The meeting stiles on pairs of doors shall be equipped with an adjustable astragal.

2.7 FINISH

- A. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Acid-chromate-fluoride-phosphate conversion coating; Organic Coating: As specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
1. Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

2. Custom color and gloss as selected by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where aluminum entrances and storefronts are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Install aluminum entrance doors and storefront framing in openings prepared under other Sections plumb, square, level, in exact alignment with surrounding work, with proper clearances, and securely and positively anchored to building structure, to meet performance requirements specified herein, in accordance with manufacturer's published instructions and approved submittals.
- B. Use only skilled mechanics for erection, under supervision of manufacturer's representative.
- C. Provide protection against galvanic action. Isolate dissimilar materials with bituminous coating or non-absorptive dielectric tape.
- D. Install aluminum entrance doors, storefront frame, and finish hardware. Carefully fit and adjust doors and hardware to frames and weatherstripping. After erection check and adjust operating hardware for smooth and proper operation.
- E. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Section 079200.
- F. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances.
 1. Variation from Plane: Limit variation from plane or location shown to 1/8" in 12'-0"; 1/4" over total length.
 2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16". Where surfaces meet at corners, limit offset from true alignment to 1/32".
 3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8".

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor shall engage a qualified independent testing agency to perform testing indicated for storefronts.
- B. Test fixed frames for water infiltration per AAMA 501.2; latest edition. Test within the first 10% of work complete, area to be a minimum of 100 SF of wall and including a perimeter where frames adjoin adjacent construction. Interior finishes must not interfere with observation of test area or be removed from test area. Not appropriate for operable doors.
 1. This test (AAMA 501.2) shall be performed infield on new construction.

- C. Repair or remove Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.4 PROTECTION AND CLEANING OF ALUMINUM

- A. Protect finished metal surfaces from damage during fabrication, shipping, storage, and erection, and from then until acceptance by Owner.
- B. Clean metal surfaces promptly after installation, exercising care to avoid damage. Remove excess sealant, dirt, and other substances. Lubricate hardware and other moving parts.

3.5 PROTECTION AND CLEANING OF GLASS

- A. Replace glass that is broken, cracked or chipped prior to time of final acceptance of Project by Owner.
- B. Clean glass surfaces promptly after installation, exercising care to avoid damage to same.

END OF SECTION

SECTION 084900

FIRE RATED GLASS, FRAMING AND DOOR SYSTEMS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SUMMARY

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the fire rated interior glass, framing and door systems as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

- A. Carpentry – Section 062000.
- B. Finish Hardware - Section 087100.
- C. Glass and Glazing - Section 088000.

1.4 REFERENCES

- A. American Architectural Manufacturers Association (AAMA)
 - 1. AAMA 2604 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - 2. AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. American Society for Testing and Materials (ASTM):
 - 1. Fire safety related:
 - a. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
 - 2. Material related:
 - a. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 - b. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- C. American Welding Society (AWS)
 - 1. AWS D1.3 - Structural Welding Code - Sheet Steel;
- D. Builders Hardware Manufacturers Association, Inc.
 - 1. BHMA A156 - American National Standards for door hardware; (ANSI/BHMA A156).

- E. National Fire Protection Association (NFPA):
 - 1. NFPA 80: Fire Doors and Windows.
 - 2. NFPA 251: Fire Tests of Building Construction & Materials
 - 3. NFPA 252: Fire Tests of Door Assemblies
 - 4. NFPA 257: Fire Test of Window Assemblies
- F. Underwriters Laboratories, Inc. (UL):
 - 1. UL 9: Fire Tests of Window Assemblies.
 - 2. UL 10 B: Fire Tests of Door Assemblies
 - 3. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies
 - 4. UL 263: Fire tests of Building Construction and Materials
 - 5. UL-752 Ratings of Bullet-Resistant Materials
- G. American National Standards Institute (ANSI):
 - 1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings
- H. Consumer Product Safety Commission (CPSC):
 - 1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials
- I. American Society of Civil Engineers (ASCE)
 - 1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures.

1.5 SUBMITTALS

- A. Shop Drawings: Show plans, elevations, sections, and details including doors, frames, hardware and steel frame components as shown on shop drawings and schedules.
 - 1. Obtain Architect's approval before fabrication.
- B. Samples: Submit in the form of 12-inch square samples for glass and of 12-inch long samples for framing and sealants. Install sealant samples between two strips of material representative in color of the adjoining framing system.
- C. Glazing Schedule: Use same designations indicated on drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data and installation instructions.
- E. Provide signed and sealed calculations and shop drawings by a Professional Engineer licensed in the State of New York demonstrating that partitions comply with lateral load criteria of 5 psf and a maximum L/360 deflection, unless greater load required by Code.

1.6 QUALITY ASSURANCE

- A. Source Limitations for Glazing Accessories: Obtain framing system, glazing and glazing accessories from one source for each product and installation method indicated.

- B. Installer Qualifications: An experienced installer who has completed work similar in material, design, and extent to that indicated for this Project and whose work has resulted in installations with a record of successful in-service performance.
- C. Fire-Rated Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated. Fire rating to pass 120-minutes with hose stream tested in accordance with ASTM E119, NFPA 80, NFPA 251, NFPA 252, NFPA 257, UL9, UL10B, UL263.
- D. Certification - Fire-Rated Assemblies: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
 - 1. An approved independent testing laboratory equal to UL shall conduct fire test.
- E. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by an approved independent agency maintaining a current listing or certification. Label assemblies in accordance with limits of manufacturer's listing.
- F. Regulatory Requirements: Comply with provisions of the following:
 - 1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," and ANSI A117.1, as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1). Accessible doors no more than 5 lbf (22.2 N) push or pull force
 - 2). Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 2. Compliance with this standard requires auto openers to be added to the opening due to the weight of the doors. Coordinate the addition of auto-openers with the Division 8 section "Door Hardware" or other section containing these devices. Verify that the Authority Having Jurisdiction is using NFPA 101 and/or IBC and which edition dates of both as a requirement for the facility. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf (67 N) to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Door Closers: Not more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
 - 3. Means of Egress: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf (67 N) to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Door Closers: Not more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle under provisions specified by manufacturer.

1.8 PROJECT CONDITIONS

- A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner coordinate planned measurements with the work of other sections.
 - 1. Note whether field or planned dimensions were used in the creation of the shop drawings.
- B. Coordinate the work of this section with others effected including but not limited to: other interior and/or exterior envelope components and door hardware beyond that provided by this section.

1.9 WARRANTY

- A. Provide system supplier's limited five-year warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer Fire Rated Glass Material: "Pilkington Pyrostop" fire rated glazing as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065; (800-426-0279), or equal.
 - 1. Any alternative manufacturers must obtain architect approval and must provide profile shapes, performance characteristics, and dimensions to match those shown on architectural drawings.

2.2 MATERIALS – ALUMINUM FRAMES

- A. Interior Frame System: "Fireframes® Aluminum Series" by TGP 2 hour fire rated frame system, or equal.
- B. Interior Door Frame System: "Fireframes Designer Series Temperature Rise Doors," or equal.
- C. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).
- D. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M Standard Specification for Carbon Structural Steel
 - 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable
 - 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
- E. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.

2.3 MATERIALS – GLASS (SEE GLASS SCHEDULE 088000)

- A. Fire Rated Glazing: Composed of multiple sheets of Pilkington Optiwhite high visible light transmission glass laminated with an intumescent interlayer. Glass shall comply with ANSI Z97.1 Category I and II.
- B. Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory (UL® only), fire rating period, safety glazing standards, and date of manufacture.
- C. Performance: Glass must be rated to stop fire from either direction and must meet all testing requirements including the required hose-stream test (where fire-rating exceeds 20 minutes).

2.4 FIRE-RATED GLASS DOORS – ADD ALT #2

- A. Interior Doors: “Designer Series” as manufactured supplied by Technical Glass Products, or equal
- B. Provide concealed M-Force Low Energy Automatic Swing Door Opener by STANLEY Access Technologies for a both leaves. Independent operation of each leaf: left leaf will operate on push plates or power assist, right leaf will only operate on power assist and not push plate.

2.5 ACCESSORIES

- A. Fasteners: Use fasteners fabricated from Type 304 or Type 316 stainless steel.
- B. Glazing Gaskets:
 1. Glazing gaskets for interior or exterior applications: ASTM C 864 (extruded EPDM rubber that provides for silicone adhesion) or ASTM C1115 Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories (extruded silicone).
- C. Intumescent Tape: As supplied by frame manufacturer.
- D. Setting Blocks: ¼” Calcium silicate.
- E. Perimeter Anchors: Steel.
- F. Flashings: As recommended by manufacturer; same material and finish as cover caps.
- G. Silicone Sealant: One-Part Low Modulus, neutral cure High Movement-Capable Sealant: Type S; Grade NS; Class 25 with additional movement capability of 100 percent in extension and 50 percent in compression (total 150 percent); Use (Exposure) NT; Uses (Substrates) M, G, A, and O as applicable. (Use-O joint substrates include: Metal factory-coated with a high-performance coating; galvanized steel; ceramic tile.)
 1. Available Products:
 - a. Dow Corning 790, 795 - Dow Corning Corp.
 - b. Momentive.
 - c. Tremco.

H. Intumescent Caulk: Single component, latex-based, intumescent caulk designed to stop passage of fire, smoke, and fumes through fire-rated separations; permanently flexible after cure; will not support mold growth; flame spread/smoke developed 10/10.

1. Available Products:

a. 3M CP-25 WP+

2.6 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER INSULATION

A. Available Manufacturers:

1. Fibrex Insulations Inc.

2. Owens Corning.

3. Thermafiber.

4. Rockwool.

B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics; and of the following nominal density and thermal resistivity:

1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).

2. Fiber Color: Regular color, unless otherwise indicated.

2.7 FABRICATION

A. Furnish frame assemblies pre-welded when possible. Splice frames too large for shop fabrication or shipping. Fit with suitable fasteners.

B. Field glaze frame assemblies.

C. Fabrication Dimensions: Fabricate fire rated assembly to approved dimensions. Guarantee dimensions where practicable within required tolerance.

D. Obtain approved shop drawings prior to fabrication.

2.8 FINISHES

A. Recommendations for applying and designating finishes.

B. Finish after assembly.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

D. Aluminum Finishes:

1. High-performance organic coating as specified in Section 084413

2. Color and Gloss: See Finish Schedule.

E. Steel Finishes

1. Powder-Coat Finish: Polyester Super Durable powder coating which meets AAMA 2604 for chalking and fading. Apply manufacturer's standard powder coating finish system applied to factory-assembled frames before shipping, complying with manufacturer's recommended instructions for surface preparation including pretreatment, application, and minimum dry film thickness.
2. Color and Gloss: See Finish Schedule.

2.9 DOOR HARDWARE

- A. A. Coordinate hardware in fire-rated glass doors with fire-rated frames. Basis of design: TGP Designer Series Temperature Rise.
- B. C. Furnish hardware with 90-minute fire door by the manufacturer.
 1. Hardware Set #E1:
 - a. 2 Power Transfer Hinge.
 - b. 2 Exit Device.
 - c. 2 Concealed Closer.
 - d. 1 Set Smoke Seals.
 - e. 1 Power Supply.
 - f. 2 Wall Magnetic Holder, Refer to Specification 087190.
 2. Hardware Set #E1A:
 - a. 1 Power Transfer Hinge.
 - b. 1 Exit Device.
 - c. 1 Concealed Closer.
 - d. 1 Set Smoke Seals.
 - e. 1 Power Supply.
 - f. 1 Wall Magnetic Holder, Refer to Specification 087190.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive curtain wall system and sill plate is level in accordance with manufacturer's acceptable tolerances.
- B. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.
- C. Do not proceed until such conditions are corrected.

3.2 INSTALLATION

- A. Install systems by a specialty subcontractor with appropriate experience qualifications; and in strict accordance with the approved shop drawings. Employ experienced mechanics familiar with this type of specialized work.
- B. Install fire safing/firestopping at edges of system.
- C. Install glazing in strict accordance with respective glazing material manufacturer's specifications. Field cutting or tampering is not permissible.
- D. Install door hardware specified.

3.3 ADJUSTING

- A. Adjust door function and hardware for smooth operation. Coordinate with other hardware suppliers for function and use of any other attached hardware.

3.4 REPAIR AND TOUCH UP

- A. Powder Coated Finishes
 - 1. Limited to minor repair of small scratches. Use only manufacturer's recommended products.
 - 2. Such repairs shall match original finish for quality or material and view.
 - 3. Repairs and touch-up not visible from a distance of 5 feet Owner and Architect to approve.
- B. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged.

3.5 PROTECTION AND CLEANING

- A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
 - 1. Do not clean with astringent cleaners. Use a clean "grit free" cloth and a small amount of mild soap and water or mild detergent.
 - 2. Do not use any of the following:
 - a. Steam jets
 - b. Abrasives
 - c. Strong acidic or alkaline detergents, or surface-reactive agents
 - d. Detergents not recommended in writing by the manufacturer
 - e. Do not use any detergent above 77 degrees F
 - f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
 - g. Metal or hard parts of cleaning equipment must not touch the glass surface
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION

SECTION 085113

ALUMINUM WINDOWS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the aluminum windows as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Aluminum windows, double-hung and fixed.
 - 2. Miscellaneous insulation at window frames.
 - 3. Anchors, hardware and accessories including trim pieces and panning.

1.3 RELATED SECTIONS

- A. Joint Sealants - Section 079200.
- B. Glass and Glazing - Section 088000.

1.4 PERFORMANCE REQUIREMENTS

- A. Windows shall conform to the "Voluntary Specification for Aluminum Prime Windows & Sliding Glass Doors" as published by ANSI/AAMA 101/I.S.2-97 unless more stringent requirements are specified. Windows shall conform to minimum standards of AW-PG90 for double-hung windows and AW-PG115 for fixed windows.
- B. Performance and Testing: Except as otherwise indicated, comply with air infiltration tests, water resistance tests and applicable load tests specified in ANSI/AAMA 101/I.S.2-97 for type and classification of window units required in each case.
 - 1. Testing: Where manufacturer's standard window units comply with requirements and have been tested in accordance with specified tests, provide certification by manufacturer to the Architect and Owner showing compliance with such tests; otherwise, perform required tests through an AAMA-accredited testing laboratory or agency, and provide certified test results to the Architect and Owner.
 - 2. Test reports shall be not more than four years old.
 - 3. Sample submitted for tests shall be manufacturer's standard construction and whose overall dimensions shall be at least the lay-out size window and window/door unit required for this Project. Sequence of test shall be optional between manufacturer and the testing laboratory except that in all cases, air infiltration test shall be performed before water resistance test. Sash in sample shall contain the approximate configuration as that of windows to be tested.

4. To evaluate testing and measure product performance, testing shall be conducted on manufacturer's standard product glazed with type of glazing material specified herein.
- C. A thermal transmittance test and a condensation resistance test shall be conducted according to AAMA 1503-04, "Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections." Standard test conditions as specified in Section 9.1 of the 1503.1-04 shall be used. Windows shall meet the following minimum criteria:
1. Condensation Resistance Test (CRF)
 - a. With window sash and ventilators closed and locked, test unit in accordance with AAMA 1502.7.
 - b. Condensation Resistance Factor (CRF) shall be not less than 50.0 for glass and 55.0 for frame.
 2. Thermal Transmittance Test (Conductive U-Value)
 - a. With window sash and ventilators closed and locked, test unit in accordance with AAMA 1503.0.
 - b. Conductive thermal transmittance (U-value) shall be not more than 0.36 BTU/hr/sf/deg. F.
- D. Provide anchorage of window to building substrate to withstand pressure or suction winds loads per requirements of the Building Code but not less than 40 psf.
- E. Life Cycle Testing: When tested in accordance with AAMA 910-93, there is to be no damage to fasteners, hardware parts, support arms, activating mechanisms or any other damage which would cause the window to be inoperable at the conclusion of testing. Air infiltration and water resistance tests shall not exceed the primary performance requirements specified.
- F. Fabricate and install window to allow for thermal movement of materials when subject to a temperature differential from -30 deg. F. to +180 deg. F. without damage of any finish.

1.5 QUALITY ASSURANCE

- A. Manufacturers shall have been engaged in the manufacture of aluminum windows of grades specified for not less than 10 years.
- B. Take field measurements of existing openings prior to submitting shop drawings and show same on shop drawings for each opening. Note that the Contract Drawings show general locations and sizes of windows, but the Contractor shall remain responsible for all field measurements, quantities, etc.

1.6 SUBMITTALS

- A. Shop Drawings
 1. Shop drawings shall show in detail and fully indicate the location and the quantities of all the work, the kind, finish, size, section of each unit, overall and detail dimensions, factory and field joint locations, arrangements and details, location and detail of each piece of anchorage, flashings, supporting construction provisions for the work of others.
 2. Submit Shop Drawings and calculations showing fabrication and installation of window system including plans, elevations, sections, details of components, and attachments to other units of Work.

- a. For installed products indicated to comply with certain design loadings, include structural analysis data signed and sealed by a professional engineer licensed in the State of New York responsible for their preparation.
 3. Shop drawings shall show all surrounding conditions on elevations and details, including steel, concrete, masonry, lintels, block, and anchorage; all correctly dimensioned.
 4. Shop drawings of building elevations shall be at scale of 1/8" = 1'-0", or larger. Other shop drawings shall be at a scale that is normal to trade, or larger if required by Architect.
 5. Contract drawings may not be used (reproduced, enlarged, reduced, etc.) by Subcontractor for shop drawings.
 6. Shop drawings also shall fully demonstrate all requirements respecting the manufacture, finishing, handling, storage, carting sequence and erection of all materials specified herein.
 7. Show joinery techniques, provision for horizontal and vertical expansion, drainage and weep systems, glass and metal thicknesses and framing member profiles.
 8. Identify all materials, including metal alloys, glass types, fasteners, and glazing materials. Identify all shop and field sealants by product name and locate on drawings. Glazing details shall be at full size scale.
 9. Show dimensioned position of glass edge relative to metal rabbet.
 10. Shop drawings shall show attachments of window assemblies to adjoining construction and location of all work; kind, finish and size of frames, overall and detail dimensions, location and detail of each anchorage; supporting and adjoining construction; provision for the work of other trades; and all other required information.
 11. Contractor shall verify all measurements of existing window openings in the field before commencing fabrication.
 12. Any proposed deviations from work shown on the Contract drawings shall be indicated and so identified on shop drawings for Architect's review.
- B. Samples
1. Submit 12" long sample of extrusion with specified finish.
 2. Full size corner section of all types of aluminum frame, showing construction, glass and finishing - 12" x 12".
 3. All fasteners, straps, hardware, locks and keys, sealant, etc.
- C. Submit certified test results as required herein.
- D. Warranty as noted in 1.9.
- E. Window manufacturer and Contractor for work of this section must each submit references of prior projects similar in size, scope and window type.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Materials shall be packed, loaded, shipped, unloaded, stored and protected in a manner which will avoid abuse, damage and defacement in accordance with the recommendations contained in the AAMA Aluminum Curtain Wall Manual #10 entitled "Care and Handling of Architectural Aluminum from Shop to Site."

- B. Remove all paper type wrappings and interleavings that are wet, or which could become wet when unloading materials.
- C. Store inside structure in space designated by Owner.
- D. Stack vertically or on edge so that water cannot accumulate on or within materials using wood or plastic shims between components to provide water drainage and air circulation.
- E. Cover materials with tarpaulins or plastic hung on frames to provide air circulation and prevent contaminants from contacting aluminum.
- F. Keep water away from stored assemblies.
- G. The Contractor shall be responsible for taking the steps necessary to protect the materials from careless handling of tools, weld splatter, acids, roofing tar, solvents, abrasive cleaners, and other items that could damage window components and finish.

1.8 MANUFACTURER'S REPRESENTATIVE

- A. Contractor shall require representative of manufacturer of the windows to provide field instructions and supervision of the installation of the windows.
- B. Contractor shall require the manufacturer's representative to make sure that the subcontractor's workmen are fully instructed and trained in the handling and application of all the materials and shall see that all the materials are correctly installed.
- C. Upon completion of the installation, the Contractor shall submit to the Architect in written form certification that the representative of the manufacturer of the windows has supervised the work of this Section and that all windows are correctly installed.

1.9 WARRANTY

- A. Aluminum Windows and Related Materials: Ten (10) year warranty on materials and workmanship, including finish on aluminum and on glass and glazing.

PART 2 PRODUCTS

2.1 WINDOWS

- A. Aluminum windows shall be the following models made by Basis of Design manufacturer Graham Architectural Products, or comparable product by Kawneer, Wausau, or approved equal.
 - 1. Double-Hung Windows: GT2200 Series Double Hung.
 - 2. Fixed Windows: S1400H Fixed Offset (simulates double-hung window).
- B. Manufacturer's Contact: Jason Green, Green Building Products LLC Phone: 917-572-4196, Email: JGreen@GreenBuildingProducts.Biz

2.2 MATERIALS

- A. Double-Hung Aluminum Windows
 - 1. Units: One or two balanced, vertically sliding sash requiring up to four (4) counterbalancing mechanisms complying with AAMA 902 "Sash Balance Specifications." Lift rail will have nylon end caps to protect the machined ends of the rail. Saw cut or machined edges will not be acceptable. Pull down handle on bottom of meeting rail of upper sash.

2. Provide units having "lift-out" feature permitting easy removal of both sashes from inside without special tools.
- B. Offset Fixed Aluminum Windows: Provide with top and bottom fixed lites offset simulating a double-hung window; no operating hardware or equipment is required.
- C. Aluminum Framing Members
1. Extruded aluminum billet, 6063-T5 or T6 alloy for primary non-radius components; 6063-T5 or T6, 6005-T5, 6105-T5 or 6061-T6 for anchor components; all meeting the requirements of ASTM B221.
 2. Aluminum sheet alloy 3003-H14 (for painted or unfinished sheet) meeting the requirements of ASTM B209.
 3. Main Frame and Sash: Nominal thickness of not less than 0.062 inches, except for fin trim either integral or applied.
 4. Frame Sill (Double-Hung Window): Nominal thickness of not less than 0.094 inches.
 5. Frame Sill (Fixed-Hung Window): Nominal thickness of not less than 0.078 inches.
 6. Frame Depth: 4" for double-hung and fixed windows.
 - a. head, jamb and sill receptors as specified below.
 7. Sash ventilator sections must be tubular, and close flush with adjoining frame surfaces at interior and exterior.
 - a. Overlap sash ventilators will not be accepted.
 8. Glass plane shall be recessed 1" from exterior plane of window members. Framing members shall have a cove profile at glazing rebates as shown on architectural details.

2.3 COMPONENTS

- A. Sealants
1. All sealants shall comply with applicable provisions of AAMA 800 and/or Federal Specifications FS-TT-001 and 002 Series.
 2. Frame joinery sealants shall be suitable for application specified and as tested and approved by window manufacturer.
- B. Glass
1. Provide in accordance with Section 088000.
 2. Sealed insulating glass shall be tested and certified in accordance with ASTM E2190.
- C. Glazing
1. Provide in general accordance with Section 088000.
 2. Glazing method shall be in general accordance with the GANA Glazing Manual for specified glass type, or as tested and approved by the manufacturer.

D. Glazing Materials

1. Setting Blocks/Edge Blocking: Provide in sizes and locations recommended by GANA Glazing Manual. Setting blocks used in conjunction with soft-coat low-e glass shall be silicone.
2. Back-bedding tapes, expanded cellular glazing tapes, toe beads, heel beads and cap beads shall meet the requirements of applicable specifications cited in AAMA 800.
3. Glazing gaskets shall be non-shrinking, weather-resistant, and compatible with all materials in contact.
4. Structural silicone sealant where used shall meet the requirements of ASTM C1184.
5. Spacer tape in continuous contact with structural silicone shall be tested for compatibility and approved by the sealant manufacturer for the intended application.
6. Gaskets in continuous contact with structural silicone shall be extruded silicone or compatible material.

E. Steel Components

1. Provide steel reinforcements as necessary to meet the performance requirements of 1.03.
2. Concealed steel anchors and reinforcing shall be factory painted after fabrication with TGIC powder coating, or rust-inhibitive primer complying with Federal Specification TT-P-645B.

F. Receptors:

1. Provide extruded aluminum receptors to receive windows, as shown on architectural drawings.
2. Finish to match window frames.

2.4 FABRICATION

A. General:

1. Finish, fabricate and shop assemble frame and sash ventilator members into complete windows under the responsibility of one manufacturer.
2. No bolts, screws or fastenings shall impair independent frame movement, or bridge the thermal barrier, unless such bridging was also present in thermal test units and thermal models.
3. Fabricate to allow for thermal movement of materials when subjected to a temperature differential from -30° F to +180° F.

B. Frames:

1. Cope and mechanically fasten each corner, or miter and weld, or corner block each corner; then seal weather tight.
2. Make provisions for continuity of frame joinery seals at extrusion webs.

C. Main Sash Ventilator

1. Miter all corners and mechanically stake over a solid extruded aluminum corner block, set and sealed in epoxy, leaving hairline joinery, then sealed weather tight.
2. Make provisions for continuity of sash ventilator joinery seals at extrusion webs.

D. Glass Drainage: (field glazed units only)

1. Provision shall be made to ensure that water will not accumulate and remain in contact with the perimeter area of sealed insulating glass.

E. Thermal Break Construction:

1. Continuous extruded polyamide with 25% glass fiber reinforcing, mechanically crimped into cross-knurled cavities.
2. Minimum thermal barrier width 24 mm.
3. Quality assurance records must be maintained and available as requested.

F. Weather-stripping:

1. Bulb- or fin-type neoprene, EPDM, dual-durometer PVC, polypropylene, TPE, or other suitable material as tested and approved by the window manufacturer.
2. Miter, crowd, stake or join at corners. Provide drainage to exterior as necessary.
3. Weather-stripping shall provide an effective seal at the interior face of the sash ventilator.

2.5 FINISH OF ALUMINUM

A. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Acid-chromate-fluoride-phosphate conversion coating; Organic Coating: As specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

1. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
2. Custom color and gloss as selected by the Architect.

PART 3 EXECUTION

3.1 INSPECTION AND REMOVALS

- A. Examine surfaces and conditions where aluminum windows are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.
- B. Verify dimensions taken at the job site affecting the work. Bring field dimensions which are at variance to the attention of the Architect. Obtain decision regarding corrective measures before the start of installation.

3.2 INSTALLATION

- A. Use only skilled tradesman with work done in accordance with approved Shop Drawings and specifications.
- B. Plumb and align window faces in a single plane for each wall plane and erect windows and materials square and true adequately anchored to maintain positions permanently when subjected to normal thermal and building movement and specified wind loads.
- C. Adjust windows for proper operation after installation.
- D. Furnish and apply sealants to provide a weathertight installation at all metal-to-metal joints and intersections of frames and at opening perimeters. Wipe off excess material and leave all exposed surfaces and joints clean and smooth.
- E. Aluminum shall be insulated from direct contact with steel, masonry, concrete, or non-compatible materials by bituminous paint, zinc chromate primer, or other suitable insulation material.
- F. Blanket insulation shall be installed behind aluminum covers, panning and trim to ensure thermally insulated seal.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
 - 2. Air-Infiltration Testing:
 - a. Test Pressure: 6.24 PSF.
 - b. Fixed Maximum Rate: 0.06 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft.
 - c. Operable Maximum Rate: 0.15 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft.
 - 3. Water-Resistance Testing:
 - a. Test Pressure: 10 PSF (Note: No reduction in field test pressure will be allowed).
 - b. Allowable Water Infiltration: No water penetration.
 - 4. Testing Extent: One window as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
 - 5. Test Reports: Prepared according to AAMA 502.
- C. Windows will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.4 ADJUSTING AND CLEANING

- A. After completion of window installation, windows shall be inspected, adjusted, put into working order and left clean, free of labels, etc.
- B. Glass that is broken, damaged, cracked, or permanently stained shall be replaced.
- C. Final cleaning of finish shall be in accordance with AAMA 610.1.

END OF SECTION

SECTION 087100

FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

- A. The required hardware items for doors are indicated in hardware sets shown herein. Should any opening be omitted, hardware shall be provided as specified for other doors of similar locations, function, quality and design.

1.02 RELATED SECTIONS

- A. Section 081113: Metal doors and frames.
- B. Section 081416: Wood doors and frames.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with the provisions of the general contract documents.
- B. Product Data: Submit two (2) copies of the manufacturer's data for each item of hardware. Include whatever information may be necessary to show compliance with requirements.
- C. Hardware Schedule: Submit three (3) copies of the hardware schedule. Follow Door and Hardware Institute (DHI) guidelines for scheduling. At the end of the schedule list each door number with appropriate heading number and hardware set number. Furnish initial draft of schedule at the earliest possible date, in order to facilitate the fabrication of other work. Furnish final schedule after samples, manufacturer's data sheets have been approved.
- D. Keying Schedule: A key schedule showing all key numbers and spaces to which each permits entry, shall be provided. Consult with OWNER before submitting final key schedule. After final approval has been received, the schedule along with the key gathering envelopes containing keys for each lock endorsed with lock number and space designation shall be turned over to the OWNERS.
- E. Samples: Prior to submittal of the final hardware schedule and prior to delivery of hardware, submit one (1) sample of each exposed hardware unit. Sample will be reviewed by the ARCHITECT for design, color and texture only. Compliance with other requirements is the exclusive responsibility of the CONTRACTOR. Samples approved by the ARCHITECT shall be turned over to the OWNER to be used as attic stock.

1.04 QUALITY ASSURANCE

- A. Standards: All finish hardware shall conform to one or all the following standards:
 - 1. Testing Laboratories: Underwriters Laboratory (UL) and or Warnock Hersey Fire Laboratories Division: All fire rated doors shall have hardware assemblies approved by one of the listed laboratories.
 - 2. National Fire Protection Association: NFPA 80 and NFPA 101.
 - 3. Builders Hardware Manufacturers Association (BHMA).
 - 4. American National Standards Institute (ANSI).

5. American Disabilities Act (ADA).

- B. Supplier: Finish hardware shall be furnished by those having a minimum of 5 years of builder's hardware experience and shall have in their employ at least one certified Architectural Hardware Consultants (AHC) to correctly interpret the plans, detailed drawings and specifications. It is imperative that all Finish Hardware items be furnished by a factory authorized contract hardware distributor for each of the specified products.

1.05 PRODUCT HANDLING

- A. Handle, store, distribute, protect and install in accordance with the manufactures instructions. Deliver packaged material in original containers with seals unbroken and labels intact. Deliver assemblies completely identified and with adequate protection for storage, handling and installation.
- B. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control the handling and installation of hardware which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses; both before and after installation.

1.06 PROJECT CONDITIONS

- A. Coordinate hardware with other work. Tag each item or package separately, with identification related to the final hardware schedule, and include basic installation instructions in the package. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated and as necessary for proper installation and function. Deliver packaged hardware items to the proper locations for installation.
- B. Furnish hardware templates to each fabricator of doors, frames and other work to be factory prepared for the installation of hardware.

1.07 WARRANTIES

- A. The hardware manufacturers shall provide full replacement warranty as listed below. Replacement warranty shall not include any labor cost.
- | | |
|------------------------|-----------|
| 1. Surface Closers | 10 years. |
| 2. Locksets etc. | 2 years |
| 3. Balance of hardware | 2 years |

PART 2 - PRODUCTS

2.01 MATERIALS AND FABRICATION

- A. Hand of Door: The drawings show the swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door swing shown.
- B. Base Metals: Produce hardware units of the basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness but in no case of lesser quality material.
- C. Fasteners: Manufacture hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware, which has been prepared for self-tapping sheet metal screws.
- D. Screws: Furnish screws for installation, with each hardware item. Finish exposed screws to match the hardware finish.
- E. Tools for Maintenance: Furnish a complete set of specialized tools as needed, for the OWNERS continued maintenance, removal and replacement of hardware.
- F. Concealed Fasteners: Provide concealed fasteners for hardware units which are exposed when the door is closed except to the extent no standard manufacturer's units are available with concealed fasteners. Use thru bolts only where necessary to adequately fasten hardware to the door.

2.02 HINGES

- A. All hinges shall be full mortise five knuckle ball bearing type, template, with non-rising loose pins. All outswing doors shall be furnished with non-removable pins (NRP).
- B. All hinges for 1-3/4" thick doors shall be 4-1/2" wide in the open position. For other thickness doors, hinges shall be of a width to permit unobstructed swing of the doors.
- C. Size and weight of hinges shall conform to the following:
 - Up to 36" -----4-1/2" heavy weight
 - Over 36" to 44" -----5" heavy weight
 - Over 44" -----continuous hinges
- E. Quantity of hinges shall be provided to conform to the following:
 - Doors up to 60" in heights -----2 hinges
 - Doors 60" to 90" in height -----3 hinges
 - Doors 90" and over -----1 hinge every 30" in height
- F. All hinges shall be the products of one manufacturer.

2.03 LOCKSETS, LATCHSETS ETC.

- A. Unless otherwise noted, all locksets and latchsets shall conform to ANSI A156.13 Series 1000 Grade 1. Furnish wrought steel box strikes (M17) and curved lip strikes (SA114) with proper lip lengths as required.

2.04 KEYS, KEYING, AND CYLINDERS

- A. Keys: shall be nickel silver. Furnish a quantity of keys as follows.
 - 1. Grand Master Keys 5 each per group
 - 1. Master Keys 5 each per group
 - 2. Change Keys 3 each per cylinder
 - 3. Control Keys 5
 - 4. Construction Keys 5
- B. Keying: All locks shall be construction keyed and great grand master keyed to the existing keying system. Hardware supplier to meet with the Owner to establish keying requirements.
- C. Cylinders: All cylinders shall be removable core with visual key control. Furnish brass construction cores. Plastic cores will not be accepted.

2.05 DOOR CLOSING DEVICES

- A. All surface closers shall meet ANSI A156.4 Grade 1 requirements, barrier free.
- B. All closers shall be installed so that closer bodies are positioned on room side of doors to and from corridors, i.e., in-swing doors shall be regular arm. Out-swing doors shall have a parallel arm. Regular arm shall be used in connecting doors between rooms.
- C. Furnish all required brackets, filler plates and any others items required to insure proper installation and operation.

2.06 DOOR STOPS

- A. Unless otherwise noted, all door stops shall be Trimco 1270WV wall mounted door stops. Where a wall stop will not function properly, use a Trimco W1211 floor stop.

PART 3 - EXECUTION

3.01 GENERAL

- A. Approval: As soon as practical after award of Contract and before a hardware schedule is prepared, and before any hardware is ordered or delivered to the project, the CONTRACTOR shall submit to the ARCHITECT for his written approval, copies of sample list, listing each of the different items of builders hardware and catalog cuts of each item.
- B. Templates: As soon as the hardware schedule is approved the hardware supplier shall furnish to the various fabricators, required templates for fabrication purposes. Templates shall be made available not more than (10) days after receipt of the approved hardware schedule.
- C. Packaging and Marking: All hardware shall be shipped with proper fastenings for secure application. Each package of hardware shall be legibly marked indicating the part of the work for which it is intended. Markings shall correspond with the item numbers shown on the approved hardware schedule. Keys shall be tagged within each package set and plainly marked on the face of the envelope with the key control number, door designation and all identification as necessary.

- D. Delivery: Delivery shall be made to the project site to the attention of the GENERAL CONTRACTOR. Where delivery of special hardware is required at any fabricators plant, the hardware supplier shall make such delivery.

3.02 INSTALLATION

- A. Mount hardware units at heights recommended in "Recommended Locations for Builders Hardware" by BHMA, unless otherwise noted or directed by the ARCHITECT.
- B. Install each hardware unit in compliance with the manufacturer's recommendations.

3.03 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer. Replace units that cannot be adjusted.
- B. Wherever hardware installation is made more than one (1) month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance make a final check, and adjust all hardware items in such space or area. Adjust door control devices and compensate for final operation of heating and ventilating equipment.
- C. Instruct OWNERS personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.04 HARDWARE SETS

- A. The following is a general listing of hardware requirements and is not intended for use as a final hardware schedule. Any items of hardware required by established standards or practices, or to meet state and local codes or proper door operation shall be furnished specifically called out in the following listed groups.

HARDWARE SET #1

Each to have:

	Hinges	McKinney (see description) x US26D
1	Entry Lock	Sargent 8256 x LNL x US26D
1	Temporary Core	Sargent (to suit) x Brass
1	Permanent Core	Sargent (to suit) x US26D
1	Overhead Stop	Dorma 710S series x US26D
3	Silencers	Trimco 1229A

HARDWARE SET #2

Each to have:

	Hinges	McKinney (see description) x US26D
1	Storeroom Lock	Sargent 8205 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Wall Stop	Trimco 1270WV x US32D
3	Silencers	Trimco 1229A

HARDWARE SET #2A

Each to have:

	Hinges	McKinney (see description) x US26D
1	Storeroom Lock	Sargent 8205 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Sargent PS351 series x 689
3	Silencers	Trimco 1229A

HARDWARE SET #2B

Each to have:

	Hinges	McKinney (see description) x US26D
1	Storeroom Lock	Sargent 8205 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Overhead Stop	Dorma 912S x US26D
3	Silencers	Trimco 1229A

HARDWARE SET #2C

Each to have:

	Hinges	McKinney (see description) x US26D
1	Storeroom Lock	Sargent 8205 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Overhead Stop	Dorma 702S x US26D
3	Silencers	Trimco 1229A

HARDWARE SET #2D

Each to have:

	Hinges	McKinney (see description) x US26D
1	Storeroom Lock	Sargent 8205 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer	Sargent 351 series x 689
1	Overhead Stop	Dorma 902S x US26D
3	Silencers	Trimco 1229A

HARDWARE SET #3

Each to have:

	Hinges	McKinney (see description) x US26D
1	Exit Device	Sargent 12-19-8815 x ETL x US26D
1	Surface Closer w/stop	Sargent PS351 series x 689
1	Set Smoke Seals	Zero 188S-BK @ jambs & head

HARDWARE SET #4

Each to have:

	Hinges	McKinney (see description) x US26D
1	Flush Bolt (top)	Trimco W3917 x US26D
1	Storeroom Lock	Sargent 8205 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Wall Stop	Trimco 1270WV x US32D
2	Silencers	Trimco 1229A

HARDWARE SET #4A

Each to have:

	Hinges	McKinney (see description) x US26D
1	Flush Bolt (top)	Trimco W3917 x US26D
1	Storeroom Lock	Sargent 8205 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Sargent PS351 series x 689
2	Silencers	Trimco 1229A

HARDWARE SET #4B

Each to have:

	Hinges	McKinney (see description) x US26D
1	Flush Bolt (top)	Trimco W3917 x US26D
1	Storeroom Lock	Sargent 8205 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Overhead Stop	Dorma 912S x US26D
2	Silencers	Trimco 1229A

HARDWARE SET #5

Each to have:

	Hinges	McKinney (see description) x US26D
1	Classroom Lock	Sargent 8237 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer	Sargent 351 x 689
1	Overhead Stop	Dorma 912S x US26D
3	Silencers	Trimco 1229A

HARDWARE SET #6

Each to have:

2	Floor Closers	Dorma BTS75V-BF series x US26D
2	Intermediate Pivots	Dorma 75220 x US26D
2	Sets Push & Pull (BTB)	Trimco AP433 x 36"OA x US26D1

HARDWARE SET #7

Each to have:

1	Track	Coburn C1-12 (size to suit)
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1	Component Pack	Coburn C100-010
1	Bottom Door Guide	Coburn C44-371
1	Set Pull Bars	Trimco AP431 x 36"OA x US26D

HARDWARE SET #8

Each to have:

2	1-1/2" Sets Offset Pivots	Dorma OP15200 x US26D
2	Roller Latch	Trimco 1559BL x 626
2	Edge Pulls	Trimco APC30-4 x US26D
2	Overhead Stops	Dorma 702S x US26D

HARDWARE SET #9

Each to have:

1	1-1/2" Sets Offset Pivots	Dorma OP15200 x US26D
1	Roller Latch	Trimco 1559BL x 626
1	Edge Pull	Trimco APC30-4 x US26D
1	Overhead Stop	Dorma 702S x US26D

- A. The following hardware contains electrical hardware and needs to be coordinated with the electrical and security drawings.

HARDWARE SET #E1

Each to have:

	Hinges	McKinney (see description) x US26D
1	Power Transfer	Securitron Electro-Lynx CEPT x US32D
1	Electric Lock	Sargent RX-8271 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer	Sargent 351 series x 689
1	Wall Stop	Trimco 1270WV x US32D
3	Silencers	Trimco 1229A
1	Power Supply	(by security vendor)
2	Door Contacts	(by security vendor)
1	Card Access System	(by security vendor)

Note: Card reader unlocks electric lock. Free egress at all times..

HARDWARE SET #E1A

Each to have:

	Hinges	McKinney (see description) x US26D
1	Power Transfer	Securitron Electro-Lynx CEPT x US32D
1	Electric Lock	Sargent RX-8271 x LNL x US26D
1	Temporary Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer	Sargent 351 series x 689
1	Overhead Stop	Dorma 912S x US26D
3	Silencers	Trimco 1229A

- | | | |
|---|--------------------|----------------------|
| 1 | Power Supply | (by security vendor) |
| 2 | Door Contacts | (by security vendor) |
| 1 | Card Access System | (by security vendor) |

Note: Card reader unlocks electric lock. Free egress at all times..

HARDWARE SET #E2

Each to have:

- | | | |
|---|---------------------------|--------------------------------------|
| | Hinges | McKinney (see description) x US26D |
| 1 | Power Transfer | Securatron Electro-Lynx CEPT x US32D |
| 1 | Set Automatic Flush Bolts | Trimco (see description) x US26D |
| 1 | Dust Proof Strike | Trimco 3910 x US32D |
| 1 | Electric Lock | Sargent RX-8271 x LNL x US26D |
| 1 | Temporary Core | Sargent (to suit) |
| 1 | Permanent Core | Sargent (to suit) x US26D |
| 1 | Coordinating Closer | Dorma TS9315GSR series x 689 |
| 1 | Overhead Stop | Dorma 902 |
| 2 | Silencers | Trimco 1229A |
| 1 | Power Supply | (by security vendor) |
| 2 | Door Contacts | (by security vendor) |
| 1 | Card Access System | (by security vendor) |

Note: Card reader unlocks electric lock. Free egress at all times.

HARDWARE SET #E3

Each to have:

- | | | |
|---|----------------------|--------------------------------------|
| | Hinges | McKinney (see description) x US26D |
| 1 | Power Transfer | Securatron Electro-Lynx CEPT x US32D |
| 1 | Electric Exit Device | Sargent 12-19-55-8875 x ETL x US26D |
| 1 | Temporary Core | Sargent (to suit) |
| 1 | Permanent Core | Sargent (to suit) x US26D |
| 1 | Surface Closer | Sargent 351 series x 689 |
| 1 | Wall Stop | Trimco 1270WV x US32D |
| 3 | Silencers | Trimco 1229A |
| 1 | Power Supply | (by security vendor) |
| 2 | Door Contacts | (by security vendor) |
| 1 | Card Access System | (by security vendor) |

Note: Card reader unlocks electric lock. Free egress at all times. When signaled from the fire alarm system or in the event of a loss of power the door unlocks automatically.

HARDWARE SET #E4

Each to have:

- | | | |
|---|----------------|---|
| | Hinges | McKinney (see to match existing frame prep) x US26D |
| 1 | Electric Hinge | McKinney QC* (to match) x US26D |
| 1 | Electric Lock | Sargent RX-8271 x LNL x US26D |

This is an existing door. Confirm hardware will fit into existing door and frame prep.

END OF SECTION

SECTION 088000

GLASS AND GLAZING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the glass and glazing as shown on the drawings and/or specified herein, including but not limited to glazing of the following:
 - 1. Windows.
 - 2. Doors.
 - 3. Entrances.
 - 4. Fire-rated glass.
 - 5. Laminated glass for sound-rated glass assemblies.
 - 6. Glass and glazing for display cases.

1.3 RELATED SECTIONS

- A. Hollow metal doors and frames - Section 081113.
- B. Aluminum entrances and storefronts - Section 084113.
- C. Framed mirrors - Section 102800.

1.4 REFERENCES

- A. Comply with the recommendations of the following references unless more stringent requirements are indicated herein.
 - 1. IGMA Publications: IGMA Glazing Manual.
 - 2. AAMA Publications: AAMA TIR-A7 Sloped Glazing Guidelines and Glass Design for Sloped Glazing.
 - 3. LSGA Publications: LSGA Design Guide.
 - 4. SIGMA Publications: TM-3000 Vertical Glazing Guidelines and TB-3001 Sloped Glazing Guidelines.
 - 5. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201.

6. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E 152, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
7. Fire-Resistive Glazing Products for Window Assemblies: Products identical to those tested per ASTM E 163, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
8. 16 CFR 1201, Safety Standards for Architectural Glazing, Sealed Insulating Glass Manufacturing Association.
9. ASTM C 920, Elastomeric Joint Sealant.
10. SAFETY ANSI Z97.1.
11. Fire Resistant ASTM E 152.
12. Insulating Glass Criteria - IGCC International Glass Cert. Council.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thicknesses indicated on drawings and/or specified herein are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Specified Design Wind Loads: 30 psf or greater if required by Code.
 2. Probability of Breakage for Vertical Glazing:
 - a. 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - b. 1 lite per 1000 for lites installed 15 degrees from the vertical and under wind action.
 - c. Load Duration: 60 seconds or less.
 3. Maximum Lateral Deflection: For glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/100 times the short side length or 0.50", whichever is less.
 4. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - a. Temperature Change (Range): 120 deg. F ambient; 180 deg F, material surfaces.

5. Thermal Solar Performance: See Article 2.2 herein.

- C. Glass units shall be annealed, heat strengthened, fully tempered or laminated where required to meet wind and/or snow loads and safety glazing requirements, as shown, specified or recommended by the glass fabricator and as required by the prevailing Building Code.

1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's printed product data, specifications, standard details, glazing instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements, including performance requirements.
- B. Submit compatibility and adhesion test reports from sealant manufacturer indicating materials were tested for compatibility and adhesion with glazing sealant, as well as other glazing materials including insulation units.
- C. Initial Selection Samples: Submit samples of each glass and glazing material showing complete range of colors, textures, and finishes available for each material used.
 - 1. Submit complete range of samples of standard colors and patterns for ceramic frits at insulating glass.
 - 2. Submit complete range of samples of sandblasted glass showing variations of grits and opacity achieved.
- D. Verification Samples: Submit representative samples of each glass and glazing material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide glass samples having minimum size of 144 sq. in. and 6 in. long samples of sealants and glazing materials; all samples shall bear the name of the manufacturer, brand name, thickness, and quality.
- E. Calculations: Provide wind load charts, calculations, thermal stress analysis, and certification of performance of this work. Indicate how design requirements for loading and other performance criteria have been satisfied. Document shall be signed and sealed by a Professional Engineer licensed in the State of New York.
- F. Test Reports: Provide certified reports for specified tests.
- G. Warranties: Provide written warranties as specified herein.

1.7 QUALITY ASSURANCE

- A. Source: For each glass and glazing type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.
- B. Installer: A firm with a minimum of five years' experience in type of work required by this Section and which is acceptable to manufacturers of primary materials; and with a successful record of in-service installations similar in size and scope to this Project.
- C. Glass Thickness: Glass thicknesses shown on drawings and/or specified herein are minimum thicknesses. Determine and provide size and thickness of glass products that are certified to meet or exceed performance requirements specified in this Section.

- D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated.
 - 1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."
 - 2. IGMA Publications: IGMA TM-3000, "Vertical Glazing Guidelines for Sealed Insulating Glass Units."
- E. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
- F. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
- G. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.
 - 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council.
 - 2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- H. Insulating Glass Certification Program: Permanently marked on spacers with appropriate certification label of the following testing and inspecting agency:
 - 1. Insulating Glass Certification Council.
 - 2. Associated Laboratories, Inc.
 - 3. Insulating Glass Manufacturers Alliance.
- I. Manufacturer shall be ISO 9001-2000 Certified.
- J. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

1.8 TESTS

- A. Preconstruction Sealant Test: Submit samples of materials to be used to glazing sealant manufacturer to determine sealant compatibility. Include samples of glass, gaskets, glazing materials, framing members, and other components and accessories of glazing work. Test in accordance with ASTM C 794 to verify what type of primers (if any) are required to ensure sealant adhesion to substrates.
 - 1. Submit minimum of nine pieces of each type and finish of framing member, and nine pieces of each type, class, kind, condition, and form of glass, including monolithic, laminated, and insulating glass for adhesion tests.

2. Provide manufacturer's written report and recommendations regarding proper installation.

1.9 PROJECT CONDITIONS

- A. Weather: Perform work of this Section only when existing or forecasted weather conditions are within limits established by manufacturers of materials and products used.
- B. Temperature Limits: Install sealants only when temperatures are within limits recommended by sealant manufacturer, except, never install sealants when temperatures are below 40 deg. F.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations and GANA Manual.
 1. Protect materials from moisture, sunlight, excess heat, sparks, and flame.
 2. Sequence deliveries to avoid delays, but minimize on-site storage.

1.11 WARRANTIES

- A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.
- B. Manufacturer's Special Project Warranty on Coated Glass Products: Provide written warranty signed by manufacturer of coated glass agreeing to furnish f.o.b. point of manufacture, within specified warranty period indicated below, replacements for those coated glass units which develop manufacturing defects. Manufacturing defects are defined as peeling, cracking or deterioration in metallic coating due to normal conditions and not due to handling or installation or cleaning practices contrary to glass manufacturer's published instructions.
 1. Warranty Period: Manufacturer's standard but not less than five (5) years after date of substantial completion.
- C. Manufacturer's Special Project Warranty on Insulating Glass: Provide written warranty signed by manufacturer of insulating glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure of the hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided the manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during the warranty period.
 1. Warranty Period: Manufacturer's standard but not less than ten (10) years after date of substantial completion.
- D. Manufacturer's Special Project Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated glass manufacturer agreeing to replace laminated glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 1. Warranty period five (5) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/FABRICATORS

- A. All glass and glazing used at the exterior of the Project shall be manufactured by the same manufacturer. The same manufacturer and the same furnace shall be used for all tempered and heat strengthened glass used throughout the project. Acceptable manufacturers include the following:
1. Vitro Architectural Glass
 2. Guardian Industries.
 3. Pilkington.
 4. AGC.
 5. Viracon.

2.2 GLASS SCHEDULE

- A. Glass Types:
1. IG1: Fire-rated clear glass, 2-hour rating, "Pilkington Pyrostop."
 2. IG2: Single, 1/2" laminated low-iron glazing, clear.
 3. IG3: Double, 3/8" tempered glass, 2" air space, 1/2" laminated glass, low iron glazing, clear.
 4. IG4: 1/2" laminated low-iron clear glass with translucent interlayer, McGrory Glass MGIU-185.
 5. IG5: 1/2" tempered acid etched glass with raised linear pattern.

2.3 GLASS MATERIALS AND PRODUCTS

- A. Ultra-Clear (Low-Iron) Glass: Class I (clear); with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.
1. Low Iron Tempered Glass: Provide low-iron glass tempered in accordance ASTM C 1048, thicknesses as indicated. Submit samples of different manufacturers for review and acceptance as directed by the Architect and in accordance with "Submittals" article herein.
- B. Clear Float Glass: ASTM C 1036, Type I (Transparent, Flat), Class 1 (Clear), Quality q3, minimum 1/4" thick.
- C. Clear Tempered Glass: ASTM C 1048, Condition A (Uncoated), Type I (Transparent, Flat), Class 1 (Clear), Quality q3, Kind FT, minimum 1/4" thick. Tempered glass must be certified by SGCC to meet applicable standards. Tempered glass shall also conform to the following:
1. Length and Width: For 2.9 mm to 6.0 mm; +/-1.6 mm.
 2. Diagonal: +/- 3.0 mm.
 3. Edgework: Belt seaming or diamond wheels. 1.5 mm seam of upper and lower glass edges. No sharp edges.

4. Corners: No more than 3.0 mm from square.
 5. Float Glass Defects: Must meet the requirements of ASTM C 1036. The most common defects are scratches, stones gaseous bubbles and edge chips. Tables in the glass standards have limits for size/quantity of defects.
 6. Tempered glass shall have a minimum surface compression of 10,000 psi.
 7. Tempered glass to be heat-treated by horizontal (roller hearth) process with inherent roller-wave distortion parallel to the bottom edge of the glass when installed.
 8. Flatness Tolerances
 - a. Roller-Wave or Ripple: The deviation from flatness at any peak shall be targeted not exceed 0.003" as measured per peak to valley for 1/4" (6mm) thick glass.
 - b. Bow and Warp: The bow and warp tolerances shall not exceed 1/32" per linear foot.
 - c. Fully tempered glass shall be heat soaked to EN 14179-1:2005-European Heat Soaking Standard.
- D. Low 'E' Coated Glass for Exterior IG Units: Provide high-performance, clear, metallic coating, equal to VNE-63, as manufactured by Viracon. Provide Low 'E' coating which has the following performance characteristics when applied to the No. 2 surface of 1" insulating units, both lites 1/4" clear:
1. Visible Transmittance: 67%.
 2. Visible Reflectance: 11%.
 3. Winter U-value: 0.29.
 4. Shading Coefficient (SC): 0.34.
 5. Solar Heat Gain Coefficient (SHGC): 0.29.
- E. Laminated Safety Glass: Provide two glass panes of equal thickness, laminated together with a polyvinyl butyl interlayer, conform to ASTM C 1172, and as follows:
1. Interlayer Color: Clear.
 2. Interlayer Material: Provide Sentry Glass Plus by Dupont, Kuraray America, 0.030" thick at vertical applications, and 0.060" thick at sloped or horizontal applications. Use ionoplast-type (SGP) interlayer where laminated Glass edges will be exposed to direct wetting or relative humidity (RH) conditions greater than 60%.
 3. Minimum thickness of 1/4".
- F. Patterned Glass: Provide ceramic frit patterned glass in custom colors and patterns as selected by the Architect, refer to the drawings for thicknesses. Ceramic frit glass shall meet requirements specified herein for ceramic frit spandrel glass.
1. Ceramic frit at canopy glazing: Ceramic frit coated glass shall be tempered (Kind FT), laminated and meet the requirements specified herein, but in no case less than the minimum requirements of ASTM C 1048.
 - a. Ceramic frit color shall be as follows:

- 1). An acceptable white ceramic frit product is Screen 5006, 40 percent coverage 1/8-inch dots in V175 "High Opacity White" color as manufactured by Viracon.
 - 2). Notwithstanding the above, ceramic frit color is subject to approval by the Architect.
 - b. Visual Quality Control acceptance criteria of the ceramic fritted surface shall be consistent with industry guidelines, subject to approval by the Architect.
 - 1). Patterns shall be located not more than 1/16 inch off parallel from the locating glass edge.
 - 2). Frit shall be evenly applied and consistent in tone.
 - c. Manufacturer shall warrant that ceramic fritted glass shall not develop any defects which may affect the appearance of the glass or may otherwise compromise the requirements of the glass for a period of ten (10) years.
- G. Insulating Glass: Insulated glass composition shall consist of 1/4" clear exterior lite of float (or tempered, where required) glass with Low E coating on No. 2 face, 1/2" air space and 1/4" clear interior lite of float (or tempered, where required) glass. Provide factory assembled units of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space, complying with ASTM E 2190, and as follows:
1. Sealing System: Dual Seal.
 2. Primary Sealant: Polyisobutylene.
 3. Secondary Sealant: Silicone, General Electric IGS 3204 or IGS 3100, or Dow Corning 982.
 - a. For structurally glazed IG units, secondary seal shall conform to ASTM C 1249.
 4. Primary and secondary seals shall not contain voids and must be continuously bonded to the glass structure.
 5. Spacer: Clear finish aluminum with welded, soldered, or bent corners, hollow tube types, filled with low nitrogen absorption desiccant.
 6. Desiccant: Molecular sieve, silica gel, or blend of both.
 7. Air Space Thickness: 1/2".
 8. Glass Thickness: 1/4" minimum.
 9. Units shall be certified for compliance with seal classification "CBA" by the Insulating Glass Certification Council (IGCC) or by IGMA and tested in accordance with the above ASTM Test Methods.
 10. Insulating glass shall conform to the following tolerances:
 - a. Length and Width: + 3.0 mm/ -2.0 mm.
 - b. Diagonal: +/- 3.0 mm.
 - c. Thickness: As agreed +/- 1.0 mm.
 - d. Edge-Deletion of Coating: Minimum 8 mm wide. Width of deletion must be more than the width of the secondary seal. Silver layer(s) must be completely removed. Appearance must be uniform.
 - e. Primary PIB Seal: Must be complete with no breaks. Appearance must be uniform. PIB bead must overlap coating. No visible bright line when glass is viewed in transmission. The width of the PIB bead shall be 4.0 mm + 3.0/ - 1.5 mm.

- f. Secondary Seal: Nominal 6 mm + 3.0/ - 1.5 mm. The minimum width of the secondary silicone seal for IG units that are glazed structurally must be determined according to ASTM C 1249. The secondary seal must be uniformly applied without bubbles, cavities or gaps. Avoid excess sealant that will need to be trimmed off later.
11. Additional requirements and properties for primary and secondary insulating glass seals and spacers:
- a. All glass units shall comply with IGMA Guidelines which limits the dimension of the visible edge seal encroachment into the vision area to be no greater than the “sightline infringement of 3mm (0.12”).
 - b. Insulating glass unit hermetic seal to consist of butyl primary and silicone secondary seals with bent, welded, or soldered interpane spacer corners; keyed corners are not acceptable unless also soldered or welded. Spacers shall be aluminum or stainless steel. Locate spacer joint at the top or sides of the units, but in no instances at the sill. Design units to minimize the number of spacer joints. Provide solid keys, embedded in butyl sealant on all four sides, at spacer joints.
 - c. Hermetic seals must be continuous and intimately bonded to both lites of glass. Provide primary seal of uniform depth with a nominal width of 1/8 to 3/16 in. Hermetic seals shall not be contaminated with debris, fingerprints, or other foreign matter and shall not contain voids or air pockets that decrease the width of the seal below the minimum widths listed in these Specifications, or that breach the seal. The width of the primary seal shall not be less than 1/16 in., and the total cumulative length of the primary seal between 1/16 in. and 1/8 in. shall be less than 12 in. in any one insulating glass unit. The primary seal shall not have a reduced thickness at the corners. An increased thickness of the primary seal at the corners is acceptable.
 - d. Provide secondary seal of uniform depth with a nominal width of 1/4 in. Provide a total width of the primary and secondary seal of 1/2 in. Units shall meet SIGMA 65-7-2, latest edition. Units shall not contain breather or capillary tubes or similar penetrations.

2.4 GLAZING MATERIALS AND PRODUCTS

- A. General: Provide sealants and gaskets with performance characteristics suitable for applications indicated. Ensure compatibility of glazing sealants with insulating glass sealants, with laminated glass interlayers, and with any other surfaces in contact.
- B. General Glazing and Cap Bead Sealant: Provide sealant with maximum Shore A hardness of 50. Provide one of the following:
 - 1. Dow Corning 795.
 - 2. General Electric Silglaze N 2500 or Contractors SCS-1000.
 - 3. Tremco Spectrem 2.
- C. Weather Seal Sealant: Provide non-acid curing sealant with movement range $\pm 50\%$, ASTM C 719. Provide one of the following:
 - 1. Dow Corning 795.
 - 2. General Electric Silpruf.
 - 3. Tremco Spectrem 2.

- D. Backer Rod: Closed cell non-gassing polyethylene rod with rod diameter 25% wider than joint width.
- E. Dense Elastomeric Compression Seal Gaskets: Provide molded or extruded neoprene or EPDM gaskets, Shore A hardness of 75 ± 5 for hollow profile, and 60 ± 5 for solid profiles, ASTM C 864.
- F. Cellular, Elastomeric Preformed Gaskets: Provide extruded or molded closed cell, integral-skinned neoprene, Shore A 40 ± 5 , and 20% to 35% compression, ASTM C 509; Type II.
- G. Preformed Glazing Tape: Provide solvent-free butyl-polyisobutylene rubber with 100% solids content complying with ASTM C1281 AAMA A 800 with integral continuous EPDM shim. Provide preformed glazing tape in extruded tape form. Provide Tremco "Polyshim II" or approved equal.
- H. Setting Blocks: Provide 100% or silicone blocks with Shore A hardness of 80-90. Provide products certified by manufacturer to be compatible with silicone sealants. Length to be not less than 4". Width for setting blocks to be 1/16" more than glass thickness and high enough to provide the lite recommended by glass manufacturer. When thickness of setting block exceeds 3/4" the glass manufacturer must be consulted for sizes and configuration. In a vented system, setting block shall be designed so as to not restrict the flow of water within the glazing rabbet to the weep holes.
 - 1. Shims: For shims used with setting blocks, provide same materials, hardness, length and width as setting blocks.
 - 2. Structural Silicone Glazing: Provide silicone setting blocks where structural silicone occurs at sills and at insulating units with silicone edge seals.
- I. Edge Blocks: Provide neoprene or silicone as required for compatibility with glazing sealants. Provide blocks with Shore A hardness of 55 ± 5 .
- J. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place.
- K. Miscellaneous Glazing Materials: Provide sealant backer rods, primers, cleaners, and sealers of type recommended by glass and sealant manufacturers.
- L. Mirror Adhesive: Palmer's "Mirro-Mastic" or approved equal; mastic must be compatible with mirror backing.
 - 1. Clips: No. 4 finish Type 304 stainless steel.

2.5 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.
- C. Grind smooth and polish exposed glass edges.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GENERAL GLAZING STANDARDS

- A. Install products using the recommendations from the manufacturer of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in the "GANA Glazing Manual".
- B. Verify that Insulating Glass (IG) Unit secondary seal is compatible with glazing sealants.
- C. Install glass in prepared glazing channels and other framing members.
- D. Install setting blocks in rabbets as recommended by referenced glazing standards in "GANA Glazing Manual" and "IGMA Glazing Guidelines".
- E. Provide bite on glass, minimum edge and face clearances and glazing material tolerances recommended by "GANA Glazing Manual."
- F. Provide weep system as recommended by "GANA Glazing Manual."
- G. Set glass lites in each series with uniform pattern, draw, bow and similar characteristics.
- H. Distribute the weight of glass unit along the edge rather than the corner.
- I. Comply with manufacturers and referenced industry standards on expansion joint and anchors; accommodating thermal movement; glass openings; use of setting blocks, edge, face, and bite clearances; use of glass spacers; edge blocks and installation of weep systems.
- J. Protect glass edge damage during handling and installation.
- K. Prevent glass from contact with contaminating substances that result from construction operations, such as weld spatter, fireproofing or plaster.
- L. Remove and replace glass that is broken, chipped cracked or damaged in any way.

3.4 GLAZING

- A. Glazing channel dimensions, as indicated on Shop Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead. Install setting blocks at the one greater points of each lite along the horizontal mullion.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- J. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.
- K. Off-Set Glazing
 - 1. Where the glazing legs are off-set, the difference in the rabbet width shall be compensated by employing different glazing tapes with different diameter shims. The difference in shim shall be equal to the size of the off-set. The thinner tape shall be positioned first on the glazing leg closest to the interior. The thicker tape shall be cut to the exact length of the dimension between the applied tapes, and installed on the outermost glazing leg.
 - 2. Immediately prior to setting glass, paper backing shall be removed. Apply a toe bead of sealant 6" in each direction, from each corner.

3. Locate setting blocks in the sill member at quarter points, or if necessary to within 6" of each corner. Setting blocks must be set equal distance from center line of the glass and high enough to provide the recommended bite and edge clearances.
4. Set edge block according to glass manufacturer's recommendations.
5. Set Glass: The glass shall be pressed firmly against the tape to achieve full contact.
6. In a vented system, apply a heel bead (air seal) of sealant around the perimeter of glass, between the sole of the I.G. unit and the base of the rabbet of the metal framing developing a positive bond to the unit and to the metal framing. The bead of the sealant shall be deep enough so that it will partially fill the channel to a depth of 1/4" between the glass edge and the base of the metal framing rabbet.
7. Interior stops shall be set, and glazing tape spline for the appropriate face clearance shall be rolled into place, compressing the glass to the shim within the glazing tape.

3.5 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant as recommended by glass manufacturer or glass frame manufacturer.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape where noted on approved shop drawings.

3.6 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- D. Install gaskets so they protrude past face of glazing stops.

3.7 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
 - 1. Exterior glazing gasket shall be set a minimum of 1/8" below exterior glazing stop to create a channel for sealant installation.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.8 FRAMELESS MIRRORS

- A. Apply mastic to back of mirror "pats" spaced 4 pats/sq. ft.; adjust mirror so that it is plumb and in place to avoid distortion of reflecting images. Allow 1/8" space between back of mirror and wall surface.
 - 1. Apply "pats" using Palmer Electric Applicator.
- B. Apply stainless steel clips at mirror top and bottom; securely clip to substrate using non-corrosive anchors. At drywall back-up anchors must be secured to studs or steel wallplate spanning from stud to stud.

3.9 PROTECTION AND CLEANING

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- E. Clean excess sealant or compound from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.
- F. Glass to be cleaned according to:
 - 1. GANA Glass Information Bulletin GANA 01-0300 – "Proper Procedure for Cleaning Architectural Glass Products".

2. GANA Glass Informational Bulletin GANA TD-02-0402 – “Heat Treated Glass Surfaces are Different”.

G. Do not use razor blades, scrapers, or metal tools to clean glass.

END OF SECTION

SECTION 088720

ARCHITECTURAL WINDOW FILM

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the architectural window film as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. Interior privacy window film.
 - 2. Custom design distraction marking film.

1.3 RELATED SECTIONS

- A. Glass and Glazing - Section 088000.
- B. Demountable Partitions - Section 102219.

1.4 REFERENCES

- A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals, 1997 Edition.
- B. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
- C. ASTM E 308 - Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.

1.5 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Surface burning characteristics when tested in accordance ASTM E 84:
 - 1. Flame Spread: 25, maximum.
 - 2. Smoke Developed: 450, maximum.

1.6 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.

3. Installation methods.

- B. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- C. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
 - 1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section. Provide Authorized Dealer # on all documents.
 - 2. Provide a commercial building reference list of 5 properties where the installer has applied 3M Fasara window film or comparable quality film. This list will include the following information:
 - a. Name of building.
 - b. The name and telephone number of a management contact.
 - c. Type of glass.
 - d. Type of film.
 - e. Amount of film installed.
 - f. Photographs of design work.
 - g. Date of completion.
 - 3. Provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film manufacturer.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques, design draft (for logo and design work) and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

- A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer: 3M Window Film, or approved equal.
- B. Glass film to be used in custom patterns on interior glazed partitions: 3M Fasara Film, custom design.
 - 1. GF1.1: Milano SH2MAML, Translucent (Interior), Opacity TBD, custom design. Refer to finish schedule on drawings.
 - 2. GF1.2: Milano SH2MAML, Translucent (Interior), Opacity TBD, custom design. Refer to finish schedule on drawings.
 - 3. GF1.3: Milano SH2MAML, "Custom Design - Cornell Logo Marking on Glass", Opacity TBD. Refer to finish schedule on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine the areas and conditions where architectural window film is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
 - 1. Film shall be installed intact and be removable in the future without damage to the glass.
 - 2. Film shall be installed either in the factory, with protection for it during shipping and installation, or right before erecting window units in the field.

- B. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
- C. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
- D. Apply film to glass and lightly spray film with slip solution.
- E. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
- F. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
- G. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

3.4 CLEANING AND PROTECTION

- A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION

SECTION 092900

GYPSUM DRYWALL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the gypsum drywall as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Gypsum board work for partitions, ceilings, column enclosures, furring, and elsewhere where gypsum drywall work is shown on drawings.
 - 2. Metal supports for gypsum drywall construction.
 - 3. Acoustical insulation (sound attenuation blankets) for gypsum drywall work.
 - 4. Sealant for gypsum drywall work.
 - 5. Concealed metal reinforcing for attachment of railings, toilet partitions and other items supported on drywall partitions and walls.
 - 6. Taping and finishing of drywall joints.
 - 7. Installing rings and frames in drywall surfaces for grilles, registers and lighting fixtures.
 - 8. Gypsum wallboard cants at beams and other projections over 2" deep in elevator shafts where adjoining wall is of gypsum wallboard construction.
 - 9. Gypsum shaftwall construction.
 - 10. Bracing and connections.

1.3 RELATED SECTIONS

- A. Thermal insulation - Section 072100.
- B. Hollow metal door frames - Section 081113.
- C. Access doors - Section 083113.
- D. Painting - Section 099000.
- E. Elevators - Division 14.
- F. Rings for grilles, registers and light fixtures - Division 23 and 26.

1.4 QUALITY ASSURANCE

- A. The following standards, as well as other standards which may be referred to in this Section, shall apply to the work of this Section:
1. The Gypsum Construction Handbook, latest edition, USG.
 2. Construction Guide, latest edition, National Gypsum.
 3. ASTM A 568 "Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements For"
 4. ASTM C 475 "Standard Specification for Joint Treatment Materials for Gypsum Wallboard Construction"
 5. ASTM C 645 "Standard Specification for Non-Structural Steel Framing Members"
 6. ASTM C 754 "Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products"
 7. ASTM C 840 "Standard Specification for Application and Finishing of Gypsum Board"
 8. ASTM C 919 "Standard Specification for Use of Sealants in Acoustical Applications"
 9. ASTM C 954 "Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness"
 10. ASTM C 1002 "Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Board"
 11. ASTM C 1177 "Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing"
 12. ASTM C 1178 "Standard Specification for Glass Mat Water Resistant Gypsum Backing Board"
 13. ASTM C 1278 "Standard Specification for Fiber-Reinforced Gypsum Panel"
 14. ASTM C 1396 "Standard Specification for Gypsum Board"
 15. ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber"
- B. Allowable Tolerances: 1/32" offsets between planes of board faces, and 1/16" in 8'-0" for plumb, level, warp and bow.
- C. System Design Load
1. Provide standard drywall wall assemblies designed and tested by manufacturer to withstand a lateral load of 5 lbs. per sq. ft. for the maximum wall height required, and with deflection limited to L/240 of partition height.
 - a. Drywall assemblies with tile finish shall have a deflection limit of L/360.
 2. Provide drywall ceiling assemblies designed, fabricated and installed to have a deflection not to exceed L/360.

- D. Fire-Resistance Rating: Where gypsum drywall with fire resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories, or to design designations in UL "Fire Resistance Directory" or in listing of other testing agencies acceptable to authorities having jurisdiction, and compliant with UL Test #2079; criteria for cycle movement for all field height wall sections requiring allowance for vertical deflection within framing details.
- E. Installer: Firm with not less than 5 years of successful experience in the installation of specified materials.
- F. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.

1.5 SUBMITTALS

- A. Submit shop drawing for each drywall partition, furring and ceiling system showing size and gauges of framing members, hanger and anchorage devices, wallboard types, insulation, sealant, methods of assembly and fastening, control joints indicating column lines, corner details, joint finishing and relationship of drywall work to adjacent work.
- B. Samples: Each material specified herein, 12" x 12", or 12" long, or in manufacturer's container, as applicable for type of material submitted.
- C. Manufacturer's Literature: Submit technical and installation instructions for each drywall partition, furring and ceiling system specified herein, and for each fire-rated and sound-rated gypsum board assembly. Submit other data as required to show compliance with these specifications, including data for mold resistant joint compound.
- D. Test Reports: This Contractor shall submit test report, obtained by drywall manufacturer, indicating conformance of drywall assemblies to required fire ratings and sound ratings.
- E. Evaluation Reports: Submit evaluation reports certified under an independent third party inspection program administered by an agency accredited by IAS to ICC-ES AC98, IAS Accreditation Criteria for Inspection Agencies.
- F. Engineering Data for interior walls.
 - 1. Submit Engineering Data drawings to the Architect for review. The Contractor is responsible for the structural design and supports for the metal framing, and must show the proposed system and how the Performance Criteria noted below is accommodated on these drawings.
 - 2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of members. Calculations and drawings must be prepared by a Structural Engineer licensed in the State of New York and shall be signed and sealed by this Engineer.

1.6 PRODUCT HANDLING AND PROTECTION

- A. Deliver, store and handle drywall work materials to prevent damage. Deliver materials in their original, unopened containers or bundles, and store where protected from moisture, damage and from exposure to the elements. Store wallboard in flat stacks.
- B. Protect wallboard from becoming wet.

- C. Protect metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

1.7 ENVIRONMENTAL CONDITIONS

- A. Provide and maintain minimum temperature of fifty-five (55) degrees F. and adequate ventilation to eliminate excessive moisture within the building in the area of the drywall work for at least twenty-four (24) hours, prior to, during and after installation of drywall work. Installation shall not start until windows are glazed and doors are installed, unless openings are temporarily closed. Space above suspended ceilings shall be vented sufficiently to prevent temperature and pressure build up.

1.8 JOB MOCK-UP

- A. At a suitable location, where directed by the Architect, lay up a portion of a finished wall and ceiling demonstrating the quality of work, including finishing, to be obtained under this Section. Omit drywall boards in locations as directed by the Architect to show stud spacing and attachments; after acceptance, complete assembly.
- B. Adjust the finishing techniques as required to achieve the finish required by the Architect as described in this Section of these specifications.
- C. Upon approval of the mock-up, the mock-up may be left in place as a portion of the finished work of this Section.
- D. All drywall work shall be equal in quality to approved mock-up.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers for Gypsum Drywall Panels and Accessories: U.S. Gypsum Co., Georgia Pacific, CertainTeed Corporation, Continental Building Products, or National Gypsum Co. meeting specification requirements are acceptable.
 - 1. All drywall products must be manufactured in North America.
- B. Acceptable Manufacturers for Metal Supports of Drywall Assemblies: Unless otherwise noted, provide products manufactured by ClarkDietrich, Super Stud Building Products, Marino/Ware, or approved equal.

2.2 METAL SUPPORTS

- A. Metal Floor and Ceiling Runners
 - 1. Drywall Track: Formed from 0.0312 inch (20 U.S. Std. gauge) (minimum unless otherwise noted or required by performance requirements) cold formed steel, width to suit shaped metal studs. Use 20 ga. top runners with 1-1/4" minimum flanges.
 - 2. Deflection track or head of wall connections at rated partitions shall conform to UL #2079 for cycle movement. Provide positive mechanical connection of framing to structure, allowing for vertical movement within connections. Minimum of 0.0312 (20 ga.) cold formed steel for clips, 25 ga. cold formed steel for deflection track.
 - a. Product: ClarkDietrich; [BlazeFrame DSL] [MaxTrak] Slotted Deflection Track As manufactured by the Steel Network, VertiClip or VertiTrack or equal made by Metal-Lite Inc.

- b. FireTrak (including stud clips) by FireTrak Corp. or equal made by Metal-Lite Inc.
 3. Shaft Wall "J" Type Runner: Formed from 0.0329 inch (20 U.S. Std. gauge) galvanized steel, 1" x 2-1/2" or 4" wide (to suit detail) x 2-1/4" (for shaft wall).
- B. Metal Studs, Framing and Furring
 1. C-Shaped Studs: Channel type with holes for passage of conduit formed from minimum 0.0312 inch (20 U.S. Std. gauge) (unless heavier gauge is required to meet deflection limits) cold formed steel, width as shown on drawings.
 2. Furring Channels: Hat shaped, formed from galvanized steel, 25 U.S. Std. gauge.
 - a. Product: ClarkDietrich; Furring Channel, or comparable product.
 3. "C-H," "CT," or "I" Type Stud: 1-1/2" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction; gauge and size as required to meet deflection limits given herein.
 - a. Product: ClarkDietrich; CT Stud, or a comparable product.
 4. Double "E" Type Stud or "J" Track with Holding Tabs: 1" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction; gauge and size as required to meet deflection limits given herein.
 - a. Product: ClarkDietrich; J-Tabbed Track, or a comparable product.
 5. Continuous 16 gauge x 8" wide steel wall plate screwed to studs as required for support of railings, toilet partitions and other items supported on drywall partitions and walls.
- C. Suspended Ceiling and Fascia Supports
 1. Main Runners: 1-1/2" steel channels, cold rolled at 0.475 lbs. per ft., rust-inhibitive paint finish.
 2. Furring Members: Screw-type hat-shaped furring channels of 25 ga. zinc-coated steel; comply with ASTM C 645.
 3. Hangers: Galvanized, 1" x 3/16" flat steel slats capable of supporting 5x calculated load supported.
 4. Hanger Anchorages: Provide inserts, clips, bolts, screws and other devices applicable to the required method of structural anchorage for ceiling hangers. Size devices for 5x calculated load supported.
 5. Furring Anchorages: 16 ga. galvanized wire ties, manufacturer's standard clips, bolts or screws as recommended by furring manufacturer.
- D. Protective Coating: All cold-formed steel members shall have coating conforming to AISI S220; ASTM A 653, G60 or coating with equivalent corrosion resistance of ASTM A653/A653M, G60. Galvannealed products are not acceptable

2.3 GYPSUM WALLBOARD TYPES

- A. Gypsum Wallboard: 1/2" thick and 5/8" thick as indicated on drawings, "Sheetrock" by USG, "Gold Bond" by National Gypsum, or "Regular Gypsum" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.
1. 1/4" thick USG "Sheetrock" brand Flexible Gypsum Panels for curved walls and archways or approved equal.
- B. Fire-Rated Gypsum Wallboard: 1/2" thick and 5/8" thick as indicated on drawings, "Sheetrock Firecode C" by USG, "Firecheck Type C" by Lafarge/Continental, "Gold Bond Fireshield" by National Gypsum, or "Type C" and "Type X" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.
- C. Water-Resistant Backing Board for Tile Finish: 5/8" thick, "DUROCK Glass Mat Tile Backerboard" by USG, "Dens-Shield Tile Backer Board" by Georgia Pacific, or "DiamondBack Tile Backer" by CertainTeed Corp. Cover joints with a pressure sensitive woven glass fiber tape equal to Imperial Type P Tape.
- D. Moisture/Mold-Resistant Gypsum Wallboard at locations listed below, unless otherwise shown on drawings: 1/2" thick and 5/8" thick as indicated on drawings, "Mold Tough" or "Mold Tough FR" by U.S. Gypsum, "DensArmor Plus" by Georgia Pacific, "Mold Defense" and/or "Mold Defense Type X" by Lafarge/Continental, or "Gold Bond EXP Interior Extreme Gypsum Board" by National Gypsum, 48" wide, in maximum lengths available to minimize end-to-end butt joints. Board must have a rating of 10 per ASTM D 3273 with a core that meets ASTM C 1396, Section 6 or ASTM C 1658.
1. Areas in toilet rooms, lockers, janitor's closets not scheduled to receive ceramic tile, or where fire rating is required.
 2. Interior faces of exterior walls of basements, cellars and other below grade rooms.
 3. Walls and ceilings of spaces containing condensers, water tanks, water pumps and pressure reduction valves.
 4. Walls and ceilings of laundry rooms.
 5. Portions of walls within 2 feet of kitchen sinks to a height of 4 feet above the floor.
 6. Portions of walls within 2 feet of kitchen stoves to a height of 4 feet above the floor.
 7. Walls of bathrooms that are not solely water closet compartments, other than walls specifically required to be cement board.
 8. Walls and ceilings in service sink closets.
 9. Portion of walls within 2 feet of mop sinks or service sinks to a height of 4 feet above the floor.
 10. All perimeter walls and wet shafts.
- E. Mold-Resistant Shaft Wall Liner: Solid gypsum board liner for shaft wall construction, 1" thick, 24" wide, as required to suit condition, by standard lengths as required, beveled edges. Provide "Mold Tough Liner Panel" by USG, "DensGlass Ultra Shaft Guard" by Georgia Pacific, "Mold Defense Shaftliner Type X" and/or "Weather Defense Shaftliner Type X" by Lafarge/Continental, "Gold Bond Brand Fireshield Shaft Liner XP," "Gold Bond Brand EXP

Extended Exposure Shaft Liner" by National Gypsum, or "M2Tech Shaftliner" by CertainTeed Corp.

1. Liner board must have a rating 10 per ASTM D 3273 with a core that meets ASTM C 1396 Section 6.

F. Abuse-Resistant Wallboard: 5/8" thick "Sheetrock Brand Mold Tough AR" by USG, "Dens Armor Plus Abuse Resistant Panels" by Georgia-Pacific, "EXP Interior Extreme AR" or "Gold Bond Brand Hi-Abuse XP" by National Gypsum, "Protecta AR100" or "Protecta HIR 300" by Lafarge/Continental, or "AirRenew Extreme Abuse" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.

1. Board must achieve a Level 1 rating per ASTM C 1629.

G. Impact-Resistant Wallboard: 1/2" and 5/8" thick as indicated on drawings, "Sheetrock Brand Mold Tough VHI" by USG, "DensArmor Plus Impact-Resistant Panels" by Georgia-Pacific, "EXP Interior Extreme IR" or "Gold Bond Brand Hi-Impact XP" by National Gypsum, "Protecta HIR 300" by Lafarge/Continental, or "AirRenew Extreme Impact" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.

H. Impact-Resistant Gypsum Drywall: ASTM C 1396, ASTM C 1278, core types as required by fire-resistance-rated assembly indicated, and with tapered edges.

1. Products: Subject to compliance with requirements, provide USG "Sheetrock Brand Mold Tough VHI" 5/8" thickness, by United States Gypsum Company, or "AirRenew Extreme Impact" by CertainTeed Corp.

a. Locations: Including, but not limited to, stairwells, to satisfy NYC requirements.

I. Sustainable/Lightweight Gypsum Wallboard: ASTM C 1396, "Sheetrock Brand Ecosmart (Type ULIX)" or "Sheetrock Brand Ecosmart Mold Tough" by USG or "High Strength Fireshield Lite XP" by National Gypsum.

2.4 ACCESSORIES

A. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

2. Product: Subject to compliance with requirements, provide one of the following:

- a. Rockwool AFB; Rockwool
- b. SAFB Blankets; Thermafiber LLC

B. Fasteners for Wallboard: USG Brand Screws; Type S Bugle Head for fastening wallboard to lighter gauge interior metal framing (up to 20 ga.). Type S-12 Bugle Head for fastening wallboard to heavier gauge interior metal framing (20 ga. to 12 ga.); Type S and Type S-12 Pan Head for attaching metal studs to door frames and runners; and Type G Bugle Head for fastening wallboard to wallboard. Lengths specified below under "Part 3 - Execution" Articles and as recommended by drywall manufacturer.

C. Laminating Adhesive: "Sheetrock Brand Joint Compound."

- D. Metal Trim - Corner Beads: For 90 degree External Corners - ClarkDietrich; 103 Deluxe Cornerbead or "Dur-A-Bead" No. 103, 26 U.S. Std. ga. galvanized steel, 1-1/4" x 1-1/4", for 90 degree external corners.
- E. Metal Trim - Edge Beads: "Sheetrock Brand Paper Faced Metal Bead and Trim."
- F. Partition/Concrete Ceiling Trim: Trim-Tex Super Seal Tear Away or approved equal.
- G. Metal Trim Treatment Materials and Joint Treatment Materials for Gypsum Drywall Boards: Paper tape for joint reinforcing; Setting Type (Durabond 90) or Lightweight Setting Type Joint Compound for taping and topping; and Ready Mix Compound for finishing.
 - 1. For mold-resistant drywall, water resistant drywall, and tile backer board, use glass mesh tape with setting joint compound that is rated 10 when tested in accordance with ASTM D 3273 and evaluated in accordance with ASTM D 3274. Acceptable joint compound is "Rapid Set One Pass" made by CTS Cement Manufacturing Corp. or "Rapid Joint" manufactured by Lafarge North America or approved equal meeting standards noted herein.
- H. Control Joints: ClarkDietrich; #093 Control Joint or No. 0.093, USG.
- I. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. USG Corporation; SHEETROCK Acoustical Sealant.
 - b. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
 - c. Grabber Construction Products; Acoustical Sealant GSC.
 - d. Pecora Corporation; AC-20 FTR.
 - e. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
- J. Neoprene Gaskets: Conform to ASTM D 1056.
- K. Aluminum Edge Trim and Reveal Moldings: Fry Reglet drywall trim with chemical conversion coat finish for field painting in sizes as indicated on drawings.
 - 1. Corner Trim
 - a. Basis-of-Design Product: Number DMCT-375.
 - b. Characteristics:
 - 1). Description: Trim shall finish and protect outside corners.
 - 2). Material: Extruded aluminum.
 - 3). Dimension, Exposed Corner: 3/8".
 - 2. Protruding Edge Trim
 - a. Basis-of-Design Product: Number DRMPCR-100-100.
 - b. Characteristics:
 - 1). Description: Molding shall create a vertical or horizontal recessed reveal with 1/4" protrusion.
 - 2). Material: Extruded aluminum.
 - 3). Dimensions: 1" x 1".

3. Reveal Molding

- a. Basis-of-Design Product: Number DRM-625-375.
- b. Characteristics:
 - 1). Description: Molding shall create a vertical or horizontal recessed reveal.
 - 2). Material: Extruded aluminum.
 - 3). Dimensions: 5/8" depth x 3/8" width.

4. 'Z' Reveal Molding

- a. Basis-of-Design Product: Number DRMZ-625-375.
- b. Characteristics:
 - 1). Description: Reveal molding shall form a trim reveal around doors or between walls and floors.
 - 2). Material: Extruded aluminum.
 - 3). Dimensions: 5/8" depth x 3/8" width.

L. Sheet Caulking for Junction Boxes: Subject to compliance with requirements, provide one of the following:

- 1. Lowry's "Electrical Box Sealer" (800-772-2521).
- 2. Kinetics IsoBacker (Vibration Products 201-569-7400).
- 3. Tremco Sheet Caulking (800-321-7906).

M. Sheet Caulking for Junction Boxes at Fire Rated Assemblies: Subject to compliance with requirements, provide one of the following:

- 1. Firestop Putty Pads by Hevi-Duty/Nelson (800-331-7325).
- 2. Specified Technologies Inc. (800-992-1180).
- 3. HILTI CP-617 (800-879-8000).

N. Backing Rod: Closed cell neoprene rod or polyethylene film.

O. Compressible Foam Gaskets: 3/8 inch thickness; 6 pack density compressible foam with one-side high-tack adhesive; Norseal V-730.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where gypsum drywall is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. General

- 1. Install drywall work in accordance with drywall manufacturer's printed instructions and as indicated on drawings and specified herein.

2. All metal framing for drywall partitions shall extend from floor to underside of structural deck above. Provide for vertical deflection with positive mechanical connections of framing members to structure.
 3. Provide concealed reinforcement, 16 ga. thick by eight (8) inches wide or as detailed or as recommended by manufacturer, for attachment of railings, toilet partitions, and other items to be supported on the partitions which cannot be attached to the metal framing members. Concealed reinforcement shall span between metal studs and be attached thereto using two (2) self-tapping pan head screws at each stud.
 - a. Back of drywall shall be scored or notched to prevent bulging out where reinforcement plate occurs.
- B. Fire-Rated Assemblies: Install fire-rated assemblies in accordance with requirements of authorities having jurisdiction, Underwriters' Laboratories and test results obtained and published by the drywall manufacturer, for the fire-rated drywall assembly types indicated on the drawings.
- C. Acoustical Assemblies: Install acoustically-rated assemblies to achieve a minimum STC as noted on drawings, in accordance with test results obtained and published by the drywall manufacturer, for the drywall assembly type indicated on the drawings.
1. Install acoustical accessories as part of installation of full assembly.
 - a. Install sealants, gaskets and caulking so that entire assembly is "light tight" at areas of installation.
 - b. Install sheet caulking at all junction boxes in demising walls between offices, meeting rooms.
 - c. Install acoustic sealant around all penetrations through full height partitions.
 - d. Install accessories to prevent vibration, rattles or other movement not intended as part of the assembly.
 - e. Do not install items back to back in wall cavities.
 2. Provide ongoing observation and testing as assemblies are installed.
 3. Clean items on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions and requirements of acoustical consultant.
- D. Sealant
1. Install continuous acoustical sealant bead at top and bottom edges of wallboard where indicated or required for sound rating as wallboard is installed, and between metal trim edge beads and abutting construction.
 2. Install acoustical sealant in 1/8" wide vertical control joints within the length of the wall or partitions, and in all other joints, specified below under "Control Joints." Install bead of acoustical sealant around electric switch and outlet boxes, piping, ducts, and around any other penetration in the wallboard; place sealant bead between penetrations and edge of wallboard.
 3. Where sealant is exposed to view, protect adjacent surfaces from damage and from sealant material, and tool sealant flush with and in same plane as wallboard surface. Sealant beads shall be 1/4" to 3/8" diameter.

E. Wallboard Application

1. Do not install wallboard panels until steel door frames are in place; coordinate work with Section 081113, "Steel Doors and Frames."
2. See drawings for all board types. Use fire-rated wallboard for fire-rated assemblies. Use water-resistant wallboard where indicated on drawings and where wallboard would be subject to moisture. Install water-resistant wallboard in full, large sheets (no scraps) to limit number of butt joints.
3. Apply wallboard with long dimension parallel to stud framing members, and with abutting edges occurring over stud flanges.
4. Install wallboard for partitions from floor to underside of structure above and secure rigidly in place by screw attachment, unless otherwise indicated.
5. Provide "Thermafiber" safining insulation meeting standards of Section 078413 at flutes of metal deck where partitions carry up to bottom of metal deck.
6. Neatly cut wallboard to fit around outlets, switch boxes, framed openings, piping, ducts, and other items which penetrate wallboard; fill gaps with acoustic sealant.
7. Where wallboard is to be applied to curved surfaces, use wallboard specified for curved walls herein above and dampen wallboard on back side as required to obtain required curve. Finish surface shall present smooth, even curve without fluting or other imperfections.
8. Screw fasten wallboard with power-driven electric screwdriver, screw heads to slightly depress surface of wallboard without cutting paper, screws not closer than 3/8" from ends and edges of wallboard.
9. Where studs are doubled-up, screw fasten wallboard to both studs in a staggered pattern.

F. Metal Trim: Install and mechanically secure in accordance with manufacturer's instructions; and finish with three (3) coats of joint compound, feathered and finish sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions.

1. Corner Beads: Install specified corner beads in single lengths at all external corners, unless corner lengths exceed standard stock lengths.
2. Edge Beads: Install specified edge beads in single lengths at all terminating edges of wallboard exposed to view, where edges abut dissimilar materials, where edges would be exposed to view, and elsewhere where shown on drawings. Where indicated on drawings, seal joint between metal edge bead and adjoining surface with specified gasket, 1/8" wide minimum and set back 1/8" from face of wallboard, unless other size and profile indicated on drawings.
3. Casing beads shall be set in long lengths, neatly butted at joints. Provide casing beads at juncture of board and vertical surfaces and at exposed perimeters.

G. Control Joint Locations: Gypsum board surfaces shall be isolated with control joints where:

1. Ceiling abuts a structural element, dissimilar wall or other vertical penetration.
2. Construction changes within the plane of the partition or ceiling.
3. Shown on approved shop drawings.

4. Ceiling dimensions exceed thirty (30) feet in either direction.
5. Wings of "L," "U," and "T" shaped ceiling areas are joined.
6. Expansion or control joints occur in the structural elements of the building.
7. Shaftwall runs exceed 30' without interruption.
8. Partition or furring abuts a structural element or dissimilar wall or ceiling.
9. Partition or furring runs exceed 30' without interruption.
10. Where control joints are required, ceiling height door frames may be used as control joints. Less than ceiling height frames shall have control joints extending to the ceiling from both corners.

H. Joint Treatment and Spackling

1. Joints between face wallboards in the same plane, joints at internal corners of intersecting partitions and joints at internal corners of intersections between ceilings and walls or partitions shall be filled with joint compound.
2. Screw heads and other depressions shall be filled with joint compound. Joint compound shall be applied in three (3) coats, feathered and finish surface sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions. Treatment of joints and screw heads with joint compound is also required where wallboard will be covered by finish materials which require a smooth surface, such as vinyl wall coverings.

3.3 FURRED WALLS AND PARTITIONS

- A. Use specified metal furring channels. Run metal furring channel framing members vertically, space sixteen (16) inches o.c. maximum. Fasten furring channels to concrete or masonry surfaces with power-driven fasteners or concrete stub nails spaced sixteen (16) inches o.c. maximum through alternate wing flanges (staggered) of furring channel. Furring channels shall be shimmed as necessary to provide a plumb and level backing for wallboard. At inside of exterior walls, an asphalt felt protection strip shall be installed between each furring channel and the wall. Furring channel and splices shall be provided by nesting channels at least eight (8) inches and securely anchoring to concrete or masonry with two (2) fasteners in each wing.
- B. Wallboard Installation: Same as specified under Article 3.4 - "Metal Stud Partitions."

3.4 METAL STUD PARTITIONS

- A. Unless otherwise noted, steel framing members shall be installed in accordance with ASTM C 754.
- B. Runner Installation: Use channel type. Align accurately at floor according to partition layout. Anchor runners securely sixteen (16) inches o.c. maximum with power-driven anchors to floor slab, with power-driven anchors to structural slab above. See "Stud Installation" below for runners over heads of metal door frames. Where required, carefully remove sprayed-on fireproofing to allow partition to be properly installed.
- C. Stud Installation
 1. Use channel type, positioned vertically in runners, spaced as noted on drawings, but not more than sixteen (16) inches o.c.

2. Anchor studs to floor runners with screw fasteners. Provide snap-in or slotted hole slip joint bolt connections of studs to ceiling runners leaving space for movement. Anchor studs at partition intersections, partition corners and where partition abuts other construction to floor and ceiling runners with sheet metal screws through each stud flange and runner flange.
 3. Connection at ceiling runner for non-rated partitions shall be snap-in or slotted hole slip joint bolt connection that shall allow for movement. Seal studs abutting other construction with 1/8" thick neoprene gasket continuously between stud and abutting construction.
 4. Connections for fire rated partitions at ceiling runners shall conform to UL Design #2079.
 5. Install metal stud horizontal bracing wherever vertical studs are cut or wallboard is cut for passage of pipes, ducts or other penetrations, and anchor horizontal bracing to vertical studs with sheet metal screws.
 6. At jambs of door frames and borrowed light frames, install doubled-up studs (not back to back) from floor to underside of structural deck, and securely anchor studs to jamb anchors of frames and to runners with screws. Provide cross braces from hollow metal frames to underside of slab.
 7. Over heads of door frames, install cut-to-length section of runner with flanges slit and web bent to allow flanges to overlap adjacent vertical studs, and securely anchor runner to adjacent vertical studs with sheet metal screws. Install cut-to-length vertical studs from runner (over heads of door frame) to ceiling runner sixteen (16) inches maximum o.c. and at vertical joints of wallboard, and securely anchor studs to runners with sheet metal screws.
 8. At control joints, in field of partition, install double-up studs (back to back) from floor to ceiling runner, with 1/4" thick continuous compressible gasket between studs. When necessary, splice studs with eight (8) inches minimum nested laps and attach flanges together with two (2) sheet metal screws in each flange. All screws shall be self-tapping sheet metal screws.
- D. Runners and Studs at Chase Wall: As specified above for "Runners" and "Studs" and as specified herein. Chase walls shall have either a single or double row of floor and ceiling runners with metal studs sixteen (16) inches o.c. maximum and positioned vertically in the runners so that the studs are opposite each other in pairs with the flanges pointing in the same direction. Anchor all studs to runner flanges with sheet metal screws through each stud flange and runner flange following requirements of paragraph 3.4, B. Provide cross bracing between the rows of studs by attaching runner channels or studs set full width of chase attached to vertical studs with one self-tapping screw at each end. Space cross bracing not over thirty-six (36) inches o.c. vertically.
- E. Wallboard Installation - Single Layer Application (Screw Attached)
1. Install wallboard with long dimension parallel to framing member and with abutting edge joints over web of framing member. Install wallboard with long dimension perpendicular to framing members above and below openings in drywall extending to second stud at each side of opening. Joints on opposite sides of wall shall be arranged so as to occur on different studs.
 2. Boards shall be fastened securely to metal studs with screws as specified. Where a free end occurs between studs, back blocking shall be required. Center abutting ends over studs. Correct work as necessary so that faces of boards are flush, smooth, true.

3. Wallboard screws shall be applied with an electric screw gun. Screws shall be driven not less than 3/8" from ends or edges of board to provide uniform dimple not over 1/32" deep. Screws shall be spaced twelve (12) inches o.c. in the field of the board and 8" o.c. staggered along the abutting edges.
4. All ends and edges of wallboard shall occur over screwing members (studs or furring channels). Boards shall be brought into contact but shall not be forced into place. Where ends or edges abut, they shall be staggered. Joints on opposite sides of a partition shall be so arranged as to occur on different studs.
5. At locations where piping receptacles, conduit, switches, etc., penetrate drywall partitions, provide non-drying sealant and an approved sealant stop at cut board locations inside partition.
6. No gypsum board layers are to be continuous between two adjacent rooms. Gypsum board shall be interrupted at all partition intersections.

F. Wallboard Installation - Double-Layer Application

1. General: See drawings for wallboard partition types required.
2. First Layer (Screw Attached): Install as described above for single layer application.
3. Second Layer (Screw Attached): Screw attach second layer, unless laminating method of attachment indicated on drawings or necessary to obtain required sound rating or fire rating. Install wallboard vertically with vertical joints offset thirty-two (32) inches from first layer joints and staggered on opposite sides of wall. Attach wallboard with 1-5/8" screws sixteen (16) inches o.c. along vertical joints and sixteen (16) inches o.c. in the field of the wallboard. Screw through first layer into metal framing members.
4. Second Layer (Laminated): Install wallboard vertically. Stagger joints of second layer from first layer joints. Laminate second layer with specified laminating adhesive in beads or strips running continuously from floor to ceiling in accordance with manufacturer's instructions. After laminating, screw wallboard to framing members with 1-5/8" screws, spaced twelve (12) inches o.c. around perimeter of wallboard.

G. Wallboard Installation - Laminated Application: Where laminated wallboard is indicated, use specified laminating adhesive, install wallboard vertically and maintain tolerances as specified for screw attached wallboard.

H. Insulation Installation: Install where indicated on drawings. Place blanket tightly between studs.

I. Deflection of Structure Above: To allow for possible deflection of structure above partitions, provide top runners for non-rated partitions with 1-1/4" minimum flanges and do not screw studs or drywall to top runner. Where positive anchorage of studs to top runner is required, anchorage device shall be by means of slotted hole (in clip connection with screw attachment to web of steel through bushings located in slots of clips), or other anchorage device approved by Architect.

J. Control Joints

1. Leave a 1/2" continuous opening between gypsum boards for insertion of surface mounted joint.
2. Back by double framing members.

3. Attach control joint to face layer with 9/16" galvanized staples six (6) inches o.c. at both flanges along entire length of joint.
4. Provide two (2) inch wide gypsum panel strip or other adequate seal behind control joint in fire rated partitions and partitions with safing insulation.

3.5 DRYWALL FASCIAS AND CEILINGS

- A. Furnish and install inserts, hanger clips and similar devices in coordination with other work.
- B. Secure hangers to inserts and clips. Clamp or bolt hangers to main runners.
- C. Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners, except as otherwise shown.
- D. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.
- E. Metal Furring Channels: Space sixteen (16) inches o.c. maximum. Attach to 1-1/2" main runner channels with furring channel clips (on alternate sides of main runner channels). Furring channels shall not be let into or come in contact with abutting masonry walls. End splices shall be provided by nesting furring channels no less than eight (8) inches and securely wire tying. At any openings that interrupt the furring channels, install additional cross reinforcing to restore lateral stability.
- F. Mechanical accessories, hangers, splices, runner channels and other members used in suspension system shall be of metal, zinc coated, or coated with rust inhibitive paint, of suitable design and of adequate strength to support units securely without sagging, and such as to bring unit faces to finished indicated lines and levels.
 1. Provide special furring where ducts are over two (2) feet wide.
- G. Apply board with its long dimension at right angles to channels. Locate board butt joints over center of furring channels. Attach board with one (1) inch self-drilling drywall screws twelve (12) inches o.c. in field of board at each furring channel; eight (8) inches o.c. at butt joints located not less than 3/8" from edges.

3.6 SHAFT WALLS

- A. Runner Installation: Use "J" metal runners at floor and ceiling, with the short leg toward finish side of wall. Securely attach runners to structural supports with power-driven fasteners at both ends and twenty-four (24) inches o.c.
- B. Shaft Wall Liner: Cut shaft wall liner panels one (1) inch less from floor to ceiling height and erect vertically between J-runners.
- C. C-H Studs: Cut metal studs 3/8" to not more than 1/2" less than floor to ceiling height and install between shaft wall liner panels so that panels are fitted snugly into the one (1) inch wide "H," "T," or "I" portion of the stud. Space studs twenty-four (24) inches o.c., unless otherwise indicated on drawings. Install full-length steel E-Studs or J-runners vertically at T-intersections, corners, door jambs, and columns. Install full length E-Studs or J-runners over shaft wall liner both sides of closure panels. Frame openings cut within a liner panel with J-Runner around perimeter. For openings, frame with vertical E-Stud or J-runner at edges, horizontal runner at head and sill, and reinforcing as shown on the drawings. Suitably frame all openings to maintain structural support for wall. Install floor-to-ceiling steel E-Studs or J-runners each side of elevator door frames to act as strut-studs. Attach strut-stud to floor and ceiling runners with two (2) 3/8" Type S screws, space twelve (12) inches o.c. Over metal doors, install a cut to

length section of runner and attach to strut-studs with clip angles and 3/8" Type S Screws space twelve (12) inches o.c.

- D. Wallboard Installation - Double Layer Installation: Erect gypsum wallboard base layer vertically or horizontally to meet fire rating on one side of studs with end joints staggered. Fasten base layer panels to studs with one (1) inch Type S screws twenty-four (24) inches o.c. Caulk perimeter of base layer panels. Apply gypsum wallboard face layer vertically over base layer with joints staggered and attached with 1-5/8" Type S screws staggered from those in base, spaced eight (8) inches o.c. and driven into studs.
- E. Wallboard Installation (Where Both Sides of Shaft Wall are Finished): Apply gypsum wallboard face layers vertically both sides of studs. Stagger joints on opposite partition sides. Fasten panels with one (1) inch or two (2) inches Type S screws spaced eight (8) inches o.c. in field and along edges into studs.
- F. Cants: Provide one (1) inch thick shaft wall liner, cut to suit condition, at beams and other projections wider than two (2) inches in elevator shafts. Cants shall slope seventy-five (75) degrees from the horizontal. Screw attach shaft wall liner to the vertical metal studs.
- G. Support elevator hoistway door frames independently of drywall shaft framing system, or reinforce system in accordance with system manufacturer's instructions.
- H. Where handrails are indicated for direct attachment to drywall shaft system, provide not less than a sixteen (16) ga. x eight (8) inches wide galvanized steel reinforcement strip, accurately positioned and secured to studs and concealed behind not less than one 1/2" thick course of gypsum board in the system.
- I. Integrate stair hanger rods with drywall shaft system by locating cavity of system as required to enclose rods.
- J. Horizontal Shaftwall Duct and Ceiling Assemblies: Provide I-stud cavity shaftwall system for horizontal duct protection consisting of I-studs 24" o.c. with 1" fire-rated shaft liner panels inserted in the stud tabs, and three layers of 1/2" firecode C gypsum board attached to the stud flanges opposite the shaft liner panels.

3.7 ERECTION AT COLUMN ENCLOSURES

- A. Metal furring supports shall be provided under work of this Section, and shall be cut to lengths as necessary for tight fit such that spacing is not more than sixteen (16) inches o.c.
- B. Board shall be fastened securely to supports with screws as specified. Place boards in position with minimum number of joints. Where free ends occur between supports, back-blocking or furring shall be required. Center abutting ends over supports. Correct work as necessary so that faces of boards are flush, smooth and true. Provide clips or cross furring for attachment as required.
- C. All layers shall be screw attached to furring.
- D. When column finish called for on drawings to be in the same plane as drywall finish layer, maintain even, level plane.

3.8 FINISHING

- A. Taping: A thin, uniform layer of compound shall be applied to all joints and angles to be reinforced. Reinforcing tape shall be applied immediately, centered over the joint, seated into the compound. A skim coat shall follow immediately, but shall not function as a fill or second coat. Tape shall be properly folded and embedded in all angles to provide a true angle.

- B. Filling: After initial coat of compound has hardened, additional compound shall be applied, filling the board taper flush with the surface. The fill coat shall cover the tape and feather out slightly beyond the tape. On joints with no taper, the fill coat shall cover the tape and feather out at least four (4) inches on either side of the tape. No fill coat is necessary on interior angles.
- C. After compound has hardened, a finishing coat of compound shall be spread evenly over and extending slightly beyond the fill coat on all joints and feathered to a smooth, uniform finish. Over tapered edges, the finished joint shall not protrude beyond the plane of the surface. All taped angles shall receive a finish coat to cover the tape and taping compound, and provide a true angle. Where necessary, sanding shall be done between coats and following the final application of compound to provide a smooth surface, ready for painting.
- D. Fastener Depressions: Compound shall be applied to all fastener depressions followed, when hardened by at least two (2) coats of compound, leaving all depressions level with the plane of the surface.
- E. Finishing Beads and Trim: Compound shall be applied to all bead and trim and shall be feathered out from the ground to the plane of the surface. When hardened, this shall be followed by two (2) coats of compound each extending slightly beyond the previous coat. The finish coat shall be feathered from the ground to the plane of the surface and sanded as necessary to provide a flat, smooth surface ready for decoration.
- F. Except as otherwise noted, level of finish for surface exposed to view shall conform to Level 4 of ASTM C 840 and GA-214 of the Gypsum Association.
 - 1. For drywall boards with fiberglass facing, at curved walls, wallcovering and at vinyl graphics, provide Level 5 finish of ASTM C 840 and GA-214.
- G. Drywall construction with defects of such character which will mar appearance of finished work, or which is otherwise defective, will be rejected and shall be removed and replaced at no expense to the Owner.

3.9 CLEANING AND ADJUSTMENT

- A. At the completion of installation of the work, all rubbish shall be removed from the building leaving floors broom clean. Excess material, scaffolding, tools and other equipment shall be removed from the building.
- B. Work shall be left in clean condition ready for painting or wall covering. All work shall be as approved by Architect.
- C. Cutting and Repairing: Include all cutting, fitting and repairing of the work included herein in connection with all mechanical trades and all other trades which come in conjunction with any part of the work, and leave all work complete and perfect after all trades have completed their work.

3.10 PROTECTION OF WORK

- A. Installer shall advise Contractor of required procedures for protecting drywall work from damage and deterioration during remainder of construction period.

END OF SECTION

SECTION 093000

TILE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the ceramic tile as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Ceramic floor tile.
 - 2. Colored body porcelain wall tile.
 - 3. Setting beds, grout and sealant.
 - 4. Metal trims and joints.
 - 5. Bond break underlayments.

1.3 RELATED SECTIONS

- A. Concrete - Section 033000.
- B. Gypsum Drywall - Section 092900.
- C. Cement Leveling Compound - Section 035416.

1.4 REFERENCES

- A. ANSI A108 Series/A118 Series - American National Standards for Installation of Ceramic Tile.
- B. ANSI A136.1 - American National Standards for Organic Adhesives for Installation of Ceramic Tile.
- C. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
- D. ASTM C 150 - Standard Specification for Portland Cement.
- E. TCNA - Handbook for Ceramic, Glass and Stone Tile Installation; Tile Council of North America, latest 2017 Edition.
- F. ISO 13007 - International Standards Organization; classification for Grout and Adhesives.
- G. LFT Tile - Large Format Tile, tile 15" or larger in any one direction and/or 144 sq. inch in size.
- H. Stone Tile – Conform to requirements of MIA (Marble Institute of America) Dimension Stone Design Manual.

1.5 QUALITY ASSURANCE

- A. Qualifications of Installers: For cutting, installing and grouting of ceramic tile, use only thoroughly trained and experienced journeyman tile setters who are completely familiar with the requirements of this work, and the recommendations contained in the referenced standards, and the installers are Certified Ceramic Tile Installer (CTI) through the Ceramic Tile Education Foundation (CTEF) or Tile Installer Thin Set Standards (ITS) verification through the University of Ceramic Tile and Stone.
- B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with the following:
 - 1. Manufacture all tile in accordance with Standard Grade Requirements of ANSI A-137.1.
 - 2. Install all ceramic tile in accordance with the recommendations contained in Handbook for Ceramic, Glass and Stone Tile Installation of the Tile Council of North America, Inc., latest edition noted herein and ANSI A108/A118/A136.
- C. Flooring surfaces shall have a minimum wet DCOF AcuTest value of 0.42 and tested per ANSI A326.3 Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

1.1 SUBMITTALS

- A. Samples
 - 1. Before any ceramic tile is delivered to the job site, submit to the Architect sample panels, approx. 12" x 12", mounted on hardboard back-up with selected grout color for each color and pattern of ceramic tile and grout specified.
 - 2. Submit 6" length of stone saddles.
 - 3. Submit 12" long sections of all tile trim pieces and expansion joints.
 - 4. Submit 12" x 12" samples of waterproofing membrane.
- B. Master Grade Certificates: Prior to opening ceramic tile containers, submit to the Architect a Master Grade Certificate, signed by an officer of the firm manufacturing the ceramic tile used, and issued when the shipment is made, stating the grade, kind of tile, identification marks for tile containers, and the name and location of the project.
- C. Mock-ups
 - 1. At an area on the site where approved by the Architect, provide a mock-up ceramic tile installation.
 - a. Make the mock-up approximately 4 ft x 4 ft in dimension.
 - b. Provide one mock-up for each type, class, and color of installation required under this Section.
 - c. The mock-ups may be used as part of the Work, and may be included in the finished Work, when so approved by the Architect.
 - d. Revise as necessary to secure the Architect's approval.
 - 2. The mock-ups, when approved by the Architect, will be used as datum for comparison with the remainder of the work of this Section for the purposes of acceptance or rejection.

3. If the mock-up panels are not permitted to be part of the finished Work, completely demolish and remove them from the job site upon completion and acceptance of the work of this Section.

1.2 PRODUCT HANDLING

A. Delivery and Storage

1. Deliver all materials of this Section to the job site in their original unopened containers with all labels intact and legible at time of use.
2. Store all materials under cover in a manner to prevent damage and contamination. Store only the specified materials at the job site.

B. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.3 PROJECT CONDITIONS

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

C. Maintain temperatures at not less than 50 deg. F. in tiled areas during installation and for 7 days after completion.

1.4 ATTIC STOCK

A. Provide approximately one (1%) percent of extra stock of each type of tile.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
2. Obtain waterproof/crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Metal edge strips.

2.2 TILE

A. For all tiles, see Colors and Finishes Schedule for additional information. See Architectural Drawings for pattern requirements.

B. Floor Tile

1. F7.1 (Café)

- a. Porcelain; color "Slate Gray," finish "Matte," Era as manufactured by Tilebar, 24" x 48".
- b. Tile Grout: TBD; manufactured by Laticrete, or approved equal.
- c. Stone Saddle: TBD, honed finish, 3/4" thick.

2. F7.2 (Janitor's Closets)

- a. Porcelain; color "Slate Gray," finish "Matte," Era as manufactured by Tilebar, 12" x 24".
- b. Tile Grout: TBD; manufactured by Laticrete, or approved equal.
- c. Stone Saddle: TBD, honed finish, 3/4" thick.

C. Base Tile

1. B4.1 (Janitor's Closets)

- a. Ceramic tile; color "Arctic White 0790," finish "Matte," Linear as manufactured by Daltile, 4" x 16".
- b. Tile Grout: TBD; manufactured by Laticrete, or approved equal.

2. B4.2 (Prep Room)

- a. Ceramic tile; color "Arctic White 0790," finish "Matte," Linear as manufactured by Daltile, 4" x 16".
- b. Tile Grout: TBD; manufactured by Laticrete, or approved equal.

D. Wall Tile

1. CT1a (Café Counter Fascia): Color "Graphite," Enigma, manufactured by Tilebar, 2" x 8".

- a. Tile Grout: TBD; manufactured by Laticrete, or approved equal.

2. CT1b (Multipurpose Room backsplash): Color "Light Gray," Enigma, manufactured by Tilebar, 2" x 8".

- a. Tile Grout: TBD; manufactured by Laticrete, or approved equal.

3. CT2 (Café)

- a. CT2.a: Color "Tomato Red," finish "Gloss," Original Ceramic as manufactured by Fireclay Tile, 2" x 8".
- b. CT2.b: Color "Currant SH17," Linear Color Wheel, as manufactured by DalTile, 2" x 8".
- c. CT2.c: Color "Selenium Red," Emery, manufactured by Tilebar, 2" x 8".
- d. Tile Grout: TBD; manufactured by Laticrete, or approved equal.

4. CT3 (Janitor's Closet wainscot, up to 3'-4" A.F.F.)
 - a. CT3.a: Color "Arctic White 0790," finish "Matte," Linear as manufactured by DalTile, 4" x 12".
 - b. CT3.b: Color "Tea for Two / Satin," Color By Numbers as manufactured by Nemo, 4" x 12".
 - c. CT3.c: Color "White," Basic White as manufactured by Tilebar, 4" x 12".
 - d. Tile Grout: "88 Silver Shadow;" manufactured by Laticrete, or approved equal.

2.3 TRIM AND SPECIAL SHAPES

- A. Provide external and internal corners, trim shapes at openings, and all other trim and special shapes to match the tile specified herein, as required by field conditions and drawing details.

2.4 STONE SADDLES

- A. Provide sound, dark grey slate saddles as selected by the Architect, minimum 3/4" thick, with an abrasive hardness of not less than 10.0, when tested in accordance with ASTM C 241. Cut saddle to fit jamb profile, honed finish.

2.5 MORTAR BED, BOND COAT AND GROUT

- A. Portland Cement: ASTM C 150, Type I.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Sand: ASTM C 144, clean and graded natural sand.
- D. Reinforcing for Mud Set Systems: 2" x 2" x 16/16 ga. welded wire mesh.
- E. Latex Admixture for Mortar Bed
 1. MAPEI, Planicrete AC, blended with a 3:1 site mix.
 2. Laticrete 333.
 3. Pro Spec – Acrylic Additive.
 4. Custom – Custom Crete Thin Set Additive.
- F. Latex – Portland Cement Bond Coat, complying with ANSI A118.4 and ISO 13007, C2ES1P1 with minimum compressive strength of 400 psi.
 1. MAPEI, Keraflex Super.
 2. Laticrete; 211 dry-set mortar and 4237 latex admixture.
 3. Pro Spec – Permalastic System consisting o Permalastic Dryset Mortar and Permalastic Admixture
 4. Custom – Pro-Lite.
- G. Improved Modified Cement Mortars, complying with ANSI 118.15 and ISO 13007, CSES1P1.
(Also for use with LFT Tile and Stone Tile)
 1. Custom Building Products; Mega-Lite Crack Prevention Mortar (650-725 psi).

2. Laticrete; 220 Marble Granite Mortar (500-540 psi).
3. Mapei; Keraflex Super (400-600 psi).
4. Pro Spec; StayFlex 590 (460 psi).

H. Wall and Base Tile

1. Over drywall use ANSI A136.1-1967 Organic Adhesive for installation of Ceramic Tile, Type I and ISO 13007 D2TE. Shear strength shall be 50 psi minimum. Adhesive primer as recommended by adhesive manufacturer. Manufacturer shall certify, in writing, that adhesive and primer used are proper types for the intended tile types and application. Conform to TCNA Detail W-242.
 - a. MAPEI Type 1 Mastic.
 - b. Laticrete Premium 15 Adhesive.
 - c. ProSpec B-1000 Tile Adhesive.
 - d. Custom Relia Bond Adhesive
2. Over masonry and concrete use a mortar bed leveling coat conforming to ANSI A108.1A followed by a Latex Portland Cement Bond Coat, MAPEI, Keraflex Super, Custom Mega Flex or equal by Laticrete or Pro Spec, conforming to ANSI A118.4, ISO 13007-C2ES1P1, and TCNA Detail W-211.
3. Over cement board use a Latex Portland cement mortar bond coat, MAPEI, Keraflex Super, Custom Mega Flex or equal by Laticrete or Pro Spec, conforming to ANSI A118.4, ISO 13007-C2ES1P1, and TCNA Detail W-244; coat board with waterproof membrane as specified below.
4. Over glass mat water resistant gypsum backer board use a Latex Portland cement mortar bond coat, MAPEI, Keraflex Super, conforming to ANSI A118.4, ISO 13007-C2ES1P1, and TCNA Detail W-245.

I. Floor Tile and Stone Saddle - Mud Set: Set floor tile and stone saddle using Portland Cement mortar setting bed conforming to ANSI A108.1A and latex modified Portland cement bond coat, Basis of Design, MAPEI, Keraflex Super, conforming to ANSI A118.4, ISO 13007-C2ES1P1, and TCNA Detail F-112.

1. For installation of (LFT and Stone Tile), Improved Modified Cement Mortars and medium bed, Basis of Design, MAPEI, Ultraflex LFT conforming to ANSI 118.15, ISO 13007-C2ES1P1.

J. Floor Tile and Stone Saddle - Waterproof Setting Bed: Set floor tile and stone saddle using thin set latex Portland cement bond coat, Basis of Design, MAPEI, Keraflex Super, conforming to ANSI A118.4, ISO 13007-C2ES1P1, and waterproofing membrane conforming to TCNA Detail F-122/122A.

1. For installation of (LFT and Stone Tile), Improved Modified Cement Mortars and medium bed, Basis of Design, MAPEI, Ultraflex LFT conforming to ANSI 118.15, ISO 13007-C2ES1P1.

K. Water: Clean, fresh and suitable for drinking.

L. Trims: Schluter Systems tile trim as detailed; finish: Brushed Antique Bronze Anodized.

M. Grout complying with A118.7; and ISO 13007, CG2WAF: For grouting ceramic tile, provide a commercial Portland cement grout "Ultracolor Plus FA" (additive not required) made by MAPEI

or equal by Laticrete or Custom or approved equal; (addition not required); color as selected by the Architect. Add latex additive to grout made by same manufacturer as grout.

- N. Physical Properties: The setting beds and grouts must meet the following physical requirements:
1. Compressive Strength – 3000 psi min.
 2. Shear Bond Strength – 500 psi min.
 3. Water Absorption – 4.0% max.
 4. Service Rating (ASTM C 627) – Extra Heavy Duty.
- O. Sealer: Seal all grout joints and all unglazed tile using “Sealer’s Choice 15 Gold” by Aqua Mix Inc or “Ultracare Penetrating Plus Stone, Tile, and Grout Sealer” by MAPEI.
- P. Temporary Protective Coating: Either product indicated below that is applied in the tile manufacturer’s factory and formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
1. Petroleum paraffin wax, applied hot, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg. F. per ASTM D 87.
 2. Grout release in form of manufacturer’s standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- Q. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, equal to “Concentrated Stone & Tile Cleaner” made by Aqua-Mix, “Ultracare Concentrated Tile & Grout Cleaner” by MAPEI, or approved equal, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.6 SEALANT

- A. Joint Backing: Preformed, compressible, resilient, non-extruding, non-staining strips of foam neoprene, foam polyethylene, or other material recommended by sealant manufacturer.
- B. Bond Breaker: Polyethylene tape, 3 mils thick or other material recommended by sealant manufacturer.
- C. Sealant Primer: Colorless, non-staining, or type to suit substrate surface, as recommended by sealant manufacturer.
- D. Sealant: One-part silicone based sanitary sealant, conforming to ASTM C 920, Type S, Grade NS, Class 25. Sealant hardness upon full cure shall be between 20-30 Shore "A" Durometer. Color of sealant to blend with or match adjacent materials, and as selected by the Architect. Sealant shall be equivalent to 1700 Sanitary Sealant made by General Electric or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where ceramic tile is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 CONDITION OF SURFACES

A. Allowable Variations in Substrate Levels

1. Floors: + 1/8" in 10'-0" distance and 1/4" total max. variation from levels shown.

B. Grind or fill concrete and masonry substrates as required to comply with allowable variations.

C. Concrete substrates must meet ANSI A108.01 tolerances and surface textures in preparation for tile work; coordinate with concrete trades.

3.3 PREPARATION

A. Etch concrete substrate as may be required to remove curing compounds or other substances that would interfere with proper bond of setting bed. Rinse with water to remove all traces of treatment. Surface must meet finish requirements as noted in ANSI 108.01.

B. Provide cement leveling over all existing concrete slabs to create new level surface; see Section 035416.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at project site before installing.

D. Field Applied Temporary Protective Coating: Pre-coat tile with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.4 JOINTS IN TILE WORK

A. Joint Widths: 1/8" wide in ceramic tile.

B. Alignment: Wall, base and floor joints shall align through the field and trim. Direction and location of all joints as directed by Architect.

C. Movement Joints: Conform to TCNA Detail EJ171. Locate where movement joints are in back-up material. Provide movement joint at joints between mop receptors and ceramic tile. Provide movement joint at all vertical internal joints of wall tile. Movement joints 1/8" wide in ceramic tile. Fill all movement joints with specified backing and sealant. Use bond breaker where sufficient space for joint backing does not exist.

1. Provide sealant between ceramic tile and plumbing fixtures, mirrors, pipes, countertops and other dissimilar materials penetrating or adjacent to ceramic tile.

3.5 INSTALLATION

A. Comply with the following installation standards

1. Wall tile over drywall using organic adhesive - ANSI A136.1 and ISO 13007, D2TE.
2. Wall tile over cement board or glass mat backer board using dry set mortar with latex additive - ANSI A118.4 and ISO 13007, C2ES1P1.
3. Wall tile over masonry or concrete using dry set mortar with latex additive - ANSI A118.4 and ISO 13007, C2ES1P1.
4. Floor tile using full mud set mortar - ANSI A118.4, A228.15, and ISO 13007, C2ES1P1.

5. Floor tile using dry set mortar with latex additive - ANSI A118.4, A118.15, and ISO 13007, C2ES1P1.
- B. Backs of tile must be cleaned before installation.
 - C. All setting beds and/or adhesives shall provide for an average contact area of not less than 95% coverage.
 - D. Allowable Variations in Finished Work: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes and alignment shown.
 1. Floors: 1/8" in 10'-0" run, any direction; +/- 1/8" at any location; 1/32" offset at any location.
 2. Walls: 1/8" in 8'-0" run, any direction; 1/8" at any location; offset at any location, 1/32".
 3. Joints: +/- 1/32" joint width variation of any location; 1/16" in 3'-0" run deviation from plumb and true.
 - E. Handle, store, mix and apply setting and grouting materials in compliance with the manufacturer's instructions.
 - F. Extend tile work into recesses and under equipment and fixtures, to form a complete covering without interruptions. Terminate work neatly at obstructions, edges and corners without disruption of pattern or joint alignment.
 - G. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight, aligned joints. Fit tile closely to electrical outlets, piping and fixtures so that plates, collars, or covers overlap tile.
 - H. Lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are the same size. Lay out tile work and center tile fields both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths.

3.6 CLEANING AND PROTECTION

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 1. Remove grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use cleaners only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning to insure removal of all cleaning material.
 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. Apply coat of sealer to all grout joints and all unglazed tile.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

- D. Before final inspection, remove protective coverings from tile surfaces.
- E. Leave finished installation clean and free of cracked, chipped, broken, unbonded or otherwise defective tile work.

END OF SECTION

SECTION 095113

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the acoustical panel ceilings as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Acoustical panel units.
 - 2. Exposed "T" suspension system, including hangers and inserts, clip angles, rods and steel channels.
 - 3. Provisions for the installation of lighting fixtures, diffusers, grilles and similar items provided under other Sections.
 - 4. Cutting, drilling, scribing and fitting as required for electro-mechanical penetrations.
 - 5. Perimeter and column moldings, trim and accessories for acoustical ceilings.

1.3 RELATED SECTIONS

- A. Steel Deck - Section 053100.
- B. Drywall ceilings - Section 092900.
- C. HVAC - Division 23, for diffusers, grilles and related frames.
- D. Electrical - Division 26, for lighting fixtures.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations published by the Ceilings and Interior Systems Contractor's Association.
- B. Qualifications of Installers
 - 1. The suspended ceiling subcontractor shall have a record of successful installation of similar ceilings acceptable to Architect and shall be currently approved by the manufacturer of the ceiling suspension system.
 - 2. For the actual fabrication and installation of all components of the system, use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.
- C. The work is subject to the following standards:

1. ASTM C 635 "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings," American Society for Testing and Materials.
 2. ASTM C 636 "Standard Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels," American Society for Testing and Materials.
- D. In addition to suspension system specified, provide seismic struts and seismic clips to meet seismic standards as required by prevailing Codes and Ordinances.
- E. All ceiling and suspension system shall comply with all of the following NY State Building Codes as required by Project Conditions.

1.5 SUBMITTALS

- A. Shop Drawings: Submit completely dimensioned ceiling layouts for all areas where acoustical ceilings are required, showing:
1. Any deviations from Architect's reflected ceiling plan layouts, especially lighting fixture and dimensions. Also indicate if any light fixtures will not fit into Architect's ceiling layout due to dimensional restrictions or field conditions.
 2. Direction and spacing of suspension members and location of hangers for carrying suspension members.
 3. Direction, sizes and types of acoustical units, showing suspension grid members, and starting point for each individual ceiling area.
 4. Moldings at perimeter of ceiling, at columns and elsewhere as required due to penetrations or exposure at edge of ceiling tiles.
 5. Location and direction of lights, air diffusers, air slots, and similar items in the ceiling plane.
 6. Details of construction and installation at all conditions.
 7. Materials, gauges, thickness and finishes.
- B. Samples and Product Literature: Submit the following samples and related manufacturer's descriptive literature.
1. Twelve (12) inch long components of suspension systems, including moldings.
 2. Acoustical units — full size.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

- A. Do not install acoustical ceilings until wet-work in space is completed and nominally dry, work above ceilings has been completed, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.8 COORDINATION

- A. Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, fire suppression system components, and partition system.

1.9 EXTRA STOCK

- A. Extra Stock: Deliver stock of maintenance material to Owner. Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.
 - 1. Acoustical Ceiling Units: Furnish quantity of full size units equal to 2.0% of amount installed.

PART 2 PRODUCTS

2.1 ACOUSTICAL PANELS

- A. Acoustical Ceiling Tile (C2)
 - 1. ACT (C2.1): Ultima by Armstrong or equal by USG or CertainTeed; Size: 24" x 24".
 - 2. ACT PLANK SYSTEM (C2.2): Optima by Armstrong or equal by USG or CertainTeed. Size: 24" x length indicated on drawings.
 - 3. ACT SCRUBBABLE (C2.3): Ultima Health Zone by Armstrong or equal by USG or Rockwool Rockfon. Size: 24" x 48".
- B. Large-Format Acoustical Panels (C3): Provide "Altitudes Torsion Spring" as manufactured by Armstrong or equal made by Claro by Decoustics or by USG. 100% accessible. Size: 48" x 48".
- C. Trim: Axiom by Armstrong or equal.
- D. Suspension System: Prelude 15/16" exposed tee grid system by Armstrong or equal by USG or Chicago Metallic Corp.; Color: White.

2.2 ACOUSTICAL SHAPED CEILING SYSTEMS

- A. Basis of Design: "Soundscapes Shapes" fiberglass baffle by Armstrong World Industries, Inc.
 - 1. Sizes: As scheduled.
 - 2. Color: White.
 - 3. Acoustical Performance: Sound absorption of 1.38 Sabins psf.
 - 4. Suspension System Product: "Hanging Kit 5450.

2.3 SUSPENSION SYSTEMS, GENERAL

- A. The suspension system shall support the ceiling assembly shown on the drawings and specified herein, with a maximum deflection of 1/360 of the span, in accordance with ASTM C 635.
- B. Provide ceiling clips and inserts to receive hangers, type as recommended by suspension system manufacturer, sizes for pull-out resistance of not less than five (5) times the hanger design load, as indicated in ASTM C 635.
- C. Suspension systems shall conform to ASTM C 635, intermediate duty.
- D. Provide manufacturer's standard wall moldings with off-white baked enamel finish to match suspension systems. For circular penetrations of ceilings, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas where acoustical panel ceilings are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected to permit proper installation of the layout.

3.2 PREPARATION

- A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.
- B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION

- A. Codes and Standards: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations and industry standards.
- B. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members. Locate hangers not more than 6" from each end, leveling to tolerance of 1/8" in 12'-0".
- C. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, reinforcing, countersplaying or other equally effective means.
- D. Install edge moldings at edges of each acoustical ceiling area, and at locations where edge of acoustical units would otherwise be exposed after completion of the work.
 - 1. Secure moldings to building construction by fastening through vertical leg. Space holes not more than 3" from each end and not more than sixteen (16) inches o.c. between end holes. Fasten tight against vertical surfaces.
 - 2. Level moldings with ceiling suspension system, to a level tolerance of 1/8" in 12'-0".

- E. Install acoustical units in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.
- F. Install hold-down clips in toilet areas, and in areas where required by governing regulations; space 2'-0" o.c. on all cross tees.
- G. Light fixtures or other ceiling apparatus shall not be supported from main beams or cross tees if their weight causes the total load to exceed the deflection capability of the ceiling suspension system. In such cases the load shall be supported by supplemental hangers furnished and installed by this Section of work.
- H. Where fixture or ceiling apparatus installation causes eccentric loading on runners, provide stabilizer bars to prevent rotation.

3.4 ADJUST AND CLEAN

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge molding, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 095426

SUSPENDED WOOD CEILINGS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the wood ceilings, as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Suspended wood ceiling system.
 - 2. Complete suspension system including clip rail system.

1.3 RELATED SECTIONS

- A. Architectural Woodwork - Section 064023.

1.4 SUBMITTALS

- A. Shop Drawings: Submit ceiling sections and completely dimensioned ceiling layouts for all areas where wood panel ceilings are required, showing:
 - 1. Any deviations from reflected ceiling plan layouts on the drawings, especially lighting fixture and dimensions. Also indicate if any light fixtures will not fit into ceiling layout due to dimensional restrictions or field conditions.
 - 2. Direction and spacing of suspension members and location of hangers for carrying suspension members.
 - 3. Direction, sizes and types of wood panel units, showing suspension grid members and starting point for each individual ceiling area.
 - 4. Moldings at ceiling perimeters and penetrations.
 - 5. Location and direction of lights, diffusers, and similar items in the ceiling plane.
 - 6. Movement joint and butt joint locations.
 - 7. Access panel locations.
 - 8. Details of construction and installation at all conditions.
 - 9. Materials, gauges, thickness and finishes.
- B. Samples: Submit samples, including manufacturer's descriptive literature for:
 - 1. All components of suspension systems, including moldings.

2. Wood ceiling panel assembly, 24" square, stained to match Architect's selected color.

1.5 QUALITY ASSURANCE

A. Qualifications of Installers

1. The suspended ceiling subcontractor shall have a record of successful installation of similar ceilings acceptable to the Architect and shall be currently approved by the manufacturer of the ceiling suspension system.
2. For the actual fabrication and installation of all components of the system, use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations published by the Ceilings and Interior Systems Contractors' Association (CISCA).

C. Fire Performance Characteristics: Wood acoustical ceiling panels shall be constructed using fire retardant core components meeting or exceeding the requirements of ASTM E 84 Class A.

D. Prior to Submittals meet at project site with ceiling subcontractor, General Contractor, wood ceiling manufacturer's representative, installers of related work including mechanical, electrical, sprinkler and fire alarm subcontractors, and the Architect to review methods and procedures associated with ceiling work.

E. Mockups: Before installing linear wood ceilings build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockups for ceiling sections in sizes and locations indicated in the drawings.
2. Notify Architect seven days in advance of dates and times when mock-ups will be constructed.
3. Obtain Architect's approval of mock-ups prior to starting linear wood ceiling fabrication.
4. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work.
5. Demolish and remove mock-up when requested.
6. Approved mock-ups may become part of the completed Work if allowed by the Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood ceiling materials to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, or other causes.
- B. Handle wood panel units carefully to avoid damaging units in any way.
- C. Material must be stored and installed only in a secure ambient environment with humidity a minimum of 25% and maximum of 55% and temperature between 50°F and 86°F.
- D. Ceiling system materials shall be stored flat and level in a fully enclosed space. For a minimum of seventy-two (72) hours immediately prior to ceiling installation, the linear wood strips shall be

stored in the room in which they will be installed. The temperature and humidity of the room shall closely approximate those conditions that will exist when the building is occupied. The linear wood strips shall be stored off the floor.

1.7 COORDINATION

- A. Coordinate layout and installation of wood ceiling and suspension system components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, fire suppression system components (if any), and partition system.

1.8 WARRANTIES

- A. Manufacturer: All materials supplied by the manufacturer of the ceiling system shall be guaranteed against manufacturing defects for one (1) year. Because of differing site conditions, wood stains and colorings can vary with age, and are excluded from this warranty.
- B. Contractor: All work shall be guaranteed for one (1) year from final acceptance of completed work.

PART 2 PRODUCTS

2.1 SUSPENDED WOOD CEILING

- A. Product: Provide Rulon International "Aluratone A900 with Edgebanding" or comparable product by Architectural Components Group, Inc., or approved equal
 1. The wood panels shall be made from fire-retardant particleboard with face-cut veneers of type to be selected by the Architect, with a clear semi-gloss coating.
 2. Style: Micro-grooved.
 3. Panel Size: As indicated on the drawings.
 4. Face Groove Spacing: 2mm "U" Grooves at 10mm o.c. on face.
 5. Ends of panels shall be finished to match other exposed faces.
 6. Wood Veneer Finish: Custom finish to match White Oak control sample.
 7. Panel Backing: Black acoustical felt integral to panel.
 8. Perimeter trim at recessed light fixtures and diffusers shall be finished to match other exposed faces.
 9. Factory cut openings for lighting.
 10. Provide and install 2" thick, black rigid acoustic board, Owens Corning Select Sound or equal to support grid openings unless otherwise noted.
 11. Suspension System: Torsion spring.
- B. Edges, Borders, and Perimeter Trims: Provide spacers, edge bands, borders and perimeter trims as detailed. All wood ceiling products specified shall be supplied by the ceiling manufacturer.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas where linear wood ceilings are to be installed and correct any of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

- A. Ceiling Layout: Measure ceiling areas prior to installation to confirm application and establish the layout of the hangers and carriers, in accordance with installation instructions.
- B. Coordination: Furnish the layout for supports that shall be installed for suspension of ceilings, and coordinate with other trades the location of devices which will penetrate the ceiling panels or interfere with the installation. Recessed or surface devices located within the ceiling panels are to be located and cut in the field.
- C. Work Area: The work area is to be fully-enclosed and the HVAC systems must be functioning and in continuous operations. All wet work (plastering, concrete, etc.) must be complete and dry.

3.3 INSTALLATION

- A. General: Install materials in accordance with the manufacturer's printed instructions. The installation shall comply with applicable regulations and industry standards.
- B. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, reinforcing, countersplaying or other equally effective means.
- C. Install edge moldings at edges of each wood ceiling area, and at locations where edge of ceiling units would otherwise be exposed after completion of the work.
 - 1. Secure moldings to building construction by fastening through vertical leg. Space holes not more than 3" from each end and not more than 16" o.c. between end holes. Fasten tight against vertical surfaces.
 - 2. Level moldings with ceiling suspension system, to a level tolerance of 1/8" in 12'-0".
- D. Install ceiling units in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.
- E. Install hold-down clips in areas where required by governing regulations; space 2'-0" o.c. on all cross tees.
- F. Light fixtures or other ceiling apparatus shall not be supported from main beams or cross tees if their weight causes the total load to exceed the deflection capability of the ceiling suspension system. In such cases the load shall be supported by supplemental hangers furnished and installed by this Section of work.
- G. Where fixture or ceiling apparatus installation causes eccentric loading on runners, provide stabilizer bars to prevent rotation.
- H. Joints at wood strips to be staggered random pattern. No joints at wood strip runs of 8'-0" or less.

3.4 ADJUSTMENT, CLEANING, AND REPAIR

- A. Make final adjustments to level or contours.
- B. Upon completion of installation, all acoustical ceiling panels shall be cleaned free of dirt, dust, grease, oils, and fingerprints. Wood surfaces shall be wiped with furniture polish to enhance the surface finish.
- C. All work which cannot be successfully cleaned or repaired shall be removed and replaced.

END OF SECTION

SECTION 096500

RESILIENT TILE FLOORING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the resilient tile flooring, as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Tile.
 - 2. Rubber base.
 - 3. Transition strips.
 - 4. Accessories.

1.3 RELATED SECTIONS

- A. Concrete slab - Section 033000.
- B. Gypsum board partitions - Section 092900.
- C. Carpeting - Section 096800.

1.4 QUALITY ASSURANCE

- A. Qualifications of Installers: Use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

1.5 SUBMITTALS

- A. Manufacturer's Data: For information only, submit manufacturer's technical information and installation instructions for type of resilient tile.
- B. Samples
 - 1. Submit full-size sample tiles for each type and color required, representative of the expected range of color and pattern variation. Sample submittals will be reviewed for color, texture, and pattern only. Compliance with all other requirements is the exclusive responsibility of the Contractor.
 - 2. Submit six (6) inch long samples of base and strips.
- C. Submit manufacturer's warranty as noted herein.

1.6 DELIVERY AND STORAGE

- A. Deliver materials to the project site in the manufacturer's original unopened containers, clearly marked to indicate pattern, gauge, lot number and sequence of materials.
- B. Carefully handle all materials and store in original containers at not less than seventy (70) degrees F. for at least forty-eight (48) hours before start of installation.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F. or more than 95 deg F., in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F. or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

1.8 WARRANTY

- A. Provide manufacturers 5-year limited warranty.

PART 2 - PRODUCTS

2.1 TILE

- A. See finish schedule for more information.
 - 1. F3.a (Pantries): Provide "K001 Graphic Charcoal" Kayar as manufactured by Mondo, 12" x 12".
 - 2. F3.b (Pantries): Provide "6523 Road Trip" Noraplan Sentica as manufactured by Nora, 24" x 24".
 - 3. F3.c (Pantries): Provide "SRC4022 Turducken" Recycled Rubber + Cork as manufactured by Siena, 38" x 38".

2.2 BASE

- A. Rubber Base: 1/8" thick x 4" high continuous rubber with pre-formed internal and external corner pieces by Johnsonite ("Duracove") or approved equal. Provide cove and straight (toeless) bases, as specified per Finish Schedule

2.3 ACCESSORIES

- A. Adhesives: Waterproof, stabilized type, as recommended by the tile manufacturer for the type of service indicated based on a RH of 90%.

- B. Concrete Slab Primer: Non-staining type recommended by the tile manufacturer.
- C. Leveling Compound: Novoplan 2 made by Mapei, Ardex K-15 or approved equal.
- D. Edging Strips: 1/8" thick, homogeneous vinyl or rubber composition, tapered or bullnose edge, color as selected by the Architect from manufacturer's standards.
- E. Finish
 - 1. Cleaner shall be equal to "Super Shine All" made by Hillyard Chemical Co., or approved equal.
 - 2. Wax shall be equal to "Super Hil-Brite" made by Hillyard Chemical Co., or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where resilient tile flooring is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 CONDITION OF SURFACES

- A. Allowable Variations in Substrate Levels (Floors): $\pm 1/8$ " in 10'-0" distance and 1/4" total maximum variation from levels shown.
- B. Grind or fill concrete substrates as required to comply with allowable variation.

3.3 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb. of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum **75** percent relative humidity level.

- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.4 TILE INSTALLATION

- A. Install tile only after all finishing operations, including painting, have been completed and permanent heating system is operating. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by tile manufacturer.
- B. Place tile units with adhesive cement in strict compliance with the manufacturer's recommendations. Butt tile units tightly to vertical surfaces, thresholds, nosings and edgings. Scribe around obstructions and to produce neat joints, laid tight, even and in straight, parallel lines. Extend tile units into toe spaces, door reveals, and into closet and similar openings.
- C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on the finish tile as marked in the subfloor. Use chalk or other non-permanent marking devices.
- D. Lay tile from center marks established with principal walls, discounting minor off-sets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.
- E. Match tiles for color and pattern by using tile from cartons in the same sequence as manufactured and packaged. Cut tile neatly to and around all fixtures. Broken, cracked, chipped or deformed tile is not acceptable.
- F. Tightly cement tile to sub-base without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks through tile, or other surface imperfections.
- G. Lay tile with grain in all tile running in the same direction.
- H. Place resilient edge strips tightly butted to tile and secure with adhesive. Provide edging strips at all unprotected edges of tile, unless otherwise shown.
- I. Bases: In all spaces where base is indicated, install bases tight to walls, partitions, columns, built-in cabinets, etc., without gaps at top or bulges at bottom, with tight joints and flush edges, with molded corner pieces at internal and external corners. Provide end stops adjacent to flush type door frames and where base does not terminate against an adjacent surface. Keep base in full contact with walls until adhesive sets.

3.5 SHEET FLOORING INSTALLATION

- A. Install sheet flooring only after all finishing operations, including painting, have been completed and permanent heating system is operating. Moisture content of concrete slabs, building air

temperature and relative humidity must be within limits recommended by sheet flooring manufacturer.

- B. Flooring shall be installed to a tolerance of 1/8" in 10'-0" run; 1/32" offset at any location.
- C. Place sheet flooring with adhesive cement in strict compliance with the manufacturer's recommendations. Butt tightly to vertical surfaces, thresholds, nosings and edgings. Scribe around obstructions and to produce neat joints, laid tight, even and in straight, parallel lines.
- D. Lay sheet flooring to substrate without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.
- E. Lay sheet flooring to provide as few seams as possible. Match edges for color shading and pattern at seams in compliance with the manufacturer's recommendations, such as reversing adjoining sheets of the same roll, so that abutting edges are from the same edge of the roll.
- F. Weld seams in vinyl sheet flooring in compliance with the manufacturer's instructions to provide a "seamless" installation.

3.6 CLEANING AND PROTECTION

- A. Remove any excess adhesive or other surface blemishes from tile, using neutral type cleaners as recommended by the tile manufacturer. Protect installed flooring from damage by use of heavy Kraft paper or other covering.
- B. Finishing: After completion of the project and just prior to the final inspection of the work, thoroughly clean tile floors and accessories. Apply two (2) coats of wax and buff using materials as specified herein.

END OF SECTION

SECTION 096813

CARPET TILE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor materials, equipment and services necessary to complete the carpet tile as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Carpet tile.
 - 2. Rubber base.
 - 3. Rubber transition strip.
 - 4. Rubber stair nosing.
 - 5. Adhesive.

1.3 RELATED SECTIONS

- A. Cement Leveling Compound - Section 035416.
- B. Resilient Tile Flooring - Section 096500.
- C. Thin Set Epoxy Terrazzo - Section 096623.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Firm with not less than five (5) years of experience in installation of commercial carpeting of type, quantity and installation methods similar to work of this Section.
- B. General Terminology/ Information Standard: Refer to current edition of "Carpet Specifier's Handbook" by The Carpet and Rug Institute; for definitions of terminology not otherwise defined herein, and for general recommendations and information.
- C. Carpet used on Project must be from same dye lot for each carpet type.

1.1 SUBMITTALS

- A. Product Data: Submit manufacturer's complete technical product data for each type of carpet, cushion and accessory item required.
- B. Samples: Submit full size samples of carpet tile and six (6) inches long samples of each type exposed edge stripping.
- C. Certification: Submit manufacturer's certification stating that carpet materials furnished comply with specified requirements.

1. Include listing of mill register numbers for carpet furnished.
 2. Include supporting certified laboratory test data indicating that carpet meets or exceeds specified test requirements.
- D. Maintenance Data: Submit manufacturer's printed maintenance recommendations, including methods and frequency recommended for maintaining carpet in optimum conditions under anticipated traffic and use conditions.
- 1.2 EXTRA STOCK
- A. Produce and deliver to project at least five (5) percent overrun on calculated yardage. Provide required overrun exclusive of carpet needed for proper installation, waste and usable scraps.
- 1.3 PRODUCT DELIVERY AND STORAGE
- A. Deliver carpeting materials in original mill protective wrapping with mill register numbers and tags attached. Store inside, in well ventilated area, protected from weather, moisture and soiling.
- 1.4 WARRANTY
- A. Provide special project warranty, signed by Contractor and Manufacturer (Carpet Mill), agreeing to repair or replace defective materials and workmanship of carpeting work during two (2) year warranty period following substantial completion. Attach copies of product warranty.

PART 2 PRODUCTS

2.1 CARPET TILE

- A. Provide Milliken Naturally Drawn Collection
1. F1.1A:
 - a. Color
 - 1). Base: Natural.
 - 2). Accents: (1) Red, (1) Smoke.
 - b. Product: Open Air 418 Stria.
 - c. Manufacturer: Interface.
 - d. Location: 2nd floor offices, meeting room.
 - e. Tyler Williams-Molitor, (347) 331-5917.
 - f. tyler.williams.molitor@interface.com
 2. F1.1B:
 - a. Color
 - 1). Base: Oat.
 - 2). Accents: (1) Red, (1) Smoke.
 - b. Product: Open Air 418 Stria.
 - c. Manufacturer: Interface.
 - d. Location: 3rd and 4th floor offices, lounges, Touchdown.
 - e. Tyler Williams-Molitor, (347) 331-5917.
 - f. tyler.williams.molitor@interface.com
 3. F1.2:
 - a. Color
 - 1). Base: Granite.

- 2). Accents: (2) Red, (1) Smoke.
 - b. Product: Open Air 418 Stria.
 - c. Manufacturer: Interface.
 - d. Location: Corridor, department suite.
 - e. Tyler Williams-Molitor, (347) 331-5917.
 - f. tyler.williams.molitor@interface.com
4. F1.3:
- a. Color: Red.
 - b. Product: Open Ended.
 - c. Manufacturer: Interface.
 - d. Location: Multipurpose room, conference rooms, meeting room 225.
 - e. Tyler Williams-Molitor, (347) 331-5917.
 - f. tyler.williams.molitor@interface.com

2.2 ACCESSORIES

- A. Base: 4" high, 1/8" thick, continuous rubber, top set flat base with pre-formed internal and external corner pieces, color as selected by Architect.
- B. Rubber Transition Strip: 1/8" thick, homogeneous rubber, tapered or bullnose edge as per architectural drawings, color as selected by Architect.
- C. Rubber Stair Nosing: Roppe #16 Double Flange carpet nosing.
- D. Adhesive for Carpet Tile: Provide release type adhesive as recommended by the carpet tile manufacturer for use with carpet tile specified. Provide adhesive which complies with flame spread rating required for the carpet installation.
- E. Miscellaneous Materials: Provide the types of adhesives and tape, and other accessory items recommended by the carpet manufacturer and Installer for the conditions of installation and use.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where carpet tile is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PRE-INSTALLATION REQUIREMENTS

- A. Note that carpet is to be installed over a cement leveling compound. See Architectural Drawings for additional information and details of the installation.
- B. Floor shall be clean and free of cracks and protrusions. Any gaps or cracks more than 1/16" wide to be filled in with latex leveling compound. Protrusions must be sanded down smooth, the floor cleanly swept and vacuumed if necessary to remove all dust and grit.
- C. Floor temperature shall be 65 deg., at least 24 hrs. prior to installation; and 48 hrs. after carpet is installed.
- D. Conduct a moisture test. The presence of moisture in the concrete floor will interfere with the curing and subsequent performance of the adhesive. Conduct the test as follows:
 - 1. Drive a concrete nail a half inch into the floor. Then remove the nail.

2. Place a small amount of anhydrous calcium chloride or calcium sulphate crystals over the hole.
 3. Cover the crystals and the hole with a piece of flat glass and seal the edges with waterproof tape or putty. Since concrete pourings vary, repeat the test every 1500 sq. ft.
 4. Leave in place 72 hrs. Any color change in the crystals indicates the presence of moisture. Do not apply carpet until slab is free of moisture and meets with approval of carpet adhesive manufacturer.
- E. Sequence carpeting with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period.

3.3 INSTALLATION

A. General

1. Comply with manufacturer's instructions and recommendations. Maintain direction of pattern and texture, including lay of pile.
2. Adhere all tiles with a full spread of adhesive. Dry-fit cut tiles and apply adhesive to tile back after tile has been cut.
3. Tiles shall be installed in a monolithic corner to corner manner following arrows printed on back of each tile indicating pile direction. Tiles shall be installed to achieve patterns as directed by the Architect.
4. Vinyl reducer strips shall be used along any necessary open edges so as to maintain the fixed perimeter.

3.4 CLEANING UP

- A. Upon completion of the carpeting installation in each area, visually inspect all carpet installed in that area and immediately remove all dirt, soil, and foreign substance from the exposed face; inspect all adjacent surfaces and remove all marks and stains caused by the carpet installation; remove all packaging materials, carpet scraps, and other debris from the carpet installation to the area of the job site set aside for its storage.

3.5 PROTECTION

- A. In all areas, provide a temporary non-staining paper pathway in the direction of traffic.

END OF SECTION

SECTION 098300

ACOUSTICAL PLASTER FINISHES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the acoustical gypsum plastering as shown on the drawings and/or specified herein.
 - 1. Acoustical gypsum plaster ceilings.

1.3 RELATED SECTIONS

- A. Carpentry - Section 062000.
- B. Gypsum Drywall - Section 092900.
- C. Sprinklers - Division 21.
- D. Mechanical - Division 23.
- E. Electrical - Division 26.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualification: At least 3 years' experience fabricating and installing comparable work, employing skilled mechanics under competent supervision for all phases of the Work.
- B. Provide acoustical panels manufactured from recycled crushed glass and coated with plaster finish which has been tested to and achieved the following values:

<u>Test Method/Authority</u>	<u>Property</u>	<u>Value</u>
ASTM E 605	Density	1.8 lbs/sqft
ASTM E 84	Surface Burning Characteristics	15, 15
ASTM C 423	Sound Absorption	NRC = 0.55 - 0.75
ASTM E 761	Compression Strength	125 psi

- C. Provide testing results and procedures from an independent and accredited acoustical testing laboratory. Edges of test samples must be sealed with wooden or metal frames

1.5 SUBMITTALS

- A. Shop Drawings
 - 1. Base drawings on field measurements.

2. Show dimensioned ceiling plans at 1/4" = 1'-0" scale with seam and joint locations, cutout sizes and locations, anchor locations, relation to adjacent work; 3" = 1'-0" scale joint and mounting details, including relationships to edge trims, walls, fixtures, access doors.
- B. Product Data: Material types, weight/thickness, design, color; and other data necessary to fabricate and install work and coordinate work with affected trades.
 - C. Samples: 6" x 6" samples of each material.
 - D. Mock-up: Provide full-size mockup including 2 connections and prefabricated corners demonstrating different geometric corners and shapes for the Architect's approval.
 - E. Certification
 1. Acoustical Performance: Certified reports of acoustical performance tests conducted and/or witnessed by a recognized, independent, testing agency. Tests shall have been done by specified methods or recognized equivalent. Sound absorption tests shall be not more than three years old. Reports on earlier tests are acceptable if it can be established to the Architect's satisfaction, that they are valid indications of compliance with Project requirements.
 2. Fire Hazard: Evidence of compliance with regulatory agency and specifications requirements.
 - F. Cleaning and Maintenance Instructions: Recommendations for Owner maintenance and cleaning per Section 017300 requirements. Identify cleaning/spotting products generically or by trade name.
 - G. Manufacturer Qualifications: List comparable installations with 3-year (minimum) service histories. Describe installations and give Owner/building manager names and addresses.

1.6 REFERENCES

- A. ASTM C 423: Test for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- B. ASTM E 84: Test for Surface Burning Characteristics of Building Materials.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Allow materials to become acclimated to Project conditions before installation, if necessary to prevent sag and distortion during service life.

1.8 ENVIRONMENTAL CONDITIONS

- A. Work areas shall be at or near ambient occupancy temperature and relative humidity.
- B. Painting, dust-raising activities, and work that introduces dampness shall be completed.

PART 2 PRODUCTS

2.1 MATERIAL

- A. Basis of Design: Provide sound-absorptive acoustical finish system "StarSilent" by Pyrok, Inc., or comparable product by Armstrong, or approved equal. System shall consist of a sound absorbing panel made of recycled glass screwed into a rigid framing system. A base coat and a

finish coat shall be applied onto the supporting panels on site, per manufacturer's specifications. The top coat shall be troweled smooth to give the appearance of a smooth conventional plaster.

1. The Acoustical Plaster System shall consist of StarSilent sound absorbing, StarSilent Fix, Base coat and Finish Coat Plasters.
2. Plaster System shall be provided in a total system thickness (Sound Panels, Base and Top Finish Coat) of approximately 1.18-inches.
3. The Base and Top Finish coat shall be provided in the standard Pyrok, StarSilent "Natural White" color, or equal.
4. Provide manufacturer's standard trim as required for a complete installation.
5. Access doors used in the acoustical plaster system shall be trimless and have a 1-inch recessed door. Access Door model number 5020, sized as required, manufactured by Karp, Inc. or equal.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine areas where and conditions under which acoustical gypsum plastering is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected to permit the proper installation of the work.
- B. All substrates for the application shall not vary from plumb, level or smooth consistent curvature more than 1/4 inch in 12 feet.
- C. Verify that all mechanical and electrical services within area of application has been tested and approved, prior to commencement of application.

3.2 PREPARATION

- A. Examine substrate surfaces to receive acoustical plaster panel system.
- B. Building must be fully enclosed and weather tight.
- C. Do not apply finish coats when temperatures are below 55° F.
- D. Perform all patching and repairing of material required to be done due to cutting, etc. by other trades.

3.3 APPLICATION

- A. Apply in accordance with manufacturer's printed instructions:
 1. Install 1-1/2 inch cold rolled channel on 4-foot centers and 20 gauge 7/8-inch hot channel on 400 mm centers.
 2. Fasten StarSilent panels to ceiling or wall framing on 400 mm centers.
 3. Apply StarSilent fix to panel edges. Apply StarSilent Plan over fasteners and StarSilent Fix. Light sand next day.
 4. Sand over fasteners and panel seams.

5. Apply StarSilent finish coat in three or four light coats to achieve proper coverage. Each coat required to dry overnight before proceeding.

B. Coordinate work with other trades when work may be affected or have an impact on the installation.

3.4 CLEANING AND PATCHING

A. Remove fall out material immediately upon completion of the work in each area. Clean surfaces to remove evidence of soiling. Repair or replace damaged work surfaces to acceptable conditions.

B. Coordinate work with other work, to minimize possibility of damage to system resulting from performance of subsequent work. As other units of work are completed in each area, patch damaged areas or surfaces of insulation by patching procedures as required to provide acceptable results.

C. Provide natural or mechanical ventilation as required to properly cure the acoustical finish installation.

D. Dispose of all waste materials in a proper and legal manner.

END OF SECTION

SECTION 098413

ACOUSTIC WALL PANELS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the acoustic wall panels as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Fabric Covered 1" thick Acoustic Wall Panels.

1.3 RELATED SECTIONS

- A. Carpentry - Section 062000.
- B. Gypsum wallboard - Section 092900.
- C. Ceramic Tile - Section 093000.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualification: At least 5 years' experience fabricating and installing comparable work, employing skilled mechanics under competent supervision for all phases of the Work.

1.1 SUBMITTALS

- A. Shop Drawings/Product Data
 - 1. Base drawings on field measurements.
 - 2. Show dimensioned wall elevations with seam and joint locations, cutout sizes and locations, anchor locations, relation to adjacent work; large scale joint and mounting details; materials type, weight/thickness, design, color; and other data necessary to fabricate and install work and coordinate work with affected trades.
- B. Samples: Two 12" x 12" (minimum) panels in selected finish, showing seam, edge and cutout conditions.
- C. Certification
 - 1. Acoustical Performance: Certified reports of acoustical performance tests conducted and/or witnessed by a recognized, independent, testing agency. Tests shall have been done by specified methods or recognized equivalent. Sound absorption tests shall be not more than three years old. Reports on earlier tests are acceptable if it can be established to the Architect's satisfaction, that they are valid indications of compliance with Project requirements.

2. Fire Hazard: Evidence of compliance with regulatory agency and specifications requirements.

D. Cleaning and Maintenance Instructions: Recommendations for Owner maintenance and cleaning per Section 017300 requirements. Identify cleaning/spotting products generically or by trade name.

E. Manufacturer Qualifications: List comparable installations with 3-year (minimum) service histories. Describe installations and give Owner/building manager names and addresses.

1.2 REFERENCES

A. ASTM C 423 Test for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM E 84 Test for Surface Burning Characteristics of Building Materials.

1.3 DELIVERY, STORAGE AND HANDLING

A. Allow materials to become acclimated to Project conditions before installation, if necessary, to prevent sag and distortion during service life.

1.4 PROJECT CONDITIONS

A. Environmental Conditions

1. Work areas shall be at or near ambient occupancy temperature and relative humidity.

2. Painting, dust-raising activities, and work that introduces dampness shall be completed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide products manufactured by one of the following:

1. Fabritrak Systems Inc. (Basis of Design)

2. Fabric Wall (Alternate)

3. StretchWall Products Inc. (Alternate)

2.2 GENERAL

A. Field fabricate panels using track system, in sizes and configurations indicated; attach facing materials to cores to produce installed panels with visible surfaces fully covered and free from waves in fabric weave, wrinkles, sags, blisters, seams, adhesive or other foreign matter.

1. Fabricate back mounted panels in factory to exact sizes required to fit wall surfaces based on field measurements of completed substrates indicated to receive acoustical wall panels.

2. Where radius corners are indicated, attach facing material so there are no seams or gathering of material.

B. Dimensional Tolerances of Finished Units: Overall height and width of panels - plus or minus 1/16".

- C. Sound Absorption Performance: Provide acoustical wall panels with minimum noise reduction coefficients (NRC) indicated, as determined by testing per ASTM C 423 for mounting type specified under individual product requirements.
- D. Colors, Textures, and Patterns: refer to Colors and Finishes schedule on the architectural drawings for fabric number and color.

2.3 FABRIC COVERED ACOUSTICAL WALL PANELS

- A. Provide Stretch Fabric Wall Acoustic Panels with Class A flame spread rating per ASTM E84, acoustical absorption performance to meet ASTM C423. Fabric panels to be framed with extruded polymer extrusions. Core material is to be acoustical panel insulation with a fire-rated white muslin lining over insulation. For fabric name and colors to be used, see the Colors and Finishes Schedule on the Architectural Drawings.
- B. Manufacturer: Fabric Wall or approved equal

2.4 ACCESSORIES

- A. Back Mounting Accessories: Manufacturer's standard or recommended accessories for securely mounting panels of type and size indicated to substrates provided, and complying with the following requirements:
 - 1. Mechanically Mounted Edge Reinforced Panels: Metal panel clip and base support bracket system consisting of 2-part panel clips, with one part of each clip mechanically attached to back of panel and the other part to wall substrate, designed to support panels laterally; and base support brackets designed to support full weight of panels; with both designed to allow panel removal.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where acoustic wall panels are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. General
 - 1. Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, scribed to fit adjoining work accurately at borders and at penetrations. Comply with panel manufacturer's printed instructions for installation of panels using type of mounting accessories indicated or, if none indicated, as recommended by manufacturer.
 - 2. Construction Tolerances
 - a. Variation from Plumb and Level: +/- 1/16".
 - b. Variation of Joints from Hairline: Not more than 1/16".
 - 3. Move any electrical boxes, fire strobe light/horn or other device to the face of the panels. Cut edges of the fabric to be concealed by the fixture trim.

- B. Anchoring to Drywall: Anchor clips to unreinforced gypsum board with toggle or Molly anchors. Anchor clips to metal drywall framing with tapping sheet metal screws.
- C. Panels shall be pressed against wall and slid down engaging "Z" clips into wall brackets.
- D. Remove and replace panels that are damaged and are unacceptable to Architect.

3.3 ADJUSTING AND CLEANING

- A. Correct non-complying and damaged/defective Work. Replace work that cannot be satisfactorily repaired.
- B. Restretch and reinstall sagging and distorted fabric and correct other defects that occurred during normal service.
- C. Carefully and thoroughly clean completed work by vacuuming and/or other means. Remove soil, stains, loose threads.
- D. Protect work from soiling and other damage.

END OF SECTION

SECTION 099000

PAINTING AND FINISHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the drawings and/or specified herein, including, but not limited to, the following:
 1. Prime painting unprimed surfaces to be painted under this Section.
 2. Painting all items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.
 3. Painting all ferrous metal (except stainless steel) exposed to view.
 4. Painting all galvanized ferrous metals exposed to view.
 5. Painting interior concrete block exposed to view.
 6. Painting gypsum drywall exposed to view.
 7. Concrete sealer.
 8. Leveling compound.
 9. Painting of wood exposed to view, except items which are specified to be painted or finished under other Sections of these specifications. Back painting of all wood in contact with concrete, masonry or other moisture areas.
 10. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
 11. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers, lighting fixtures, and the like, which are exposed to view through these items.
 12. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
 13. Painting of any surface not specifically mentioned to be painted herein or on drawings, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, shall be included as though specified.

1.3 RELATED SECTIONS

- A. Shop priming is required on some, but not all of the items scheduled to be field painted. Refer to other Sections of work for complete description.

- B. Shop Coat on Machinery and Equipment: Refer to the Sections under which various items of manufactured equipment with factory applied shop prime coats are furnished, including, but not necessarily limited to, the following Sections. All items of equipment furnished with prime coat finish shall be finish painted under this Section.
 - 1. Plumbing - Division 22.
 - 2. Heating, ventilation and air conditioning - Division 23.
- C. Color Coding of Mechanical Piping and Electrical Conduits - Divisions 22 and 26.
 - 1. This Color Coding consists of an adhesive tape system and is in addition to painting of piping and conduits under this Section, as specified above.

1.4 MATERIALS AND EQUIPMENT NOT TO BE PAINTED

- A. Items of equipment furnished with complete factory finish, except for items specified to be given a finish coat under this Section.
- B. Factory-finished toilet partitions.
- C. Factory-finished acoustical tile.
- D. Non-ferrous metals, except for items specified and/or indicated to be painted.
- E. Finished hardware, excepting hardware that is factory primed.
- F. Surfaces not to be painted shall be left completely free of droppings and accidentally applied materials resulting from the work of this Section.

1.5 QUALITY ASSURANCE

- A. Job Mock-Up
 - 1. In addition to the samples specified herein to be submitted for approval, apply in the field, at their final location, each type and color of approved paint materials, applied 10 feet wide, floor to ceiling of wall surfaces, before proceeding with the remainder of the work, for approval by the Architect. Paint mock-ups to include door and frame assembly.
 - 2. These applications when approved will establish the quality and workmanship for the work of this Section.
 - 3. Repaint individual areas which are not approved, as determined by the Architect, until approval is received. Assume at least two paint mock-ups of each color and gloss for approval.
- B. Qualification of Painters: Use only qualified painters for the mixing and application of paint on exposed surfaces.
- C. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Architect in writing of any anticipated problems using the coating systems as specified with substrates primed by others.
- D. All paints must conform to the Volatile Organic Compounds (VOC) standards of prevailing codes and ordinances.

1.6 SUBMITTALS

A. Materials List

1. Before any paint materials are delivered to the job site, submit to the Architect a complete list of all materials proposed to be furnished and installed under this portion of the work.
2. This shall in no way be construed as permitting substitution of materials for those specified or accepted for this work by the Architect.

B. Samples

1. Accompanying the materials list, submit to the Architect copies of the full range of colors available in each of the proposed products.
2. Upon direction of the Architect, prepare and deliver to the Architect two (2) identical sets of Samples of each of the selected colors and glosses painted onto 8-1/2" x 11" x 1/4" thick material; whenever possible, the material for Samples shall be the same material as that on which the coating will be applied in the work.

C. Manufacturer's Recommendations: In each case where material proposed is not the material specified or specifically described as an acceptable alternate in this Section of these specifications, submit for the Architect's review the current recommended method of application published by the manufacturer of the proposed material.

D. Close out Submittal

1. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or plant manufacturer/supplier shall furnish a coating maintenance manual such as Sherwin Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, MSDS, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.7 PRODUCT HANDLING

A. Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at time of use.

B. Protection

1. Store only the approved materials at the job site, and store only in a suitable and designated area restricted to the storage of paint materials and related equipment.
2. Use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.
3. Use all means necessary to protect paint materials before, during and after application and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 EXTRA STOCK

A. Upon completion of this portion of the Work, deliver to the Owner an extra stock of paint equaling one (1) five-gallon container of each color and gloss used and each coating material used, with all such extra stock tightly sealed in clearly labeled containers.

1.9 JOB CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50 degrees F. and 90 degrees F., unless otherwise permitted by the paint manufacturer's printed instructions.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F. and 95 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.
- C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds eighty-five (85) percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.
- D. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 PRODUCTS

2.1 PAINT MANUFACTURERS

- A. Except as otherwise noted, provide the painting products listed for all required painting made by one of the manufacturers listed in the paint schedule (Section 2.4). These companies are Benjamin Moore, PPG Paints (PPG), Sherwin Williams (S-W), and ICP Building Solutions Group (SM). Comply with number of coats and required minimum mil thicknesses as specified herein.

2.2 MATERIALS

- A. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer and use only to recommended limits.
- B. Colors and Glosses: All colors and glosses shall be as selected by the Architect. Certain colors will require paint manufacturer to prepare special factory mixes to match colors selected by the Architect. Color schedule (with gloss) shall be furnished by the Architect.
- C. Coloring Pigment: Products of or furnished by the manufacturer of the paint or enamel approved for the work.
- D. Linseed Oil: Raw or boiled, as required, of approved manufacture, per ASTM D 234 and D 260, respectively.
- E. Turpentine: Pure distilled gum spirits of turpentine, per ASTM D 13.
- F. Shellac: Pure gum shellac (white or orange) cut in pure denatured alcohol using not less than four (4) lbs. of gum per gallon of alcohol.
- G. Driers, Putty, Spackling Compound, Patching Plaster, etc.: Best quality, of approved manufacture.
- H. Heat Resistant Paint: Where required, use heat resistant paint when applying paint to heating lines and equipment.

2.3 GENERAL STANDARDS

- A. The various surfaces shall be painted or finished as specified below in Article 2.4. However, the Architect reserves the right to change the finishes within the range of flat, semi-gloss or gloss, without additional cost to the Owner.
- B. All paints, varnishes, enamels, lacquers, stains and similar materials must be delivered in the original containers with the seals unbroken and label intact and with the manufacturer's instructions printed thereon.
- C. All painting materials shall bear identifying labels on the containers with the manufacturer's instructions printed thereon.
- D. Paint shall not be badly settled, caked or thickened in the container, shall be readily dispersed with a paddle to a smooth consistency and shall have excellent application properties.
- E. Paint shall arrive on the job color-mixed except for tinting of under-coats and possible thinning.
- F. All thinning and tinting materials shall be as recommended by the manufacturer for the particular material thinned or tinted.
- G. It shall be the responsibility of the Contractor to see that all mixed colors match the color selection made by the Architect prior to application of the coating.

2.4 SCHEDULE OF FINISHES

- A. High-Performance Coating on Exterior Galvanized Ferrous Metals
 - 1. Hot dipped galvanized surfaces shall be abraded prior to painting. Provide brush off blast using abrasive (sandblasting), as follows:
 - a. Surface Preparation: SSPC-SP16 Brush of Blast off Galvanized Metals.
 - b. Coat 1: Tnemec Series L69 Epoxoline at 4-6 mils DFT.
 - c. Coat 2: Tnemec Series 1095 EnduraShield at 2-3 mils DFT.
- B. High-Performance Coating on Exterior Non-Galvanized Ferrous Metals
 - Prime Coat: "Amercoat 68HS Epoxy Zinc-Rich Primer" by PPG; "Series 94-H₂O Hydro-Zinc" by Tnemec; "Organic Zinc Rich Primer V 170" by Benjamin Moore Corotech or "Zinc Clad II Plus Inorganic Zinc Rich Coating B69V212" by Sherwin Williams.
 - Second Coat: "Pitt Guard Rapid Coat Epoxy 95-245" by PPG; "Series 27WB Typoxy" by Tnemec; "Epoxy Mastic Coating V 160" by Benjamin Moore Corotech or "Macropoxy 646 Fast Cure Epoxy B58-600" by Sherwin Williams.
 - Third Coat: "Pitthane Ultra 95-812 (Gloss)" or "High Build 95-8800 (Semi-Gloss)" by PPG; "Series 1070V (gloss) Fluoronar" or "Series 1071V (semi-gloss) Fluoronar" by Tnemec; "Acrylic Aliphatic Urethane V 500 (Gloss)" or "V 510 (Semi-Gloss)" by Benjamin Moore Corotech or "Hi-Solids Polyurethane B65-300/350" by Sherwin Williams.
- C. Interior Ferrous Metal
 - Semi-Gloss Finish/Latex
 - Primer: Benj. Moore Ultra Spec-HP Acrylic Metal Primer (HP04)
PPG Devflex 4020 PF DTM Primer/Flat Finish
S-W Pro-Industrial Pro-Cryl Universal Primer B66-3100 Series
 - First Coat: Benj. Moore Ultra Spec HP DTM Acrylic Semi-Gloss (HP29)

PPG Pitt Glaze WB1 Pre-Catalyzed Semi-Gloss Epoxy 16-510
S-W Pro Industrial Acrylic Semi-Gloss, B66-650 Series
Second Coat: Benj. Moore Ultra Spec HP DTM Acrylic Semi-Gloss (HP29)
PPG Pitt Glaze WB1 Pre-Catalyzed Semi-Gloss Epoxy 16-510
S-W Pro Industrial Acrylic Semi-Gloss, B66-650 Series
a. Total DFT not less than: 4.0 mils

D. Interior Concrete Block

Eggshell Finish/Vinyl Acrylic Latex Over Filler

Block Filler: Benj. Moore Ultra Spec Masonry Int./Ext. High Build Block Filler (571)
PPG Speedhide HI Fill Latex Block Filler 6-15XI
S-W Pro Industrial Heavy-Duty Block Filler, B42-150
First Coat: Benj. Moore Ultra Spec 500 Interior Latex Eggshell (N538)
PPG Speedhide Zero Interior Latex Eggshell 6-4310XI
S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-1900 Series
Second Coat: Benj. Moore Ultra Spec 500 Interior Latex Eggshell (N538)
PPG Speedhide Zero Interior Latex Eggshell 6-4310XI
S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-1900 Series
a. Total DFT not less than: 10.9 mils

E. Interior Drywall

Flat Finish/Vinyl Acrylic Latex

Primer: Benj. Moore Ultra Spec 500 Interior Latex Primer (N534)
PPG Speedhide Zero Interior Latex Primer 6-4900XI
S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600
SM Primemaster Primer/Sealer
First Coat: Benj. Moore Ultra Spec 500 Latex Flat (N536)
PPG Speedhide Zero Interior Latex Flat 6-4110XI
S-W ProMar 200 Zero VOC Interior Latex Flat, B30-12600 Series
SM Scuffmaster MC2000
Second Coat: Benj. Moore Ultra Spec 500 Latex Flat (N536)
PPG Speedhide Zero Interior Latex Flat 6-4110XI
S-W ProMar 200 Zero VOC Interior Latex Flat, B30-12600 Series
SM Scuffmaster Ultra-Clear Gloss
a. Total DFT not less than: 3.6 mils

Eggshell Finish/ Scuff Resistant Latex

Primer: Benjamin Moore Ultra Spec 500 Interior Latex Primer (N534)
SM Primemaster Primer/Sealer

First Coat: Benjamin Moore Ultra Spec Scuff-X Latex Eggshell (485)
SM Scuffmaster MC2000

Second Coat: Benjamin Moore Ultra Spec Scuff-X Latex Eggshell (485)
SM Scuffmaster Ultra-Clear Gloss

Eggshell Finish/Vinyl Acrylic Latex

Primer: Benj. Moore Ultra Spec 500 Interior Latex Primer (N534)
PPG Speedhide Zero Interior Latex Primer 6-4900XI
S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600
First Coat: Benj. Moore Ultra Spec 500 Interior Latex Eggshell (N538)
PPG Speedhide Zero Interior Latex Eggshell 6-4310XI
S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-1900 Series
Second Coat: Benj. Moore Ultra Spec 500 Interior Latex Eggshell (N538)
PPG Speedhide Zero Interior Latex Eggshell 6-4310XI

- S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-1900 Series
- a. Total DFT not less than: 3.8 mils

F. Interior Painted Wood

Satin Finish/Latex

- Primer: Benj. Moore Advance Waterborne Int. Alkyd Primer (790)
PPG Seal Grip Int./Ext. Acrylic Universal Primer/Sealer 17-921
S-W Multi-Purpose Latex Primer/Sealer B51 Series
- First Coat: Benj. Moore Advance Waterborne Int. Alkyd Satin (792)
PPG Speedhide Zero Interior Latex Satin, 6-4410XI
S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-1900 Series
- Second Coat: Benj. Moore Advance Waterborne Int. Alkyd Satin (792)
PPG Speedhide Zero Interior Latex Satin, 6-4410XI
S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-1900 Series
- a. Total DFT not less than: 4.0 mils

Semi-Gloss Finish/Latex

- Primer: Benj. Moore Advance Waterborne Int. Alkyd Primer (790)
PPG Seal Grip Int./Ext. Acrylic Universal Primer/Sealer 17-921
S-W Multi-Purpose Latex Primer/Sealer B51 Series
- First Coat: Benj. Moore Advance Waterborne Int. Alkyd (793)
PPG Speedhide Zero Interior Semi-Gloss Latex, 6-4510XI
S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series
- Second Coat: Benj. Moore Advance Waterborne Int. Alkyd (793)
PPG Speedhide Zero Interior Semi-Gloss Latex, 6-4510XI
S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series
- a. Total DFT not less than: 3.8 mils

G. Primer for Fiberglass Faced Drywall:

- 1 coat Benjamin Moore 046 Fresh Start Acrylic Superior Primer
- 1 coat PPG Paints Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer 17-921
- 1 coat Pratt & Lambert "Suprime" Interior Latex Enamel Undercoater Z1013/F1013
- 1 coat Sherwin Williams "Builders Solution."

H. Concrete Sealer: Euclid; Luster Seal or comparable product by one of the following:

1. V-Seal
2. Seal-Krete
3. Or approved equal.

2.5 LEVELING COMPOUND

- A. Leveling Compound (for coating of concrete columns, concrete beams and bottom of concrete slabs where exposed to view): Provide USG Structo-lite Basecoat Plaster and three (3) coats of USG "Cover Coat Compound". Texture to be flat finish. Provide site mock-up for smoothing existing exposed rough concrete surfaces (underside of concrete slab).

2.6 EXISTING SURFACES TO BE PAINTED

- A. Existing surfaces shall be painted in accordance with schedule given in Article 2.4 herein except that first or prime coat may be eliminated where existing paint is sound. Where existing paint must be removed down to base material, provide first or prime coat as specified.

2.7 PIPING AND MECHANICAL EQUIPMENT EXPOSED TO VIEW

- A. Paint all exposed piping, conduits, ductwork and mechanical and electrical equipment. Use heat resisting paint when applied to heating lines and equipment. The Contractor is cautioned not to paint or otherwise disturb moving parts in the mechanical systems. Mask or otherwise protect all parts as required to prevent damage.
- B. Exposed Uncovered Ductwork, Piping, Hangers and Equipment: Latex Enamel Undercoater and one (1) coat Acrylic Latex Flat.
- C. Exposed Covered Piping, Duct Work and Equipment: Primer/Sealer and one (1) coat Acrylic Latex Flat.
- D. Panel Boards, Grilles and Exposed Surfaces of Electrical Equipment: Latex Enamel Undercoater and two (2) coats Latex Semi-Gloss.
- E. Equipment or Apparatus with Factory-Applied Paint: Refinish any damaged surfaces to match original finish. Do not paint over name plates and labels.
- F. All surfaces of insulation and all other work to be painted shall be wiped or washed clean before any painting is started.
- G. All conduit, boxes, distribution boxes, light and power panels, hangers, clamps, etc., are included where painting is required.
- H. All items of Mechanical and Electrical trades which are furnished painted under their respective Contracts shall be carefully coordinated with the work of this Section so as to leave no doubt as to what items are scheduled to be painted under this Section.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL WORKMANSHIP REQUIREMENTS

- A. Only skilled mechanics shall be employed. Application may be by brush or roller. Spray application only upon acceptance from the Architect in writing.
- B. The Contractor shall furnish the Architect a schedule showing when he expects to have completed the respective coats of paint for the various areas and surfaces. This schedule shall be kept current as the job progresses.
- C. The Contractor shall protect his work at all times and shall protect all adjacent work and materials by suitable covering or other method during progress of his work. Upon completion of the work, he shall remove all paint and varnish spots from floors, glass and other surfaces. He shall remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and shall leave his part of the work in clean, orderly and acceptable condition.
- D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide ample in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.
- E. Remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.

- F. All materials shall be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.
- G. Coverage and hide shall be complete. When color, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Owner.
- H. All coats shall be dry to manufacturer's recommendations before applying succeeding coats.
- I. All suction spots or "hot spots" in plaster after the application of the first coat shall be touched up before applying the second coat.
- J. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

3.3 PREPARATION OF SURFACES

- A. Existing Surfaces: Clean existing surfaces requiring paint or finishing, remove all loose and flaking paint or finish and sand surface smooth as required to receive new paint or finish. No "telegraphing" of lines, ridges, flakes, etc., through new surfacing is permitted. Where this occurs, Contractor shall be required to sand smooth and re-finish until surface meets with Architect's approval.
- B. General
 1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished shall be perfectly dry, clean and smooth.
 2. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
 3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.
- C. Metal Surfaces
 1. Weld Fluxes: Remove weld fluxes, splatters, and alkali contaminants from metal surfaces in an approved manner and leave surface ready to receive painting.
 2. Bare Metal: Thoroughly clean off all foreign matter such as grease, rust, scale and dirt before priming coat is applied. Clean surfaces, where solder flux has been used, with benzene. Clean surfaces by flushing with mineral spirits. For aluminum surfaces, wipe down with an oil free solvent prior to application of any pre-treatment.
 - a. Bare metal to receive high performance coating specified herein must be blast cleaned SSPC SP-6 prior to application if field applied primer; coordinate with steel trades furnishing ferrous metals to receive this coating to ensure that this cleaning method is followed.
 3. Shop Primed Metal: Clean off foreign matter as specified for "Bare Metal." Prime bare, rusted, abraded and marred surfaces with approved primer after proper cleaning of surfaces. Sandpaper all rough surfaces smooth.
 4. Galvanized Metal: Prepare surface as per the requirements of ASTM D 6386.

5. Metal Filler: Fill dents, cracks, hollow places, open joints and other irregularities in metal work to be painted with an approved metal filler suitable for the purpose and meeting the requirements of the related Section of work; after setting, sand to a smooth, hard finish, flush with adjoining surface.
- D. Gypsum Drywall Surfaces: Scrape off all projections and splatters, spackles all holes or depressions, including taped and spackled joints, sand smooth. Conform to standards established in Section 092900, "Gypsum Drywall."
- E. Wood Surfaces: Sand to remove all roughness, loose edges, splinters, or splinters and then brush to remove dust. Wash off grease or dirt with an approved cleaner. Fill all cracks, splits, nail holes, screw holes, and surface defects with putty after the priming coat has been applied. Putty shall be brought up flush with the surface and sanded smooth and touched-up with primer when dry.
- F. Block Masonry Surfaces: Thoroughly clean off all grit, grease, dirt mortar drippings or splatters, and other foreign matter. Remove nibs or projections from masonry surfaces. Fill cracks, holes or voids not filled under the "Masonry" Section, with Portland cement grout, and bag surface so that it has approximately the same texture as the adjacent masonry surface.
- G. Testing for Moisture Content: Contractor shall test all plaster, masonry, and drywall surfaces for moisture content using a reliable electronic moisture meter. Contractor shall also test latex type fillers for moisture content before application of top coats of paint. Do not apply any paint or sealer to any surface or to latex type filler where the moisture content exceeds seven (7) percent as measured by the electronic moisture meter.
- H. Touch-Up: Prime paint all patched portions in addition to all other specified coats.

3.4 MATERIALS PREPARATION

- A. Mix and prepare painting materials in strict accordance with the manufacturer's directions.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.
- D. Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied. Tint undercoats to match the color of the finish coat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

- A. Paint Gloss schedule
 1. Walls: Eggshell.
 2. Ceilings: Flat.
 3. Metal: Semi-Gloss.
- B. General
 1. Apply paint by brush or roller in accordance with the manufacturer's directions. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet

back, or high pile sheep's wool as recommended by the paint manufacturer for material and texture required.

2. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried. Sand between each enamel or varnish coat application with fine sandpaper, or rub surfaces with pumice stone, where required to produce an even, smooth surface in accordance with the coating manufacturer's directions.
3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to ensure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.
4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - a. "Exposed surfaces" is defined as those areas visible when permanent or built-in fixtures, convactor covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.
5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint, before final installation of equipment.
6. Paint the back sides of access panels, removable or hinged covers to match the exposed surfaces.
7. Finish doors on tops, bottoms, and side edges the same as the faces, unless otherwise indicated.
8. Enamel finish applied to wood or metal shall be sanded with fine sandpaper and then cleaned between coats to produce an even surface.
9. Paste wood filler applied on open grained wood after beginning to flatten, shall be wiped across the grain of the wood, then with a circular motion, to secure a smooth, filled, clean surface with filler remaining in open grain only. After overnight dry, sand surface with the grain until smooth before applying specified coat.

C. Scheduling Painting

1. Apply the first coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
2. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

D. Prime Coats: Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.

- F. "Touching-Up" of Factory Finishes: Unless otherwise specified or shown, materials with a factory finish shall not be painted at the project site. To "touch-up," the Contractor shall use the factory finished material manufacturer's recommended paint materials to repair abraded, chipped, or otherwise defective surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether to be painted or not, against damage by the painting and finishing work. Leave all such work undamaged. Correct any damages by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.
- B. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.7 CLEAN UP

- A. During the progress of the work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.
- B. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION

SECTION 099001

EXTERIOR CUPOLA PAINTING – CUPOLA (ADD ALT #1)

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Remove all existing coating from all surfaces. Provide manufacturer's recommended surface preparation including removal of metal oxide prior to paint application.
 - 2. Provide three-coat paint system including primer, intermediate coat with embedded mesh at metal cladding joints, and two finish coats.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 071400 – Fluid-Applied Waterproofing
- B. Section 076000 – Metal Roofing and Flashing
- C. Section 079201 – Joint Sealants

1.04 DEFINITIONS

- A. The word “paint” in this Section refers to substrate cleaners, fillers, sealers, primers, undercoats, enamels and other first, intermediate, last or finish coatings.
- B. The word “primer” in this Section refers to substrate cleaners, fillers, sealers, undercoats, and other first or intermediate coats beneath the last or finish coating.
- C. The words “finish paint” in this Section refers to the last or final coat and previous coats of the same material or product directly beneath the last or final coat.
- D. Finish Paint Systems: Finish paint and primers applied over the same substrate shall be considered a paint system of products manufactured or recommended by the finish coat manufacturer.
 - 1. Finish paint products shall meet or exceed specified minimum physical properties.

1.05 SUBMITTALS

- A. Submit the following items from the manufacturer.
 - 1. Samples and/or manufacturer's literature for all materials specified and proposed for use on this project, each properly labeled.
 - 2. Manufacturer's installation recommendations for all materials used on this project.

3. Certifications (in time to prevent delay in the work) by the producers of all materials that all materials supplied comply with all the requirements of these specifications and the appropriate standards.
 4. Maintenance requirements for waterproofing system.
- B. Field Survey Drawings: Survey existing surface to receive paint and provide annotated elevations or plans noting any damage that requires repair beyond surface preparation noted in this Specification. Provide photographs documenting damage.
- C. Painting Schedule: Cross-referenced Painting Schedule listing all exterior and interior substrates to be painted and specified finish paint type designation; product name and manufacturer, recommended primers and product numbers, and finish paint color designation for each substrate to be painted.
1. Designate exterior substrates by building name and number, substrate to be painted and surface location.
 2. Designate interior substrates by building name and number, floor, room name and number, and surface to be painted.
- D. Product Data Sheets: Manufacturer's published product data sheets describing the following for each finish paint product to be applied:
1. Percent solids by weight and volume, solvent, vehicle, weight per gallon, ASTM D 523 gloss/reflectance angle, recommended wet and dry film thickness, volatile organic compound (VOC) content in lbs/gallon, product use limitations and environmental restrictions, substrate surface preparation methods, directions and precautions for mixing and thinning, recommended application methods, square foot area coverage per gallon, storage instructions, and shelf-life expiration date.
 2. Manufacturer's recommended primer for each finish paint product and substrate to be painted.
 3. Manufacturer's complete range of available colors for each finish paint product to be applied.
- E. Finish Paint Type Samples: Two finish paint samples applied over recommended primers for each substrate to be painted.
1. Samples shall be in the designated color and specified ASTM D 523 reflectance.
 2. Label each sample with the following information:
 - a. Project number and Painting Schedule designation describing substrates and locations represented by the sample.
 - b. Finish paint and primer manufacturer, product names and numbers, finish paint color and reflectance.
 3. Leave a 1 inch wide exposed strip of unpainted substrate and each coat of primer and finish paint.
 4. Sample Sizes:
 - a. 4 inch by 8 inch flat sheets.
- F. Quality Control Submittals:

1. Test Reports: Furnish certified test results from an independent testing laboratory, showing that products submitted comply with the specifications, when requested by the Engineer.
 2. Certificates: Furnish certificates of compliance required under QUALITY ASSURANCE Article.
- G. Existing Exterior Paint Film Stripping and Removal Submittals:
1. Submit proposed materials and methods for removing existing paint films down to a clean and original undamaged substrate.
 - a. Depending upon the substrate to be stripped and thickness of paint films to be removed, acceptable methods of removal include hand or mechanical tools, pressure washing with water, heat or steam devices, chemical strippers and other appropriate methods.
 - b. More aggressive paint stripping and removal methods will not be accepted when less aggressive methods are equally effective with less damages.
 - c. Chemical Strippers: As recommended by a letter of approval by finish paint manufacturer.

1.06 PROJECT CONDITIONS

- A. Protect the existing building and its contents, exterior components not included in the work, interior finishes, and all site work against all risks associated with this work. Replace damaged components at no charge to the Owner and to the satisfaction of the Engineer using mechanics skilled in the appropriate trade, including all site work. The premises, including access drives and parking areas, shall be left in a neat, clean, and safe condition at the end of each day's work.
- B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit painting system to be installed according to manufacturer's written instructions and warranty requirements.

1.07 PRE-INSTALLATION CONFERENCE

- A. Prior to beginning work on the submittals or the mock-ups, a qualified technical representative from the painting contractor and paint system manufacturer shall attend a pre-work meeting at the site with the contractor and Engineer to review project scope, submittals, and schedule.

1.08 MOCKUPS

- A. Mockups: Perform the following mockups on the building, at locations approved by the Engineer in advance. Coordinate with other trades as required. Notify the Engineer at least 48 hrs before starting the work on each mockup. Reconstruct each mockup as many times as necessary to meet the approval of the Engineer. Do not proceed with any part of the work before the mockup is approved by the Engineer. Mockups will be used to establish both technical and aesthetic standards for the remainder of the project. The approved mockup sample may become part of the final installation.
 1. 5 SF of existing coating removal. Removal must include areas with inside corners and details.
 2. 5 SF of paint system application including paint installation at decorative feature and over metal seam.

1.09 QUALITY CONTROL

- A. **Applicator Qualifications:** Engage an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-services performance.
- B. **Single Source Responsibility:** Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use thinners approved by paint manufacturer and use within recommended limits.
- C. Provide products which comply with all state and local regulations controlling the use of volatile organic compounds (VOC's)
- D. **Container Labels:** Label each product container with paint manufacturer's name, product name and number, color name and number, thinning and application instructions, date of manufacture, shelf-life expiration date, required surface preparations, recommended coverage per gallon, wet and dry film thickness, drying time, and clean up procedures.

1.10 PROTECTION, HANDLING, AND STORAGE

- A. **Delivery:** Deliver materials to the Site in original, unopened containers and cartons bearing manufacturer's printed labels. Do not deliver products which have exceeded their shelf life, are in open or damaged containers or cartons, or are not properly labeled as specified.
- B. **Storage and Handling:** Store products in a dry, well ventilated area in accordance with manufacturer's published product data sheets. Storage location shall have an ambient air temperature between 45 degrees F and 90 degrees F.

1.11 PROJECT CONDITIONS

- A. **Environmental Requirements:**
 - 1. **Ambient Air Temperature, Relative Humidity, Ventilation, and Surface Temperature:** Comply with paint manufacturer's published product data sheet or other printed product instructions.
 - 2. If paint manufacturer does not provide environmental requirements, use the following:
 - a. **Ambient Air Temperature:** Between 45 degrees F and .75 degrees F.
 - b. **Relative Humidity:** Below 75 percent.
 - c. **Ventilation:** Maintain the painting environment free from fumes and odors throughout the Work of this Section.
 - d. **Surface Temperature:** At least 5 degrees F above the surface dewpoint temperature.
 - 3. Maintain environmental requirements throughout the drying period.

1.12 WARRANTY

- A. **Waterproofing Contractor's Warranty:** The Waterproofing Contractor shall supply the Owner with a minimum two-year workmanship warranty. In the event any work related to the waterproofing is found to be defective within two years of Substantial Completion, the Waterproofing Contractor shall remove and replace such at no additional cost to the Owner. The Waterproofing Contractor's warranty obligation shall run directly to the building owner, and

a copy the waterproofing signed warranty shall be sent to the waterproofing system's manufacturer.

1. The duration of the Waterproofing Contractor's two-year warranty shall run concurrent with the waterproofing system's manufacturer's twenty-year total system warranty.
- B. Waterproofing Systems Manufacturer's Warranty: The waterproofing system manufacturer shall guarantee areas to be in a watertight condition, for a period of twenty years, from the date of final acceptance of the waterproofing system. The warranty shall be a twenty-year no dollar limit, nonprorated total system labor and material warranty. Total system warranty shall include all waterproofing materials, related components, and accessories. The manufacturer shall repair defects in materials and workmanship as promptly after observation as weather and site conditions permit.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Paints and Coatings
 - a. RD Coatings – Distributed by Righter Group, Inc., 11 Upton Drive, Wilmington, MA 01887, (800)-848-4841
 - b. Tnemec Inc., P.O. Box 165770, North Kansas City, MO 64116 (800) 863-6321
 - c. Sherwin-Williams Co., Cleveland, OH 44101, (800) 321-8194

2.02 MISCELLANEOUS PRODUCTS

- A. Cleaning Solvents: Low toxicity with flash point in excess of 100 degrees F.
- B. Color Pigments: Pure, nonfading, finely ground pigments with at least 99 percent passing a 325 mesh sieve.
1. Use lime-proof color pigments on masonry, concrete and plaster.
 2. Use exterior pigments in exterior paints.
- C. Galvanizing Compound, Cold: Single component compound with 93 percent pure zinc in the dried film and meeting the requirements of DOD-P-21035A (NAVY).
- D. Masking Tape: Removable paper or fiber tape, self-adhesive and nonstaining.
- E. Mineral Spirits: Low odor type recommended by finish paint manufacturer.
- F. Paint Stripper: As recommended by finish paint manufacturer.
- G. Stain Blocker, Primer-Sealer: As recommended by finish paint manufacturer.
- H. Turpentine: ASTM D 13.

2.03 FINISH PAINT TYPES

- A. Physical Properties:

1. Specified percent solids by weight and volume, pigment by weight, wet and dry film thickness per coat, and weight per gallon are minimum physical properties of acceptable materials.
 - a. Opaque Pigmented Paints: Physical properties specified are for white titanium dioxide base before color pigments are added.
 - b. Specified minimum wet and dry film thickness per coat are for determining acceptable finish paint products. Minimum wet and dry film thickness per coat to be applied shall comply with approved finish paint manufacturer's product data sheets.
 2. Gloss or Reflectance: The following ASTM D 523 specified light levels and angles of reflectance:
 - a. Flat: Below 15 at 85 degrees.
 - b. Eggshell: Between 5 and 20 at 60 degrees.
 - c. Satin: Between 15 and 35 at 60 degrees.
 - d. Semigloss: Between 30 and 65 at 60 degrees.
 - e. Gloss: Over 65 at 60 degrees.
- B. Paint System: Exterior Acrylic Polymer (provide all coats from same manufacturer) Manufacturers include RD Coatings, Tnemec, Sherwin-Williams.
1. Prime Coat: One coat of a water-borne direct-to-metal adhesion primer for ferrous and nonferrous metals based on acrylic dispersion at a minimum thickness of 2.0 mils DFT.
 - a. Solids by Weight: 54%
 - b. Solids by Volume 40%
 - c. VOC: 40 grams/liter
 - d. Density: Ca 1.3
 - e. Viscosity: 20P-30P (Brookfield 20 Rpm)
 - f. Nonflammable
 2. Intermediate (Base) Coat: One base coat of a single-component, highly elastomeric, low-VOC (less than 8 g/l), acrylic coating containing zinc phosphate rust inhibitors to all primed surfaces at 5.0 – 6.0 mils DFT.
 - a. Solids by Weight: 64.0 – 66.0%
 - b. Solids by Volume: 55.0 – 57.0%
 - c. VOC: Less than 8 g/l
 - d. Elongation: Minimum 200%
 - e. Viscosity: 180-220P (Brookfield 20 Rpm)

- f. Density: Ca.1.25
 - g. Non-Flammable: Class A rating for Flame Spread and Smoke Development per ASTM E84
 - h. ASTM D870, Results: No defect after twelve months' continuous immersion
 - i. ASTM D1653, Results: 9.9 g/m² per 24 hrs. (Perm rate of approximately 0.3 and a metric perm rate of approximately 0.2).
 - j. ASTM D5894, Results: No rusting, no rust creep at scribe, no blistering after 5,000 hrs.
 - k. ASTM D2485, Results: Coating sample unchanged with adhesion rating of 5B per ASTM 3359 at wet/dry cycles at 50/75/100°C
- 3. Detail Coat: Coat all seams, joints and perimeter flashings using base coat and reinforcing fleece, applied by brush or roller at a minimum of 5 to 7 mils DFT. Fill any seams, gaps or joints using manufacturer's caulking.
 - 4. First Full Finish Coat - Apply one full additional base coat to all areas at a min. thickness of 6.0 to 7.0 mils DFT.
 - 5. Second Full Finish Coat: Apply one full coat of manufacturer's single component acrylic exterior grade finish coat, satin finish (Color Selected by generic Owner Project Manager), at 2.5 to 3.0 mils DFT.
 - a. Solids by Weight: 59-62%
 - b. Solids by Volume: 43-45%
 - c. VOC: 172 g/l
 - d. Density: 10.72 lbs/gal
 - e. Viscosity: 90 KU
 - f. Nonflammable
- C. Colors: Provide paint colors as selected by Owner.
 - D. Approved finish paint manufacturers to match designated colors of other manufacturers.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to be prepared, primed, or painted for compliance with contract documents, required environmental conditions, manufacturer's product data sheets, product label instructions and other written requirements.
 - 1. Do not begin any phase of the work without first checking and verifying that surfaces and environmental conditions are acceptable for such work and that any earlier phase deficiencies and discrepancies have been properly corrected.

- a. The commencement of new work shall be interpreted to mean acceptance of surfaces to be affected.

3.02 PREPARATION

- A. Protection: Cover and protect surfaces to be painted, adjacent surfaces not to be painted, and removed furnishings and equipment from existing paint removals, airborne sanding particles, cleaning fluids and paint spills using suitable drop cloths, barriers and other protective devices.
 1. Adjacent exterior surface protections include roofs, walls, landscaping, driveways and walkways. Interior protections include floors, walls, furniture, furnishings and electronic equipment.
 2. Remove and replace removable hardware, lighting fixtures, telephone equipment, other devices and cover plates over concealed openings in substrates to be painted.
 - a. Cover and neatly mask permanently installed hardware, lighting fixtures, cover plates and other devices which cannot be removed and are not scheduled for painting.
 3. Schedule and coordinate surface preparations so as not to interfere with work of other trades or allow airborne sanding dust particle to fall on freshly painted surfaces.
 4. Provide adequate natural or mechanical ventilation to allow surfaces to be prepared and painted in accordance with product manufacturer's instructions and applicable regulations.
 5. Provide and maintain "Wet Paint" signs, temporary barriers and other protective devices necessary to protect prepared and freshly painted surfaces from damages until Work has been accepted.
- B. Clean and prepare surfaces to be painted in accordance with specifications, paint manufacturer's approved product data sheets and printed label instructions. In the event of conflicting instructions or directions, the more stringent requirements shall apply.
 1. Cleaners: Use only approved products manufactured or recommended by finish paint manufacturer. Unless otherwise recommended by cleaner manufacturer, thoroughly rinse with clean water to remove surface contaminants and cleaner residue.
 2. Pressure Wash: Pressure wash metal surfaces to be coated using a minimum of 3,000 psi. Washing system should contain a suitable solution of an environmentally approved cleaning agent to remove all surface contamination and a 0° spinner tip. Care should be taken so as not to deform any thin gauge metal. Follow washing operation with hand and power tools as necessary to remove any remaining loose existing coating, should it be present. Allow all surfaces to completely dry before proceeding with the coating application.
- C. Surface Preparation:
 1. Existing Exterior Coated Metal Surfaces: Thoroughly clean to remove dirt, soot, grease, mildew, chalkiness, and stains using finish paint manufacturer's recommended liquid cleaner. Also complete following:
 - a. Metal (if any): Power wash the surface at 5,000 psi or use chemical stripper to remove paint. Clean the metal surface of remaining paint with a wire wheel. Clean the surface before painting. Verify the pH of the surface is within manufacturer allowances (near neutral).

2. Galvanized Metal:
 - a. Allow new galvanized surfaces to weather as long as possible before cleaning. Remove surface contaminants using clean rags and petroleum spirits.
 - b. Remove “white rust” using appropriate solvent and, if necessary, wire brushing or sanding.
 - c. Use appropriate Structural Steel Painting Council Standard SSPC-SP1 to SSPC-SP6 to clean steel substrates where galvanized protection has been removed.
- D. Painting Material Preparations:
 1. Prepare painting materials in accordance with manufacturer’s approved product data sheets and printed label instructions.
 - a. Stir materials before and during application for a consistent mixture of density. Remove container surface paint films before stirring and mixing.
 - b. Slightly tint first opaque finish coat where primer and finish coats are the same color.
 - c. Do not thin paints unless allowed and directed to do so in writing within limits stated on approved product data sheets.

3.03 APPLICATION

- A. Environmental Conditions:
 1. Water-based Paints: Apply when surface temperatures will be 50 degrees Fahrenheit to 90 degrees Fahrenheit throughout the drying period.
 2. Other Paints: Apply when surface temperatures will be 45 degrees Fahrenheit to 95 degrees Fahrenheit throughout the drying period.
 3. Apply exterior paints during daylight hours free from rain, snow, fog and mist when ambient air conditions are more than 5 degrees above the surface dewpoint temperature and relative humidity less than 85 percent.
 - a. When exterior painting is allowed or required during nondaylight hours, provide portable outdoor weather recording station with constant printout showing hourly to diurnal air temperature, humidity, and dewpoint temperature.
 4. Exterior Cold Weather Protection: Provide heated enclosures necessary to maintain specified temperature and relative humidity conditions during paint application and drying periods.
- B. Install approved paints where specified, or shown on the drawings, and to match approved field examples.
 1. Paint Applicators: Brushes, rollers or spray equipment recommended by the paint manufacturer and appropriate for the location and surface area to be painted.
 2. Approved minimum wet and dry film thicknesses shall be the same for different application methods and substrates.

- C. Paint Type Coats To Be Applied: Unless specified otherwise by finish paint manufacturer's product data sheet, the number of coats to be applied for each paint type are as follows:
 - 1. New unpainted surfaces and surfaces scheduled for paint removal – apply prime coat, intermediate coat, detail coat, and two finish coats.

3.04 ADJUSTING AND CLEANING

- A. Reinstall removed items after painting has been completed.
 - 1. Restore damaged items to a condition equal to or better than when removed. Replace damaged items that cannot be restored.
- B. Touch up and restore damaged finish paints. Touch up and restoration paint coats are in addition to the number of specified finish paint coats.
- C. Remove spilled, splashed, or spattered paint without marring, staining or damaging the surface. Restore damaged surfaces to the satisfaction of the Engineer.
- D. Remove temporary barriers, masking tape, and other protective coverings upon completion of painting, cleaning and restoration work.

END OF SECTION

SECTION 101100

VISUAL DISPLAY SURFACES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the visual display surfaces as shown on the drawings and/or specified herein, including but not necessarily limited to the following:
 - 1. Plastic impregnated tackboards.
 - 2. Frames and trim.
 - 3. Frameless Porcelain Marker Board.

1.3 RELATED SECTIONS

- A. Drywall - Section 092900.

1.4 QUALITY ASSURANCE

- A. Qualifications of Installers: For installation of whiteboards and tackboards, use only personnel who are thoroughly trained and experienced in the skills involved and who are completely familiar with the manufacturer's recommended methods of installation.
- B. Installation Methods: The recommended installation methods of the manufacturer shall become the basis for acceptance or rejection of actual installation methods used in the work.
- C. Manufacturer: Furnish all whiteboards and tackboards by one manufacturer for entire project.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each material and component part, including data substantiating that materials comply with requirements.
- B. Shop Drawings: Submit for each type of whiteboard and tackboard. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, and installation details.
- C. Samples: Submit full range of color samples for each type of whiteboard, tackboard, trim and accessories required. Provide 12" square samples of sheet materials and 12" lengths of trim members for color verification after selections have been made.

1.6 SPECIAL PROJECT WARRANTY

- A. Warranty on Porcelain Enamel Whiteboards: Provide written warranty, signed by manufacturer, agreeing to replace, within warranty period of twenty-five (25) years porcelain enamel

whiteboards which do not retain original writing and erasing qualities, defined to include surfaces which become slick and shiny, or exhibit crazing, cracking or flaking; provide manufacturer's instructions for handling, installing, protecting and maintaining whiteboards have been adhered to during the warranty period. Replacement is limited to material replacement only and does not include labor for removal and reinstallation.

1.7 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 TACKBOARDS

- A. Construction
 - 1. Provide 1/4" thick vinyl-impregnated cork tackboards in color as selected by the Architect.
 - 2. Provide 1/4" thick fiberboard core.
 - 3. Trim to be extruded aluminum designed for concealed fastenings, clear anodized finish.
- B. Manufacturers: Provide tackboards manufactured by Forbo, Greensteel Inc., Claridge Products and Equipment Inc., Carolina Whiteboard Co., or approved equal.

2.2 FRAMELESS PORCELAIN MARKERBOARD

- A. Provide "LCS Elite Porcelain Markerboards" manufactured by Claridge Products and Equipment Inc. or approved equal. Porcelain surface on 24-gauge steel, designed for LCS markerboard application.
 - 1. Core: 3/8" particleboard.
 - 2. Backer Sheet: 0.015" aluminum.
 - 3. Trim: Extruded aluminum, designed for concealed fastenings, clear anodized finish with chalk tray.
 - 4. Color: See Finish Schedule.
 - 5. Sizes as shown on the drawings; use maximum size available to eliminate seams Where Seams must be used, provide seaming diagram for architect's acceptance.

2.3 ACCESSORIES

- A. Provide clips, anchors and fasteners required for complete installation.
- B. For each wall mounted glass marker board provide Clarus box tray eraser and marker holder, with required mounting hardware, or equivalent from alternate glass board manufacturer.

2.4 FABRICATION

- A. Assembly: Provide factory-assembled whiteboard and tackboard units unless field-assembled units indicated.
- B. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
 - 1. Provide manufacturer's standard vertical joint system between abutting sections of whiteboard.
 - 2. Provide mullion trim at joints between whiteboard and tackboards.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where whiteboards and tackboards are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Deliver factory-built whiteboard and tackboard units completely assembled in one piece without joints, whenever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, prefit at factory, disassembled for delivery, and make final joints at site. Use splines at joints to maintain surface alignment.
- B. Install units in locations and mounting heights as shown on drawings and in accordance with manufacturer's instructions, keeping perimeter lines straight, plumb and level. Provide all grounds, clips, backing materials, adhesives, brackets, anchors, trim and accessories for complete installation.
- C. Coordinate job-assembled units with grounds, trim and accessories. Join all parts with neat, precision fit.

3.3 ADJUST AND CLEAN

- A. Verify accessories required for each unit properly installed and operating units properly functioning.
- B. Clean units in accordance with manufacturer's instructions, breaking in only as recommended.

END OF SECTION

SECTION 101200

DISPLAY CASES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the display cases as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

- A. Carpentry - Section 062000.

1.4 QUALITY ASSURANCE

- A. Qualifications of Installers: For installation of display cases, use only personnel who are thoroughly trained and experienced in the skills involved and who are completely familiar with the manufacturer's recommended methods of installation.
- B. Installation Methods: The recommended installation methods of the manufacturer shall become the basis for acceptance or rejection of actual installation methods used in the work.
- C. Field measure prior to preparation of shop drawings and fabrication to ensure proper fit.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each material and component part, including construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Submit detailed drawings for display cases. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, and installation details.
- C. Samples: Submit full range of color samples for each type of product, trim and accessory required. Provide 12" square samples of sheet materials and 12" lengths of trim members for color verification after selections have been made.

1.6 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 DISPLAY CASE DOORS

- A. Glazed Pivot Doors for Display Cases: Provide "Series 1301-SM" display case doors and sidelights as manufactured by CRL-Blumcraft or approved equal; with 1/2" thick clear, tempered, anti-reflective glass, lever-type cam lock with strike plate, top and bottom pivot hinges, and #593 roller catch.
 - 1. Finish on hardware: Stainless Steel (Type 304).
 - 2. Size: As indicated on Drawings.

2.2 FABRICATION

- A. Assembly: Provide factory-assembled components to requirements indicated on approved shop drawings.
- B. Cabinets shall be of dimensions shown in details and in accordance with manufacturer's shop drawings, as approved by Architect.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where display cases are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Deliver factory-built units completely assembled in one piece without joints, whenever possible.
- B. Install units in locations and mounting heights as shown on drawings and in accordance with manufacturer's instructions, keeping perimeter lines straight, plumb and level. Provide all grounds, clips, backing materials, adhesives, brackets, anchors, trim and accessories for complete recessed installation.

3.3 ADJUST AND CLEAN

- A. Verify accessories required for each unit properly installed and operating units properly functioning.
- B. Clean units in accordance with manufacturer's instructions.

END OF SECTION

SECTION 101400

SIGNAGE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the signage as shown on the drawings and/or specified herein, including the following:
 - 1. Interior panel signs
 - 2. Flag Signs for AED and Fire Extinguishers.
 - 3. LED lightbox.

1.3 RELATED SECTIONS

- A. Exit signs - Division 26.

1.4 QUALITY ASSURANCE

- A. For actual installation of signage, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the required skills.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each type of signage required.
- B. Samples: Submit samples of each type of signage showing finishes, colors, surface textures and qualities of manufacture and design of each sign component including graphics.
- C. Shop Drawings: Submit shop drawings for fabrication and erection of signage. Include plans, elevations, and large-scale details of sign wording and lettering layout. Show anchorage and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

1.6 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide materials that have been selected for their surface flatness, smoothness and freedom from surface blemishes where exposed to view in the finished unit. Surfaces exposed to view that exhibit pitting, seam marks, roller marks, oil-canning, stains, discolorations, or other imperfections on the finished units will not be acceptable.
1. Bronze: Comply with the following standards for the forms and types of bronze for the required items of work.
 - a. Temper: Provide bronze materials in standard commercial tempers and hardness, as required for fabrication, strength and durability.
 - b. Extruded Shapes: ASTM B 455, Alloy UNS No. C38500 (architectural bronze).
 - c. Plates and Bars: ASTM B 36, Alloy UNS No. C28000 (muntz metal, 60 percent copper).
 - d. Composition Bronze Castings: ASTM B 62, Alloy UNS No. C83600 (85-5-5-5 or composition bronze).
 - B. Finish to match Bronze US10B BHMA 613; satin polished, dark oxidized, oil rubbed.
 1. Hand Rubbed Natural Satin Finish, Lacquered: CDA-M31-M34-06x, fine satin directional textured mechanical finish followed by hand-rubbed directional textured mechanical finish, with clear organic coating specified below.
 - a. Clear Organic Coating: Air-dried acrylic coating; Incralac as developed by International Copper Research Corp., 1.0 mil minimum dry thickness.
 2. Statuary Conversion Coating, Bright Relieved and Lacquered: CDA-M12-C55-06x. Mechanical Finish: matte finish as cast; Chemical Finish: conversion coating, sulfide; Mechanical Finish: buffed as specified, with clear organic coating specified above.

2.2 INTERIOR PANEL SIGNS

- A. Identification Signage: Wall-hung, pin-mounted, groups of cast bronze letters, symbols and/or logos. See drawings.
- B. Directories: 1 per floor (3 total); 24" W x 36" H.
- C. Signs: 1 per door; 8" W x 8" H.
- D. Interior Wayfinding Signage:
1. Vinyl on Glass
 - a. Digitally printed graphics on transparent vinyl attached to back of glass
 - b. Finish: 3M™ Scotchcal™ Clear View Graphic Film IJ8150, MP6425SP / SVOC1304SP
 2. Vinyl on Elevators
 - a. Digitally cut applied vinyl
 - b. Finish: 3M™ Scotchcal™ ElectroCut™ Graphic Films Medium Gray 180C-31, 7725-31, 7125-31 PANTONE Cool Gray 7 C

3. Room Identification

- a. Applied acrylic header router cut face
- b. Front and edges painted
- c. Direct print message adhered to front of finished sign
- d. Matte acrylic faceplate with smooth edges
- e. Finish: Benjamin Moore 426A2 Linen White (SSP)
- f. Mounting: VHB; tactile letters and Grade II Clear Raster Braille; Black Acrylic Backer
Mounting: VHB & Silicone

4. Preferred Vendor: Strategic Sourcing, 2 Gilbert Road, Saratoga Springs, NY 12866,
518-618-1667

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where signage is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Install units and components at the locations directed by the Architect, securely mounted with concealed theft-resistant fasteners. Attach to substrates in accordance with the manufacturer's instructions.
- B. Install level, plumb, and at the proper height.
- C. Cooperate with other trades for installation of sign units to finish surfaces.
- D. Repair or replace damaged units as directed by the Architect.

END OF SECTION

SECTION 102219

DEMOUNTABLE PARTITIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the demountable partitions as shown on the drawings and/or specified herein, including but not limited to the following:
 - 1. Partition system.
 - 2. Doors and frames in partition system.
 - 3. Finish hardware for doors.

1.3 RELATED SECTIONS

- A. Wood Doors - Section 081416.
- B. Finish Hardware - Section 087100.
- C. Interior Glass and Glazing - Section 088010.
- D. Architectural Window Film - Section 088720.
- E. Electrical - Division 26.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Provide office partition system manufactured by a single firm specializing in production of this type of work.
- B. Shop Assembly: Preassemble items in shop to greatest extent possible. Disassemble units only to extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Installed partitions shall have a deflection limit of $L/240$ when subject to a 5 psf uniform lateral load and a concentrated load of 200 lbs.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's detailed materials and fabrication specifications and installation instructions. Include catalog cuts of hardware, fastenings and other data as required.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of partition assemblies which are not fully described by manufacturer's data. Show anchorage and accessory items and finishes.

- C. Samples: Submit samples of each required finish and color. Prepare samples on same materials which will be used in partition assemblies.
- D. Closeout Submittals
 - 1. Maintenance Data: Include Muraflex Maintenance Manual for demountable partitions.
 - 2. As built shop drawings.
 - 3. Manufacturer warranties transferrable to Owner.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver demountable panel partition components cartoned or crated to provide protection during transit and job storage.
- B. Inspect partition components upon delivery for damage. Minor damages may be repaired, provided finish items are equal to new work and acceptable to Architect. Remove and replace damaged items as directed.
- C. Store partition components on raised platforms in vertical positions with blocking between units to allow air circulation. Keep stored material covered and protected from damage.

1.7 SEQUENCING

- A. Install demountable partitions after installation of flooring, walls, and ceiling finishes, including painting.

1.8 WARRANTY

- A. Manufacturer Warranty: Manufacturer's standard warranty agreeing to repair or replace components that fail from defects in material or workmanship under normal use. Damage from misuse, accidents, or normal wear and tear is excluded.
 - 1. Warranty Period: Five years for material and one year for hardware from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PARTITION SYSTEM

- A. Double Glazed Glass Wall System:
 - 1. Aluminum framed double glazed glass wall system with wood or glass doors, as indicated on drawings. Basis of design is Muraflex Mimo, or approved equal by ACME or DIRTT. Wall system STC 46; doors STC 46 with overlapping frame stops and seals.
- B. SINGLE GLAZED GLASS WALL System:
 - 1. Aluminum framed demountable partition assembly and components with wood or glass doors, as indicated on drawings. Basis of design is Muraflex Mimo, or approved equal by ACME or DIRTT. 3/8" thick laminated glass; STC-36 rating.

2.2 DEMOUNTABLE GLASS WALL PARTITIONS

- A. Aluminum Framing: Aluminum extrusions, 6063-T5 aluminum alloy; Finish: See finish schedule.

1. Frame: Aluminum extrusions made up of ceiling track and top frame sleeve connected with hexagonal standoffs to offer height adjustability. Provide integral acoustic gasketing at door frames.
 - a. Gaskets: Polyvinyl chloride, CAS No. 9002-86-2, to grip glass modules.
 - b. Width: 3"
 - c. Height: 1-9/16"
 - d. Length: As indicated on drawings.

- B. Glass: 3/8" tempered, 2" air space, 1/2" laminated glass.
 1. Fully tempered glass; ASTM C1036, Kind FT, Condition A uncoated, Type I, Quality Q3.
 - a. Base Glass: Low-iron (ultraclear)
 - b. Thickness: 10 mm (nominal 3/8 inch)
 2. Laminated Glass: ASTM C1172.
 - a. Glass Plies: Low-iron (ultraclear)
 - b. Interlayer: Clear
 - c. Thickness : 1/2"

- C. Acoustical:
 1. Minimum Noise Isolation Class shall be as follows:
 - a. Partition with swing door: NIC-30.
 - b. Partition with sliding door: NIC-28.
 2. All doors shall be provided with acoustic upgrades including, at minimum:
 - a. Swing Doors: Compressible gaskets at head and both jambs; mortised automatic drop seal at door bottom.
 - b. Sliding Doors: Brush gaskets at both sides of head track, brush gaskets both sides of receiving channel, compression gasket at inner face of receiving channel; brush seal at bottom of single glazed door, mortised automatic drop seal at bottom of double glazed door. (no sliders currently shown plans)
 3. Acoustical Performance: Where acoustical rating is indicated, provide demountable-partition assembly tested by a qualified testing agency for sound transmission loss performance according to ASTM E 90, calculated according to ASTM E 413, and rated for not less than the STC value indicated.

- D. Anchorage Devices, Clips and Fasteners: Manufacturer's standard type, compatible with materials being secured.

- E. All connection points to mullions and demising partitions are to be properly sealed to prevent loss of acoustic performance across demising conditions.

- F. Doors: Framed Pivot Glass Doors and pocket Sliding Glass Door. Refer to drawings, door schedule and hardware section.

- G. Tempered, Laminated Glass: ASTM C 1172, Condition A (uncoated), Type I (transparent flat glass), Kind LT (laminated tempered), Class 1 (clear), Quality-Q3 with clear, polyvinyl butyral interlayer not less than 0.060" thick.
 1. Glass Thickness: As indicated.

- H. Glazing: Set glass in glazing strips for firm retention and tight seal and to permit easy removal and reinstallation without damage. Loose glazing stops and exposed screws are not acceptable.
 - 1. Glazing Joint: Translucent polycarbonate trim.
- I. Connectors and Accessories: Provide connectors, fasteners, and accessories required for rigid, secure, complete, and finished partition system.
 - 1. Metal Panel Wall Caps: Provide custom aluminum panel wall caps finished to match partition frames.
 - 2. Provide accommodations for room scheduler panels as scheduled.
 - 3. Provide solid panels composed of metal finished panels. All cavities to be filled with mineral wool insulation.
 - 4. Coordinate all hardware provided by the glazed partition manufacturer with the requirements identified for each door in the door and hardware schedule.
- J. Door Hardware: Conform to requirements of Section 087100.
- K. Hardware Schedule for Demountable Partitions:
 - 1. Hardware Set #1
 - a. Framed Pivot Glass Door; Muraflex Pivot Kit
 - b. Lever: MFHDW-028B, lockable
 - c. Door Bottom: Muraflex Standard
 - d. Sound Seals: Muraflex Standard
 - e. Balance of hardware specified in 087100
 - 2. Hardware Set #E1
 - a. Framed Pivot Glass Door; Muraflex Pivot Kit
 - b. ADA Ladder Pull: Round Locking Pulls
 - c. Door Bottom: Muraflex Standard
 - d. Sound Seals: Muraflex Standard
 - e. Balance of hardware specified in 087100
 - f. Power Supply, Door Contact, Card Reader: by security vendor, see Section 087100
 - 3. Hardware Set #E1B (room 221)
 - a. Framed Pivot Glass Door; Muraflex Pivot Kit
 - b. Lever: MFHDW-028B, lockable
 - c. Door Bottom: Muraflex Standard
 - d. Sound Seals: Muraflex Standard
 - e. Balance of hardware specified in 087100
 - f. Power Supply, Door Contact, Card Reader: by security vendor, see Section 087100
 - 4. Hardware Set #E2
 - a. Framed Pivot Glass Door; Muraflex Pivot Kit
 - b. ADA Ladder Pull: Round Locking Pulls
 - c. Door Bottom: Muraflex Standard
 - d. Sound Seals: Muraflex Standard
 - e. Balance of hardware specified in 087100

- f. Power Supply, Door Contact, Card Reader: by security vendor, see Section 087100.
- 5. Hardware Set #E2A (Room 221)
 - a. Framed Pivot Glass Door; Muraflex Pivot Kit
 - b. Lever: MFHDW-028B, lockable
 - c. Door Bottom: Muraflex Standard
 - d. Sound Seals: Muraflex Standard
 - e. Balance of hardware specified in 087100
 - f. Power Supply, Door Contact, Card Reader: by security vendor, see Section 087100.
- 6. Hardware Set #E3
 - a. Framed Pivot Glass Door; Muraflex Pivot Kit
 - b. Lever: MFHDW-028B, lockable
 - c. Door Bottom: Muraflex Standard
 - d. Sound Seals: Muraflex Standard
 - e. Balance of hardware specified in 087100
 - f. Power Supply, Door Contact, Card Reader: by security vendor, see Section 087100
- 7. Hardware Set #11 (Sliding door)
 - a. FINO Framed Sliding Glass Door: Muraflex Sliding Kit
 - b. Ladder Pulls: ADA Ladder Pull: Round Locking Pulls
 - c. Balance of hardware specified in 087100L.
- L. Provide glazing film as specified in Section 088720 and pattern indicated on drawings

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where demountable partitions are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.
- B. Finished Spaces: Do not deliver or install demountable partitions until finishes in spaces to receive them are complete, including suspended ceilings, floors, carpeting, and painting.

3.2 INSTALLATION

- A. Install partitions before floor coverings and after suspended drywall ceilings have been installed. Coordinate partition work with work of other trades which are affected by partition installation. Avoid damage to installed work.
- B. Repair damaged or defaced work or replace with new work, as acceptable to Architect. Completely refinish defaced partition components with factory finished materials, or replace defaced components.
- C. Furnish, drill for and install anchoring devices required, and secure partitions to floor, ceiling and walls, using concealed fasteners.
- D. Install partitions rigid, level, plumb and in alignment, with components secure together, in accordance with manufacturer's instructions.

- E. Provide through posts to ceiling, or other concealed supports as required to ensure lateral stability of partition runs.
- F. Install continuous and positive seal to prevent light and sound transmission at partition contacts with floor, ceiling, wall and other abutting surfaces.
- G. Adjust hardware and doors and leave in proper operating condition.

END OF SECTION

SECTION 104416

FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the fire extinguishers and cabinets as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

- A. Gypsum drywall - Section 092900.
- B. Fire suppression systems - Division 22.
- C. Fire hose cabinets and valve cabinets - Division 22.

1.4 QUALITY ASSURANCE

- A. Provide portable fire extinguishers, cabinets and accessories by one manufacturer.
- B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for all portable fire extinguishers required. For fire extinguisher cabinets include roughing-in dimensions, and details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, style and materials. Where color selections by Architect are required, include color charts showing full range of manufacturer's standard colors and designs available.
- B. Samples: Submit samples, 6" square, of each required finish. Prepare samples on metal of same gauge as metal to be used in the work. Where normal color variations are to be expected, include 2 or more units in each sample showing the limits of such variations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products of one of the following:
 - 1. J.L. Industries.
 - 2. Larsen's Mfg. Co.
 - 3. Potter Roemer.

2.2 EXTINGUISHERS

- A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.
- B. Abbreviations indicated below to identify extinguisher type related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.
- C. Multi-Purpose Dry Chemical Type: UL rated 2A-10B:C, 5 lb. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.

2.3 MOUNTING BRACKETS

- A. Provide manufacturer's standard bracket designed to prevent accidental dislodgment of extinguisher, of proper size for type and capacity of extinguisher specified, in manufacturer's standard enamel finish; color to match extinguisher.

2.4 CABINETS

- A. Type and Style: Fire extinguisher cabinets shall be metal, with plexiglass panel, sized to fit within the partition or wall depth. Provide fire rated cabinets within fire rated partitions.
- B. Color: Fire extinguisher cabinets shall be factory prefinished with baked enamel in the colors selected by the Architect from the standard range of colors of the selected manufacturer.
 - 1. Finish: Solid bronze.
- C. Fully recessed: All cabinets shall be fully recessed basis of design "Occult Series", model BZ O-2409 of Larsen's Manufacturing Co. unless otherwise noted
- D. Semi-recessed: basis of design "Architectural Series", model BZ 2409 of Larsen's Manufacturing Co.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where fire extinguishers and cabinets are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Install items included in this Section in locations indicated and at heights to comply with applicable regulations of governing authorities.
 - 1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
 - 2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.
- B. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by the Architect.

3.3 IDENTIFICATION

- A. Identify fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" painted on door by silk-screen process or die cut lettering. Provide lettering on door as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.
- B. Identify bracket-mounted extinguishers with red letter decals spelling 'FIRE EXTINGUISHER' applied to wall surface. Letter size, style and location as selected by the Architect.

3.4 SERVICE

- A. Determine the approximate completion date of the work and then inspect, charge, and tag the fire extinguishers at a date not more than 10 days before or not less than one day before actual completion date of the work.

END OF SECTION

SECTION 108211

GUARDIAN GRADE COILED WIRE SCREENS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment and services necessary to complete guardian grade coiled wire screens as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

- A. Miscellaneous Metals - Section 055000.
- B. Carpentry - Section 062000.

1.4 DEFINITIONS

- A. Coiled Wire Fabric: Building material created by interlocking strands of coiled wire to form a larger flexible sheet; coiled wire fabric is made from various metals and gauges of wire, and in a wide variety of sizes, weaves, finishes, and levels of fullness.
- B. Attachment Systems: Components and materials required to provide coiled wire fabric in designated shape and form (i.e., flat under tension in two directions, under tension in two directions with a percentage of fullness, flat under tension in four directions, hanging in one direction, or wrapping a form, etc.). Attachment systems are used to connect coiled wire fabric to built environment and maintaining designated performance capability. Engineered attachments may allow coiled wire fabric systems to remain in fixed position or to move, either manually or mechanically.

1.5 REFERENCE STANDARDS

- A. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014, with Editorial Revision (2017).
- B. ASTM A380/A380M - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems; 2017.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galv-annealed) by the Hot-Dip Process; 2019a.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- E. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).

- F. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- G. ASTM D3451 - Standard Guide for Testing Coating Powders and Powder Coatings; 2006 (Reapproved 2017).
- H. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2017.

1.6 QUALITY ASSURANCE

- A. Designer Qualifications: Perform structural design under direct supervision of a Professional Engineer; Professional Structural Engineer; experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of side coiling grille/gate installation experience.
- D. Preinstallation Meetings: Conduct meetings including Contractor, Architect, fabricator, installer and other subcontractors whose work involves coiled wire fabric to confirm project requirements, framing and support conditions, mounting surfaces and manufacturer's installation requirements.
- E. Mock-Up: Provide mock-up of coiled wire fabric system (if required) for evaluation of desired appearance, performance, application and workmanship; size of mock-up not to exceed 50 sq ft.
 - 1. Locate where directed by the Architect, as indicated on drawings.
 - 2. Mock-up may; or may not remain as part of the Work.
 - 3. Do not proceed with remaining work until mock-up is approved by the Architect.
 - 4. Modify mock-up as required to produce acceptable work.
 - 5. Retain mock-up during construction as quality standard.

1.7 SUBMITTALS

- A. Product Data: Submit manufacturer's data sheets on each product used, including preparation instructions, storage and handling requirements, and installation methods.
- B. Shop Drawings: Submit detailed shop drawings for fabrication and installation, including plans and elevations, detailed sections, materials, finishes, fittings, hardware, anchorages, fastening details, and manufacturer's technical and descriptive data.
 - 1. Provide setting diagrams and templates for anchorages and hardware being installed by others.
 - 2. Indicate distinction between factory-assembled and field-assembled work on shop drawings.

3. Materials or fabrications that are indicated to comply with design loadings, include material and safety factor properties, and other information necessary for structural analysis.
- C. Samples: Submit samples for color verification of each specified finish, at least 6 inch (254 mm) 10 inch (254 mm).
- D. Certificates: Submit certificates signed by manufacturers of coiled wire products certifying that products furnished comply with requirements.
- E. Delegated Design Submittals: Submit comprehensive structural analysis of overall design for specified loads prepared by qualified professional engineer.
- F. Designer's Qualification Statement.
- G. Manufacturer's Qualification Statement.
- H. Installer's Qualification Statement.
- I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.8 COORDINATION

- A. Coordination: Coordinate field measurements and fabrication schedule with progress of construction to avoid construction delays.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in manufacturer's original, unopened packaging, with labels clearly identifying manufacturer and material.
- B. Exercise care not to scratch, mark, dent, or bend metal components during delivery, storage, and installation.
- C. Store materials indoors, protected from moisture, humidity, and extreme temperature fluctuations until ready for installation.

1.10 FIELD CONDITIONS

- A. Verify dimensions of actual openings by field measurements before fabrication; provide recorded measurements on shop drawings.

1.11 WARRANTY

- A. Correct defective work within one year after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Cascade Coil Drapery, Inc, dba Cascade Architectural: www.cascade-architectural.com

2.2 GUARDIAN GRADE COILED WIRE GRILLES

- A. Provide Guardian Grade coiled wire grill system per the following: Center Opening Gate assembly, Gate lock – Key lock on Unsecured side with Thumb Turn on Secured side, Includes Batons to assist in putting the gate into the storage pocket, Key Locking Mesh Mount Foot Bolts Facing Unsecured Side spaced ~3' to 4' apart.
- B. Attachment Method: Guardian Grade Security Double Steel Secura Track, Direct Mount.
- C. Fabriccoil Guardian Grade Coiled Wire Fabric Weaves:
 - 1. Aluminum: 5/16" weave, 14-gauge wire.
- D. Factory Finishes: Powder Coat color as specified, powder coatings tested in accordance with ASTM D3451. Color(s) as specified.
- E. Fullness: As Required for gate length.

2.3 PERFORMANCE REQUIREMENTS

- A. Structural Requirements: Guardian grade coiled wire fabric systems capable of withstanding applied loads and stresses within designated limits and under conditions as indicated on drawings.
 - 1. Provide coiled wire fabric and attachment system components in accordance with applicable building code to withstand dead and live loads resulting from environmental conditions including, but not limited to wind, seismic events, vegetation, rain, snow and ice.
 - 2. Provide coiled wire fabric systems capable of accommodating expansion and contraction of metal components without causing undue stress, buckling, opening of joints, and distortion.
 - 3. Provide structural framing and hardware of coiled wire fabric systems capable of withstanding loads and maintain deflection limitations in accordance with applicable building codes when systems are fully installed.

2.4 COMPONENTS

- A. Wire Attachment: Stainless steel, Type 304; Stainless steel, Type 316; Copper clad steel.
- B. Pipes: Hot-dipped galvanized steel; Stainless steel, Type 304; Stainless steel, Type 316.
- C. Tubes: Hot-dipped galvanized steel; Stainless steel, Type 304; Stainless steel, Type 316.
- D. Plates: Hot-dipped galvanized steel; Stainless steel, Type 304; Stainless steel, Type 316.
- E. Angles: Hot-dipped galvanized steel; Stainless steel, Type 304; Stainless steel, Type 316.
- F. Wire Ropes: Stainless steel, Type 304; Type 316; or Type.

- G. Wire Rope Swages: Stainless steel, Type 304; Type 316; or Type.
- H. Adjustable Mid-Span Tube Couplers: Stainless steel, Type 304; Type 316.
- I. Rings: Stainless steel, Type 304; Type 316.
- J. Fasteners: Nuts, bolts, washers, and machine screws; stainless steel, Type 304; Type 316.
- K. Stainless Steel: Comply with ASTM A666.
- L. Galvanized Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653, Structural Steel (SS) or Forming Steel (FS); Structural Steel (SS); Forming Steel (FS, with G60/Z180; G90/Z275; G115/Z350 coating; continuous coil-coated on exposed surfaces with specified finish coating, and manufacturer's standard panel back coating.
- M. Aluminum Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet, ASTM A792, Commercial Steel (CS) or Forming Steel (FS); Commercial Steel (CS); Forming Steel (FS); with AZ50/AZM150; AZ55/AZM165; AZ60/AZM180 coating; continuous coil-coated on exposed surfaces with specified finish coating, and manufacturer's standard panel back coating.
- N. Steel Plate Base: Factory-welded, ASTM A1003.

2.5 FABRICATION

- A. Tolerances: Verify field dimensions prior to start of shop fabrication.
- B. Fabricate steel and stainless steel components in accordance with manufacturer's requirements and the following:
 - 1. Comply with requirements indicated for metal materials, thickness, design, and details of construction; fabricate metal accurately and without any burrs.
 - 2. Provide welded connections in compliance with American Welding Society (AWS) standards for recommended practice in shop welding.
 - 3. Provide welds located behind finished surfaces that are without distortion or discoloration of exposed side.
 - 4. Provide components that are accurately cut, drilled and/or tapped to receive coiled wire fabric, hardware, fasteners, and accessories.
- C. Shop fabricate components in accordance with requirements indicated on drawings and specified performance requirements.
- D. Shop fabricate hardware, interconnected parts, and assemblies to eliminate necessity for any field cutting adjustments.
- E. Coordinate system requirements, dimensions and spacing of attachment components to ensure required factory drilled holes in supporting framework are properly located.
- F. Provide exposed joints that are butt, flush, and hairline.
- G. Fabricate exterior connections that will be exposed to weather in a manner that prevents water from entering interior portions of structure, in accordance with Architect.

- H. Upon completion of fabrication, clean and prepare applicable coiled wire fabric system in accordance with ASTM A380.

2.6 ACCESSORIES

- A. Fasteners: Comply with ASTM F593 for stainless steel or ASTM A307 for carbon steel, sizes to suit installation conditions.
- B. Anchors and Inserts: Corrosion resistant; type, size, and material required for loading and installation as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine the areas and conditions where guardian grade coiled wire screens are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.
 1. Prior to start of installation, verify that existing conditions are acceptable for installation of coiled wire fabric and attachment systems in accordance with manufacturer's installation instructions.
 2. Coordinate with setting diagrams, plans, templates, and drawings to ensure that proper installation of necessary anchors and supporting devices has been completed.
 3. Ensure that supporting system for coiled wire fabric has been properly prepared for attachment of framework, hardware, anchors, wire rope, and transfer of calculated loading.
 4. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions prior to proceeding.
 5. Coordinate with appropriate entity to correct any unsatisfactory conditions.
 6. Start of this work indicates acceptance of areas and conditions as satisfactory by installer.

3.2 PREPARATION

- A. Verify inventory of system components to ensure required components are available for installation; inspect components for damage and replace damaged components as necessary.
- B. Verify that alignment, support dimensions, and tolerances are correct.
- C. Verify that necessary structural framing is installed prior to mounting coiled wire fabric attachment system components.
- D. Verify that support framing and other surfaces to receive coiled wire fabric and attachment systems are clean and free of obstructions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's written installation instructions.
- B. Attach coiled wire fabric to structural framing using applicable hardware provided by manufacturer as indicated on approved shop drawings.
- C. Provide necessary anchorage devices and fittings to securely fasten to on-site construction; including additional knife plates, embeds, framework, blocking, threaded rods, and anchors.
- D. Provide for separation of dissimilar materials using bushings, grommets, or washers to prevent electrolytic corrosion.
- E. Upon completion of final adjustments, provide tamper-resistant lock-tight material at mechanical fittings.
- F. Provide for tension in coiled wire fabric as indicated on drawings, or as necessary to remove slack.
- G. Coiled Wire Fabric Attachment System:
 - 1. Install coiled wire fabric attachment system components in accordance with approved shop drawings.
 - 2. Install attachment system assemblies based on manufacturer's dimensions.
 - 3. Install joints that accommodate for expansion and contraction of metal components without causing undue stress, buckling, joint fatigue and/or distortion.
 - 4. Install structural blocking at wall locations used for mounting of attachment system.
 - 5. Install coiled fabric mounting hardware onto attachment systems as indicated on approved shop drawings for specified attachment system; attach with approved fasteners and techniques to ensure that framing members are horizontal and parallel to grade or slab, and straight to within 1/16 inch in 4 feet.
 - 6. Install attachment system plumb, level, square, and rigid without having any kinks or sags in coiled wire fabric.
- H. Coiled Wire Fabric:
 - 1. Install coiled wire fabric in accordance with approved shop drawings.
 - 2. Install coiled wire fabric based on manufacturer's dimensions.
 - 3. Install joints that accommodate for expansion and contraction of metal components without causing undue stress, buckling, joint fatigue and/or distortion.
 - 4. Install coiled wire fabric mounting hardware onto coiled wire fabric as indicated on approved shop drawings for specified attachment system; attach with approved fasteners and techniques to ensure that sections are horizontal and parallel to grade or slab, and straight to within 1/16 inch in 4 feet.
 - 5. Install coiled wire fabric infill with attachment system plumb, level, square, and rigid without having any kinks or sags.

3.4 CLEANING

- A. Remove temporary protective coverings of adjacent work areas, and clean installed materials prior to Date of Substantial Completion.
- B. In heavy traffic areas, establish cleaning program to pressure wash or hand-wash coiled wire fabric and attachment system on a monthly basis prior to Date of Substantial Completion.
- C. Clean coiled wire fabric system components with mild detergent and water applied with wet wrap and wiped with clean dry rag; abrasive cleaners are not permitted.
- D. Remove from project site and legally dispose of construction debris associated with this work.

3.5 PROTECTION

- A. Provide protection of installed coiled wire grilles and screens and finished surfaces to ensure they are without damage until Date of Substantial Completion.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.
- C. Replace defective or damaged components as directed by Architect.

END OF SECTION

SECTION 114000

FOODSERVICE EQUIPMENT

PART 1 – GENERAL

1.01 SUMMARY

- A. Intent: The intent of this section is to provide specifications and data for bidders to understand the project requirements and submit bids for the foodservice equipment described in Part 2. The terms and conditions of these instructions and the itemized specifications are binding.
- B. Definitions
1. Kitchen Equipment Contractor (KEC): The person, firm, or company designated as such in the contract with the Owner. The KEC will provide the foodservice equipment.
 2. Jacobs | Doland | Beer (JDB): The foodservice consultant for this contract, representing the Owner related to the foodservice scope and acting as a technical advisor to the project team.
 3. Owner: The person or organization identified as such in the contract, responsible for facilitating the execution of this contract.
 - a. Decisions: The Owner has the ability and authority to render decisions and provide pertinent information.
 - b. Information: The Owner informs all parties of critical dates, budget, limitations, outside contracts, or other factors that could affect this contract.
 4. General Contractor (GC): The main contractor for this contract, responsible for the construction site and overseeing all trades.
 5. Subcontractor: Any person, firm, or company furnishing labor, material, or both to the KEC.
 6. Written Notice: Notification that is delivered in person; sent by registered, certified mail or courier service; or sent via email with a response confirming of receipt.
 7. Trades: Contractors working outside of the foodservice scope.
 8. Authority Having Jurisdiction (AHJ): The local authority or authorities responsible for enforcement of the codes and/or standards.
- C. Contract Documents: The contract documents include all foodservice equipment plans, these specifications and details, and all addenda issued prior to the execution of this contract.
1. Contractual Relationship: These documents do not create any contractual relationship between JDB and the KEC.
 2. Complete Documents: Do not submit bids, enter agreements, or execute this contract without complete access to all contract documents.
 3. Not for Construction: All drawings issued by JDB are informative only; do not use JDB's Contract Documents for construction or submittals.
 4. Review: Carefully review contract documents and report any errors, ambiguities, inconsistencies, or omissions to the Owner and JDB in writing.
 5. Ownership: All contract documents furnished by JDB are the property of JDB and are not to be used on any other project, wholly or in part.
 6. Related Documents: Review all related documents including, but not limited to, architectural and engineering drawings and specifications.

7. Addenda: Addenda, bulletins, and clarifications covering changes, corrections, and special interpretations of the contract documents may be issued by the Owner prior to bid submittal and become part of the contract documents.
- D. Scope: Provide all labor, materials, equipment, and services required to complete the installation of equipment shown in the contract documents and detailed in these specifications.
1. Installation: Set in place and install all new and existing foodservice equipment and appliances per the contract documents, ready for final connection by Trades.
 2. Existing Equipment: Where items are listed as "Existing", relocate as shown in the contract documents. Include removal, redelivery, and installation for these items.
 3. Clean: Clean all existing items and notify the client immediately of any damage or missing pieces, if found.
 4. Items to Remain: Where items are listed as "Existing / to Remain", confirm with the GC and Owner if the item needs to be removed and reinstalled, or if they will remain in place during construction.
 5. Storage: Coordinate if offsite storage is required with the GC and Owner prior to bid. Include offsite storage and redelivery if required.
 6. Utilities: Trades to disconnect and reconnect any utilities for existing items. Verify if required for items that are "Existing / to Remain".
 7. Not in Contract Items: Coordinate the size and utility requirements for items that are shown in the contract documents, but listed as Not in Contract (NIC), though this equipment will be provided by others.

1.02 RELATED WORK PROVIDED UNDER SEPARATE CONTRACTS

- A. Related Work: Documents affecting the work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 1.
- B. Division 22 - Plumbing: Plumbing work and connections to foodservice equipment, including fittings which are not an integral part of equipment, floor drains and floor sinks, water lines, grease traps, backflow preventors, gas boosters, gas regulators, flushing of plumbing line before connection, and other plumbing work, except as otherwise specified in this section.
- C. Division 23 - HVAC: Heating, ventilating, air conditioning work, ductwork, fans, fan controls, variable demand controls, and connections to foodservice equipment, except as otherwise specified in this section.
- D. Division 26 - Electrical: Electrical work and connections to foodservice equipment including overload protection, wiring, outlets and covers, wiring to controls that are not integral to the equipment, disconnect switches, low voltage wiring, and all other electrical components, except as otherwise specified in this section.
- E. Millwork and Finishes: Divisions relating to millwork, fabricated metals, tile, or other finishes adjoining the work under this section, except as otherwise specified in this section.
- F. Other Work Included in Other Divisions: Beverage conduit; equipment pads and curbs required for foodservice equipment; walls, ceilings, floors, and any modifications to them; wall and ceiling reinforcement; disconnection and reconnection of utilities for existing equipment; disconnection and removal of existing items that will not be reused.

1.03 QUALIFICATIONS

- A. Eligibility: To be considered eligible to work on this project, be a fully recognized KEC currently engaged in the installation of standard manufactured and custom fabricated commercial foodservice equipment.

1. Employees: Have adequate experienced, competent, responsible, and quality personnel and staff.
 2. Financial Resources: If requested by the Owner, exhibit ample financial resources that demonstrates the ability to execute the work involved in a timely manner, including for any subcontractors.
- B. Project Manager: Provide the services of a full-time project manager to oversee the project.
1. Resume: Submit a detailed resume of the proposed project manager including educational, professional and work experience.
 2. Project Experience: Demonstrate the project manager's experience managing projects of a similar size and scope, including experience executing all coordination and oversight required for this project.
 3. Availability: Ensure the project manager will be available full-time during regular work hours at the jobsite on all days when required by the foodservice portion of the project, including for job meetings.
 4. Removal: Unless requested by the Owner, do not remove the project manager from the job as long as he or she is employed by the KEC.
- C. Insurance: Be solely liable for all items specified herein that are in transit, stored in and around the building, or installed but not yet approved by the Owner.
1. Coverage: Carry adequate insurance covering items from fire damage, vandalism, theft, or any type of hazard or loss which may be sustained. Insurance requirements are to be set by the Owner.
 2. Submission: File all required insurance with the Owner.
 3. Changes: Notify the Owner in writing of any changes to the insurance at least 60 days prior to the cancellation, termination, or changes in terms or limits.

1.04 BIDDING & AWARD

- A. Jobsite Conditions: Prior to bidding, understand the jobsite's conditions, limitations, access, and building rules and regulations. This may or may not require visit(s) to the site.
- B. Equipment Bids: Quote the best price for all specified equipment. Price new and unused equipment as indicated in the contract documents.
- C. Clarification: If there are discrepancies or omissions in the contract documents, request clarification in writing. In advance of receiving direction, price the greater quantity or quality.
- D. No Bid: If a bid cannot or will not be furnished, indicate "No Bid" prior to the bid due date.
- E. Itemized Bid: Submit itemized bids in an Excel spreadsheet
1. Description: List the item number, quantity, description, manufacturer, and model for each item.
 2. Equipment Price: Price each item including inland freight, overhead factors, and all other associated costs.
 3. Total Equipment Cost: Subtotal the cost of all equipment.
 4. Installation: Indicate the total price for delivery and set-in-place.
 5. Tax: Indicate any applicable sales tax.
 6. Grand Total: Total the base bid.

- F. Bid Proposal: Submit a full PDF proposal on company letterhead.
 - 1. Itemized Equipment: Include all information from the itemized bid.
 - 2. Explanations: Explain any interpretations or assumptions of the contract documents.
 - 3. Bid Expiration: State the length of time the bid will remain in effect.
 - 4. Subcontractors: If any part of this work will be completed by a subcontractor, indicate the name of the subcontractor and the scope of their work.
- G. Bid Award: The Owner reserves the right to reject any and all bids for any reason. If awarded, enter into a contract with the Owner immediately.
- H. After Award: Make no changes to the accepted bid unless agreed to by the Owner in writing.
 - 1. Price Changes: After acceptance of bid and award of contract, do not change the contract price without the Owner's written permission.
 - 2. Change Orders: If changes are made to the contract documents after contract award, issue a change order to the Owner for written approval prior to beginning work.

1.05 SUBSTITUTIONS

- A. Match Contract Documents: Provide equipment as described in the plans and specifications without modification or substitution. Where products are specified by manufacturer or model, the intent is not to limit competition, but to establish a standard of quality that is necessary for the project.
- B. Approval of Alternates: If proposing alternates, get approval in writing by the Owner and JDB before including the alternate in the bid.
- C. Substitutions After Award: If a substitution is required after award due to extenuating circumstances (i.e. an item is discontinued), inform the Owner and JDB in writing. Propose an equal alternate for review and approval by the Owner and JDB. If the alternate is not accepted, work with the Owner and JDB to determine an acceptable alternate.
- D. Coordination of Alternates: Coordinate the revised requirements if an approved alternate requires different space and/or utility connections from the specified item. Assume costs for any utility, building, architectural, or engineering changes, unless relief from this obligation is granted in writing by JDB or the Owner.
- E. Schedule Impact: Allow time for the review of proposed alternates, and ensure that the review, coordination, or rejection of alternates does not impact schedule.

1.05 QUALITY ASSURANCE

- A. Standard Equipment: For equipment of standard manufacture, provide new and unused equipment of the manufacturer's latest design that complies with the specifications.
- B. Materials: Use all new materials that are the best of their respective kind.
- C. Workmanship: Provide the highest quality and best accepted standard for installation, performed by skilled and qualified workers.

- D. Manufacturer Qualifications: Before completion and shipment, allow the Owner and/or JDB access to the factories where all specified foodservice equipment is fabricated or manufactured for the inspection of materials and construction.
- E. Manufacturers' Instructions: In addition to the requirements of these specifications, work shall comply with manufacturer's instructions and recommendations.
- F. Code Compliance: Comply with all federal, state, and local codes, and regulations relating to the execution of this job.
 - 1. NSF: Comply with the latest standards established by the National Sanitation Foundation (NSF).
 - 2. NFPA 96: Ensure the materials, construction, and installation of all exhaust hood systems comply with National Fire Protection Association (NFPA) 96.
 - 3. NFPA 17A: Ensure the fire suppression systems' installation and configuration conforms to NFPA 17A as required.
 - 4. UL / ETL: For electric equipment and components, provide equipment listed and labeled by a Nationally Recognized Testing Laboratory (NRTL), such as Underwriter's Laboratories (UL) or ETL.
 - 5. UL300: Comply with UL300 for all components of the fire protection system.
 - 6. NFPA 70: For the wiring of devices, comply with the National Fire Protection Association (NFPA) 70, National Electric Code (NEC).
 - 7. ANSI: Provide all gas- and electric-powered equipment in accordance with American National Standards Institute (ANSI).
 - 8. ASME: Provide manufacturer steam-heated and steam-generating equipment in accordance with American Society of Mechanical Engineers (ASME) code requirements and carry the stamp where required.
 - 9. AGA: Equip gas-heated equipment with automatic ignitors and automatic safety pilots to conform to American Gas Association (AGA) standards. Carry the AGA seal.
 - 10. ASHRAE 15 and 34: Manufacturer and install all refrigeration systems and components per American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 15 and 34.

1.06 SITE CONDITIONS

- A. Site Conditions: After award of contract and before creation of submittals, visit the site to take field measurements and understand all existing conditions.
- B. Field Measurements: Dimensions in the Contract Documents are approximate only.
 - 1. Fixed Dimensions: Where equipment is intended to occupy a fixed location and space, the physical conditions of the building are to control the absolute sizes.
 - 2. Dimensions Not Indicated: Where dimensions are not indicated, construct all equipment as specified or drawn to scale.
 - 3. Dimensions Not Available: Where required dimensions are not immediately obtainable and the delay in waiting for these dimensions will delay work, ask JDB or the Owner for a written decision.
 - 4. Dimensions for Fabrication: Fabricate equipment to provide necessary clearances for all surrounding and adjoining equipment and work.
- C. Access: Confirm all building access requirements from receiving to final location of equipment.
 - 1. Building Access: Check all doors, passageways, and openings to verify that equipment can be delivered to its specified location in one piece. Coordinate with

- the Contractor the possibility of holding the erection of walls or doorways if needed.
2. Vertical Transportation: Check the size and availability of loading platforms, elevators, outside building hoists, and other conveyances.
 3. Onsite Assembly: If the equipment must be shipped in sections and assembled onsite to facilitate delivery, include that cost.
 4. Inability to Deliver: If the specified equipment cannot be delivered in one piece or assembled onsite, immediately notify JDB and the Owner.
- E. Field Conditions: Where field conditions will impact the specified equipment, notify and get direction in writing from the Owner or JDB before proceeding with that portion of the work.

1.07 SUBMITTALS

- A. Provide Submittals: Upon award of contract, provide submittals for all items in the contract documents per the approved project schedule.
1. Form: Provide shop drawings and rough-ins as scalable, black-and-white PDFs. Leave sufficient space for review comments and stamps.
 2. Scale: Plans to be submitted at a scale of 1/4" = 1'-0". Fabrication and millwork shop drawings to be submitted at a scale sufficient to represent all components for review (1/2", 3/4", 1", or 1-1/2" = 1'-0").
 3. Copies: Reproductions of Contract Documents are unacceptable and will be rejected.
 4. Review: Assume responsibility for the accuracy of their submittals. Review of submittals by JDB is general and for design concept only. Review does not relieve the KEC of responsibility for proper fitting, finishing, quantities, and completion of work per the Contract Documents.
 5. Submittal Log: Maintain a perpetual log listing all equipment, submission dates, return dates, status, and dates of resubmission if required.
- B. Rough-In Drawings: Submit rough-in drawings showing the requirements of all Trades for all items in the contract documents.
1. Equipment Layout: Show the itemized layout of all equipment.
 2. Utility Connections: Prepare separate electrical, plumbing and drainage, and mechanical dimensioned rough-in drawings. Show the exact point of penetration of floors, walls, and ceilings for all utilities required. Dimension from finished walls and columns and include notations for use in the field including "stub up", "out of wall", and "branch to connection".
 3. Special Conditions: Coordinate and show all special conditions for the GC including requirements for refrigeration runs, beverage lines, wall and ceiling reinforcement, elevated bases, floor openings and depressions, locations of partitions, partial-height walls, and wall openings.
 4. Existing Rough-Ins: If there are existing rough-ins, or if rough-ins were installed before award of this contract, field verify the location of all rough-ins. Inform the Owner and JDB if any are incorrect or missing.
- C. Shop Drawings: Submit detailed drawings of all custom fabricated items including a detailed plan, elevation, and section where applicable.
- D. Cut Sheets: Submit manufacturer's specifications sheets for all items of standard manufacture. Include a cover sheet for all items indicating options and accessories.

- E. Samples: If requested, submit samples for review and approval at no additional cost before proceeding with work.

1.08 GUARANTEES

- A. Equipment Warranty: Provide all new equipment with service for one year following the issuance of a certificate of occupancy, or longer if indicated in the itemized equipment specifications. During the first year, be available for warranty call reporting, and coordinate repairs and/or replacements as required.
 - 1. Work Included: Include all materials and labor at no cost to the Owner for the repair or replacement of equipment or components. Include renewals and repairs, as necessary, due to ordinary wear and tear.
 - 2. Parts: Supply genuine standard replacement parts produced by the equipment's manufacturer.
 - 3. Work: Complete work by competent personnel under the manufacturer's supervision during regular working hours.
- B. Refrigeration System: During the warranty period, provide local service at no cost to the Owner, on a twenty-four hour per day call basis, for any and all custom refrigeration systems, for repairs to be completed during normal business hours
- C. Compressors: In addition to the above, provide an additional four-year warranty on all refrigeration compressor units, five years total.

PART 2 – PRODUCTS

2.01 MATERIALS & FINISHES

- A. Exposed Stainless Steel: Provide Type 304, #4 finish for all stainless steel unless otherwise specified. Exposed surfaces include all exposed outside and inside surfaces. The underside of a shelf may be a No. 80 ground finish. Final finish to be contractor's factory finish, not as furnished by mill.
- B. Stainless Steel: Stainless steel to be corrosion-resisting steel with not less than 18% chromium and 8% nickel, and not more than 0.12% carbon or nickel alloy, except as noted.
- C. Stainless Steel Welds: Where stainless steel is welded other than by a time control spot weld method, steel to contain at least 18% chromium and 8% nickel, and not more than 0.07% carbon, unless the sum of chromium and nickel is at least 26.5% in which case 0.08% carbon will be allowed. Ensure the stainless steel will not cause precipitation of harmful carbides due to welding operation.
- D. Stainless Steel Castings: Stainless steel castings may contain carbon up to 0.10% with 18% chromium and 8% nickel, or carbon up to 0.15% if the sum of chromium and nickel, neither falling below the prescribed minimum of 30%.
- E. Stainless Steel Gauge: Sheet iron and sheet steel to be U.S. standard of thickness, and as indicated in this section. Do not provide any material lighter than 20 gauge stainless steel.
 - 1. 10 gauge = .1406"
 - 2. 12 gauge = .1094"
 - 3. 14 gauge = .0781"
 - 4. 16 gauge = .0625"

5. 18 gauge = .0500"
 6. 20 gauge = .0375"
- F. Sound Deadening: Provide sound deadening under all stainless steel work surfaces. Sound deadening to be NSF-certified and non-absorbent.
- G. Ferrous Metals: All galvanizing to be hot dipped. Clean all other metal parts thoroughly and prime with one coat of rust inhibiting primer, except where enamel finish is used, apply one coat of aluminum lacquer over primer.
- H. Metallize: Where metalizing is required, spray with hot zinc, or spray or brush welds (minimum 1/64" thickness) with miracle no torch cold solder.
- I. Solder: Solder is to consist of 75% tin and 25% lead.
- J. Fastenings:
1. Fasteners (rivets, weld, bolts, screws, nuts, and washers) to be steel, except where brass or stainless steel is fastened, in which case they shall be of brass or stainless steel respectively.
 2. For fastening of dissimilar metals, fasteners shall be the least corrosive metal.
 3. Space fasteners to ensure suitable closure and prevent bulging of fastened metals.
- K. Millwork: Millwork materials to be free of defects that affect appearance or durability. Refer to the architectural contract documents for finishes and details.
1. Plywood: All plywood used in foodservice millwork to be marine grade.
 2. Glass: All glass to be fully tempered and transparent. Exposed edges to be smooth to the touch. Provide 3/8" glass unless otherwise noted.
- L. Temperature Protection: Where hot or cold equipment drops into a solid-surface or stone top, fully line the cutout with temperature protection such as 3M Foil Tape 3340.
- M. Silicone Sealant: Silicone sealant to be food-safe, NSF- and FDA-approved. Provide clear, black, white, or silver color as required. Apply as recommended by manufacturer.
- N. Other Materials: Provide all other materials not specifically described but required for a complete and proper installation of the work of this section. Provide all new materials that are the first quality of their respective kinds, subject to approval by the Owner.

2.02 WORKMANSHIP

- A. Quality of Materials: Materials for construction to be the best of their kind, free from all defects which would mar their appearance or render them structurally unsound.
- B. Welding:
1. Method: Use the electric fusion metal arc method for all welding. Carbon arc and gas welding are not permitted. Spot welding and soldering is not acceptable.
 2. Quality: Welds to be continuous, strong, and ductile. Grind excess metal off joints for a smooth, finished surface that matches adjoining surfaces.
 3. Locations: Weld all joints in stainless steel, custom fabricated equipment. Reduce field joints to a minimum.

4. Level: If the stainless steel has been depressed by a welding operation, hammer and peen flush with the adjoining surface. If necessary, grind again to eliminate low spots.
 5. Edges: Ensures edges are smooth and free from burrs, fins, and irregular projections.
- C. Polishing:
1. Finish: Polish all stainless steel to #4 finish, grind welds, and polish to match. Grind welds on undersides of counters or tables and "metallize". Avoid excess heating in all grinding operations to prevent discoloration.
 2. Grind Smooth: Weld all field joints on the job, grind unexposed welds smooth and "metallize", grind exposed welds smooth and polish.
 3. Continuous Welds: Continuously weld all joints. Spot welds or welded concealed studs must be polished on surface and "metallized" on underside.
 4. No Exposed Fasteners: Ensure no bolt heads or screws show on the exterior surface of any item of equipment.
- D. Soldering: Solder in strict accordance with recommended procedures of the stainless steel manufacturer. Do not solder any surfaces which may come in contact with food. Soldering shall serve only as filler to prevent leakage, not for the stability of seams and joints. It is not a replacement for welding or brazing.

2.03 FITTINGS & OTHER REQUIREMENTS

- A. Types: All fittings, control valves, plumbing works, or electrical operating switches furnished as part of the equipment are to match those specified under the Specifications for Mechanical Divisions 23 and Electrical Division 26.
- B. Lighting: Lamps within equipment to be NSF-approved plastic-coated or provided with NSF-approved lamp guards.
- C. Locks: For all equipment specified with locks, provide cylinder locks master-keyed to level of security control specified.
- D. Grommets: Provide rubber or plastic grommets for all countertop penetrations that electrical or plumbing services run through.
- E. Access: Provide access panels and other openings as required for access to equipment and components, even if not specifically shown on Contract Documents. This includes plumbing or electrical devices which are not normally furnished by the manufacturer of the equipment but are required for proper equipment functioning.
- F. Drain Valves: Provide an easily accessible drain valve on all equipment with drain outlets. Valves to be chrome plated. Provide a gate valve or a lever waste type.
- G. Micro-switches: Provide each fire suppressing system with a minimum of two micro-switches to interface with electric controls.
- H. Cord & Plug: Provide a cord and plug for all electric equipment requiring one.
- I. Starting Switches: Furnish starting switches including those for remote installation, to the Electrical Contractor who shall install and wire same.

- J. Pipes, Fittings and Valves: All pipes, fittings and valves required within the equipment shall be furnished with respective items of equipment. Exposed plumbing, piping, fittings, valves and conduit shall be chrome plated.
- K. Faucets: Provide aerators on all faucets.
- L. Pressure Regulators: On all dishwashers, provide a pressure regulator valve set for twenty pounds discharge pressure. Valves shall be self-regulating and shall have a manual adjustment range between 15-30 pounds. Valve bodies and working parts shall be of brass.
- M. Anti-Hammer Device: On all dishwashers, provide an approved anti-water hammer device. Device to consist of a synthetic rubber chamber cased in steel housing. Devices utilizing air chambers or coiled copper tubing will not be accepted.
- N. Utility Quick-Disconnect Assemblies: For mobile and portable equipment, provide utility quick-disconnect assemblies to match the equipment inlet size. Refer to the itemized specifications; where not specified as an accessory, provide:
 1. Gas: Provide Dormont Blue Hose Moveable Gas Connector, 36" long (or length as required by code), covered with stainless steel braid, coated with blue antimicrobial PVC, 1 Snapfast® QDV, 2 Swivel MAX®, 1 full port valve, coiled restraining cable with hardware, limited lifetime warranty; KEC to properly size the diameter and BTU flow capacity based on the equipment it serves
 2. Water: Provide Dormont Water Connector, 36" long (or length as required by code), Dormont Water Connector, with quick-disconnect with a two-way shut-off valve; KEC to properly size the diameter based on the equipment it serves

2.04 REFRIGERATION EQUIPMENT

- A. Complete System: Provide all materials, equipment, labor, and tools necessary to install a complete refrigeration system for items listed. Include all necessary components whether or not they have been specifically mentioned, including compressors, racks, evaporator coils, vibration eliminators, indicating sight glasses, liquid expansion valves, filters, separators, thermostats with defrost timers, local control wiring, liquid line driers, copper piping, hard type refrigeration-grade copper fittings, and tubing.
 1. Warranty: For compressors, provide a five (5) year compressor warranty and a one (1) year refrigeration service contract.
 2. Compressors: For compressors, provide high-efficiency Copeland, Tecumseh, or approved equal. Units shall be complete with liquid line drier, shut off valves, oil, sight glass, dual pressure control, and head pressure regulating valve. For freezer, provide time clock.
 3. Evaporators: Provide and install an evaporator coil defrost system on all refrigeration systems designed to operate at a balanced evaporator coil temperature.
 4. Thermostats: Control the temperature of each refrigerator with a demand defrost thermostat control and liquid line solenoid
 5. Connectors: Provide flare type connectors with heavy forged brass flare nuts for all connections. Where elbows, tees, or couplings are required, provide seamless sweat type soldered in with 95/5 solder.
 6. Expansion Valves: Provide each system with a properly sized thermostatic or electronic expansion valve, dehydrator, and sight glass.
 7. Isolation Valves: Where multiple units are remoted to the same system, provide two (2) isolation valves for each remoted unit, one (1) valve for the suction line

and one (1) valve for the liquid line. Connect isolation valves as close as possible to the fixture evaporator.

- B. Refrigerant Piping: For refrigerant piping, provide type L seamless dehydrated copper tubing.
1. Line Size: Size refrigerant lines as required, with a maximum pressure drop of two degrees ($\leq 2^{\circ}\Delta T$.)
 2. Solder: Minimize joints and fully solder permanent line connections. Zoom locks or other quick couplers are not acceptable.
 3. Hangers: Where required, provide tubing hangers at centers of no more than 8'-0".
 4. Insulation: Install 3/4" flexible Armoflex insulation around suction lines, without any gaps, glued and taped at seams.
 5. P-Traps: Provide P-traps per ASHRAE standards. At a minimum, locate one for every 15' vertical run.
 6. Pre-Piping: Where specifications call for pre-piped lines (i.e. from a fixture to a valve compartment), perform work as detailed in this section.
- C. Temperature Requirements: Unless otherwise noted, or as required by the local Health Department or NSF, install refrigeration to operate at the temperatures listed in this section.
1. Refrigerators: All walk-in, reach-in, and undercounter refrigerators to maintain 40 degrees Fahrenheit or less without freezing the food.
 2. Freezers: All walk-in, reach-in, and undercounter freezers to maintain -10 degrees Fahrenheit.
 3. Prep and Trash Rooms: All prep and trash rooms to maintain 55 degrees Fahrenheit.
 4. Wells: All refrigerated wells to maintain 0 degrees Fahrenheit.
- D. Remote Equipment: Coordinate the refrigerant type and valve requirements with all manufacturers of equipment that will be connected to the refrigeration system.
- E. Startup: Clean and dehydrate each system by maintaining a vacuum of 500 microns or lower for a minimum period of five hours. After cleaning, add the required operating charge of refrigerant and oil to each system.
- F. Testing: After completion of installation, test the entire system for performance. Ensure there are no leaks in the system.
- G. Code Compliance: Comply to all federal, state, and local codes and the current environmental regulations related to commercial refrigeration equipment and refrigerants.

2.05 ITEMIZED SPECIFICATIONS

- A. The following specifications refer to equipment as shown on the contract drawings and equipment schedules.
- B. The approved manufacturer(s) for custom fabrication for this project is **EMI Industries**.
- C. Install the following items per the plan:

ITEM 1.00 - *BACK OF HOUSE*****

ITEM 1.01 - FREEZER, REACH-IN (1)

Turbo Air Model PRO-26F-N(-L)

PRO Series Freezer, reach-in, one-section, 25.35 cu. ft., 28-3/4"W x 34-1/8"D x 78"H, top mount self-contained refrigeration, self-cleaning condenser device, digital temperature controller, self-diagnostic monitoring system, hot gas condensate system, automatic fan motor delays, (1) solid door with lock, lifetime guaranteed heavy duty hinges & handles, LED interior lighting, (3) stainless steel wire shelves, stainless steel interior & exterior (galvanized top & bottom), R290 Hydrocarbon refrigerant, 1/2 HP, 115v/60/1-ph, 7.0 amps, NEMA 5-15P, cETLus, ETL-Sanitation, Made in USA

- (1) 5 year parts & labor warranty, standard
- (1) 7 year compressor warranty (self-contained only)
- (1) PRO-26F-N-L: Left hinged
- (1) Caster Set, swivel, locking front wheels, standard

ITEM 1.02 - REFRIGERATOR, ROLL-IN (1)

Turbo Air Model PRO-50R-RI-N

PRO Series Refrigerator, roll-in, two-section, 81.87 cu. ft. capacity, 66-7/8"W x 37-3/4"D x 84-1/4"H, top mount self-contained refrigeration, self-cleaning condenser device, digital temperature controller, self-diagnostic monitoring system, hot gas condensate system, automatic fan motor delays, (2) solid doors with locks, lifetime guaranteed heavy duty hinges & handles, LED interior lighting, accepts (2) racks, stainless steel interior & exterior (galvanized top & bottom), heavy duty stainless steel ramp, R290 Hydrocarbon refrigerant, 1 HP, 115v/60/1-ph, 8.0 amps, NEMA 5-15P, cETLus, ETL-Sanitation, Made in USA (contact sales for lead time)

- (1) 5 year parts & labor warranty, standard
- (1) 7 year compressor warranty (self-contained only)

ITEM 1.03 - UNIVERSAL PAN RACK (2)

New Age Model 1655

Pan Rack, mobile, (13) universal adjustable aluminum guides, bottom pan slides are welded in place, 4 1/2" OC for 12 x 20 to 18 x 26 pans, 1-1/2" centers, end loading, 5" platform swivel casters, NSF, Made in USA, (standard factory lead time)

- (2) Lifetime warranty against rust & corrosion, 5 year workmanship and material defects warranty, standard
- (2) Model CL-B Caster Lock, for 5" platform caster (pair)

ITEM 1.04 - REFRIGERATOR, REACH-IN (2)

Turbo Air Model PRO-50R-N

PRO Series Refrigerator, reach-in, two-section, 47.73 cu. ft., 51-3/4"W x 34-1/8"D x 78"H, top mount self-contained refrigeration, self-cleaning condenser device, digital temperature controller, self-diagnostic monitoring system, hot gas condensate system, automatic fan motor delays, (2) solid doors with locks, lifetime guaranteed heavy duty hinges & handles, LED interior lighting, (6) stainless steel wire shelves, stainless steel interior & exterior (galvanized top & bottom), R290 Hydrocarbon refrigerant, 1/2 HP, 115v/60/1-ph, 8.0 amps, NEMA 5-15P, cETLus, ETL-Sanitation, Made in USA

- (2) 5 year parts & labor warranty, standard
- (2) 7 year compressor warranty (self-contained only)
- (2) Model TS23-UNLR HALF (4) pairs universal slides and pilasters for PRO-50 & PRO-77 left section
- (2) Caster Set, swivel, locking front wheels, standard

ITEM 1.05 - WORKTABLE WITH SINKS (1)

Custom Model DETAIL 1-3

Worktable per Detail 1-3. Refer to Section 2.05B for approved manufacturer(s).

- (1) Model DETAIL 1-2B Splash, angled-top, 2" wide, per Detail 1-2B
- (1) Model DETAIL 1-1A Square edge per Detail 1-1A
- (1) Model DETAIL 3-1 SINK Integral sink per Detail 3-1
- (1) Model DETAIL 3-3 Stainless steel sink cover and holder per Detail 3-3
- (1) Model DETAIL 3-5 HAND SINK Recessed hand sink per Detail 3-5
- Model DETAIL 1-3 H Undershelf per Detail 1-3 Note H
- Model DETAIL 1-3 G Side and/or rear crossbracing per Detail 1-3 Note G

ITEM 1.06 - COFFEE BREWER (1)

FETCO Model CBS-52H-15 (C52036)

Handle Operated Series Coffee Brewer, twin, 1.5 gallon capacity, automatic, on/off switch, two-portion standard, gravity flow dispense tube system, programmable recipes, gourmet coffee brew basket locks during brew cycle, hot water service, tank drain, 3 x 3.0kW heaters, 120/208-240v, 3-ph, 4+G wires, 19.5 - 22.4 max amp draw, 7.0 - 9.1kW, terminal block, 16.5 - 22.5 gallons per hour, UL, cUL, NSF (Use with FETCO D449, D452, or D009 - sold separately)

- (1) Circuit board: 3 year parts & 1 year labor warranty, standard
- (1) Electro-mechanical parts: 2 year parts & 1 year labor warranty, standard
- (1) All other parts: 1 year parts & 1 year labor warranty, standard

ITEM 1.06A - COFFEE DISPENSER (2)

FETCO Model D449

L4D-15 LUXUS® Thermal Dispenser, 1.5 gallon, Freshness Timer®, Volume Indicator™, vacuum insulated, flip & hide fill-through lid, base with built-in handles and drip tray

- (2) 1 year parts warranty, standard
- (2) Black dispenser faucet, standard

ITEM 1.07 - WALL SHELF (1)

Custom Model DETAIL 2-1

Wall shelf per Detail 2-1. Refer to Section 2.05B for approved manufacturer(s).

ITEM 1.08 - WATER FILTRATION SYSTEM (1)

Everpure Model QC7I SINGLE 4FC5-S

QC7I Water Filtration System, QC7I Single 4FC5-S, (1) 4FC5-S Fibredyne® carbon block cartridge, reduces sediment, chlorine, taste & odor, inhibits scale, 15,000 gallons capacity, 2.5 gpm flow rate, 5 micron, inlet water shut-off valve, outlet pressure gauge, flush valve, 3/8" inlet/outlet connections, NSF 42, (EV920261)

- (1) Model EV969331 Replacement Cartridge: 4FC5-S Water Filter Cartridge, 4FC5-S, (1) 4FC5-S Fibredyne® II carbon block cartridge, reduces chlorine, taste & odors, inhibits bacterial growth & scale, 15,000 gallons, 2.5 gpm, 5 micron, NSF 42 (EV969331)
- (1) Provide (1) complete set of replacement cartridges

ITEM 1.09 - TRASH CONTAINER (1)

Rubbermaid Commercial Products Model FG354060GRAY

Slim Jim® Container, 23 gallon, 22"W x 11"D x 30"H, with venting channels, molded-in handles, general purpose waste, open type without lid, high-impact plastic construction, gray, Made in USA

(1) Model FG267360GRAY Slim Jim® Swing Lid, for Slim Jim® Container, gray

ITEM 1.10 - FIRE SUPPRESSION SYSTEM (1)

Ansul Fire Protection Model R102

Fire suppression system to be a fully operational system with wet chemical suppressant. System to be U.L. 300 listed, and installed in full accordance with the manufacturer's recommendations and all required applicable NFPA, state, and local codes. Wherever possible, piping to be unexposed. Any exposed piping, conduit, and nozzles to be chrome-plated or stainless steel. Fusible link assemblies to be unexposed. Ship complete with tanks, automan release, and remote manual release. Mount cylinders and controls on the wall or the side of the exhaust hood where shown on plan at an accessible height that will not conflict with equipment below. Mount tight to underside of finished ceiling. For projects with mechanical pollution control device(s) (PCUs), provide Ansul coverage for the PCU(s). Refer to the mechanical drawings for all requirements, quantities, specifications, and location(s).

ITEM 1.11 - COMBI OVEN, VENTLESS (1)

Alto-Shaam Model 6-10E PRO

Prodigy™ Pro Combi Oven/Steamer, electric, boiler-free, countertop, capacity (6) 18" x 13" half size sheet or (7) 12" x 20" full size hotel (GN 1/1) pan capacity, Wi-Fi enabled control with steam/convection/combi cooking modes, removable "T" style temperature probe, (2) power levels, programmable cool-down, SafeVent™ steam venting, (5) cleaning levels, triple-pane door, high efficiency LED lighting, (2) side racks with (7) non-tilt support rails, door hinged right, stainless steel construction, adjustable stainless steel legs, EcoSmart®, cULus, UL EPH Classified, CE, IPX5, EAC, city-wide COA for New York City

(1) One year parts and labor warranty, standard

(1) Alto-Shaam Prodigy Factory Authorized Installation Program (First unit only)

(1) Model XP-SVC START-UP Installation start-up check

(1) ECO

(1) 208-240v/50/60/3-ph, 21.9-25.3 amps, 7.9-10.5kW, 8 AWG, NO cord or plug

(1) Model 5021519 Installation Kit, for electric combi ovens, CPVC, rated up to 30.0 amps, includes quick disconnect kit, per oven

(1) Model 6-10EVH Ventech Type 1 Hood with Condensation, for 6-10E, self-contained, two-speed high-powered fan, 775-880 CFM, includes: (2) easy clean grease filters, (2) odor filters, stainless steel construction, 1.63 amps, 0.34 kW, cULus, UL EPA, ANSI/NSF 4, CE, EAC (Not available with smoking feature, or units with recessed door) (All utilities are run through the oven, no additional hookups required)

(1) Hood Field install

(1) Model FI-24113 Ventech Type 1 Hood Washable Grease Filter with metal housing

(1) Wifi, standard

(1) Removable "T" style temperature probe, standard

(1) Model 5016091 Combi Oven Stand, mobile, 28-15/16" x 30-11/16" x 36-1/4" (734mm x 779mm x 920mm), with pan slides and shelf, spacing 2-11/16" (68mm), stainless steel, for 6-10 or 10-10

(2) Dormont Model WATER DISCONNECT Dormont Water Connector, 36" long, Dormont Water Connector, with quick-disconnect with a two-way shut-off valve; KEC to properly size the diameter based on the equipment it serves.

ITEM 1.12 - WATER FILTRATION SYSTEM (1)

Everpure Model EV979721

KleenSteam II Single System, 10,000 gallon capacity, 2.5 gpm flow rate, total system for steamers prevents limescale formation, (1) 7CB5 carbon filters, (1) SS-10 scale inhibitor Cartridge, dip tube, (2) 2.2 lbs. canisters ScaleKleen® (EV979721)

(1) Provide (1) complete set of replacement cartridges

ITEM 1.13 - WORKTABLE (1)

Custom Model DETAIL 1-3

Worktable per Detail 1-3. Refer to Section 2.05B for approved manufacturer(s).

Model DETAIL 1-3 G Side and/or rear crossbracing per Detail 1-3 Note G

ITEM 1.14 - UTILITY CHASE (1)

Custom Model DETAIL 7-6

Utility chase per Detail 7-6. Refer to Section 2.05B for approved manufacturer(s).

ITEM 1.15 - OVERSHELF, TABLE-MOUNTED (1)

Custom Model DETAIL 2-5

Table-mounted overshef per Detail 2-5. Refer to Section 2.05B for approved manufacturer(s).

ITEM 1.16 - POS PRINTER (2)

NIC / BY OWNER

This item is not in the Kitchen Equipment Contract

KEC to coordinate the size and utility requirements of this item

ITEM 1.17 - HEATED CABINET, MOBILE (2)

Alto-Shaam Model 750-S

Halo Heat® Low Temp Holding Cabinet, on/off simple controller with adjustable thermostat, indicator light, capacity (10) 12" x 20" pans, (2) chrome plated side racks, (3) wire shelves, stainless steel exterior, 2-1/2" casters; 2 rigid, 2 swivel with brakes, EcoSmart®, cULus, UL EPH ANSI/NSF 4, CE, IPX3, TUV-NORD, EAC, N11942

(2) 120v/60/1-ph, 9.0 amps, 1.1kW, 5 ft. cord, NEMA 5-15P, standard

(2) Solid door, hinged on right, standard

(2) Model 5008017 Casters, 3-1/2" (89mm), plate, (2) rigid, (2) swivel with brakes

ITEM 1.18 - REFRIGERATOR, UNDERCOUNTER (1)

Turbo Air Model PUR-60-FB-N

PRO Series Undercounter Refrigerator, front breathing airflow, two-section, 14.8 cu. ft., 60-1/4"W x 30"D x 30-1/2"H, (2) solid hinged swing doors with locks, stainless steel interior & exterior (galvanized steel bottom), (2) stainless steel wire shelves, self-cleaning condenser, R290 Hydrocarbon refrigerant, 1/6 HP, 115v/60/1-ph, 8.9 amps, NEMA 5-15P, cETLus, ETL-Sanitation, Made in USA (contact sales for lead time)

(1) 5 year parts & labor warranty, standard

(1) 7 year compressor warranty (self-contained only)

(1) Non-Standard mounting options below:

(4) Model 30265H0200 2-1/2" Caster with brake, 1/2" diameter & 13 TPI (sold by each)

ITEM 1.19 - THREE (3) COMPARTMENT SINK WITH SCRAP BASKET (1)

Custom Model DETAIL 4-5

Three-compartment sink with scrap basket per Detail 4-5. Refer to Section 2.05B for approved manufacturer(s).

ITEM 1.20 - POT RACK WALL SHELF (1)

Custom Model DETAIL 2-14

Pot rack with wall shelf per Detail 2-14. Refer to Section 2.05B for approved manufacturer(s).

ITEM 1.21 - DISHWASHER, DOOR TYPE (1)

Champion Model DH-2000 (40-70)

Versa-Clean Dishwasher, door type, high temperature with built-in 40° & 70° F rise electric booster, self-draining pump, 55 racks/hour capacity, auto-fill, stainless steel construction, electric tank heat, NSF, cULus, 1hp

- (1) 1 year limited warranty, standard
- (1) Single-point electrical connection, standard
- (1) 208v/60/3-p
- (1) Straight-through design application
- (1) Model 117084 Drain water tempering kit, (unmounted)
- (1) Model 418953 Shock Arrestor (unmounted)
- (2) Model 101273 Flat Bottom Dishrack, 20" x 20", additional
- (2) Model 101285 Peg Dishrack, 20" x 20", additional

ITEM 1.22 - CONDENSATE HOOD (1)

Halton Model DETAIL 7-1

Condensate hood per Detail 7-1. Refer to Section 2.05B for approved manufacturer(s).

ITEM 1.23 - CLEAN DISHTABLE (1)

Custom Model DETAIL 4-1

Clean dishtable per Detail 4-1. Refer to Section 2.05B for approved manufacturer(s).

ITEM 1.24 - POT RACK, WALL-MOUNTED (1)

Custom Model DETAIL 2-3

Wall-mounted pot rack per Detail 2-3. Refer to Section 2.05B for approved manufacturer(s).

ITEM 1.25 - COMPOST CONTAINER (1)

Rubbermaid Commercial Products Model FG354007GRN

Slim Jim® Station Recycling Container, 23 gallon, 22"W x 11"D x 30"H, with "We Recycle" symbol, durable, easy-to-clean, green, Made in USA

- (1) Model FG267360BLA Slim Jim® Swing Lid, for Slim Jim® Container, black, S.O.S.

ITEM 1.26 - ICE MAKER WITH BIN (1)

Existing Model RELOCATED

KEC to coordinate the size and utility requirements of this item

ITEM 1.27 - WATER FILTRATION SYSTEM (1)

Everpure Model EV933042

High Flow CSR Twin-MC2 System, for combination coffee brewers, fountain, ice & steam, 18,000 gallon capacity, 3.34 gpm flow rate, 0.2 micron rating, (2) MC 0.2 micron precoat Cartridges (1) SRX scale reduction feeder (1) EC210 pre-filter, water shut-off, pressure gauges, flushing valve (EV933042)

(1) This system requires (2) cartridges, (1) pre-filter & (1) scale reduction feeder.

(1) Provide (1) complete set of replacement cartridges

ITEM 1.28 - HAND SINK (1)

Eagle Group Model HSA-10-FWLDP-LRS

Hand Sink, wall mount, 14" wide x 10" front-to-back x 5" deep bowl, 304 stainless steel construction, factory installed side splashes, wrist handle faucet, towel & soap dispensers, lever drain with overflow, inverted "V" edge, NSF

ITEM 1.29 - SHELVING, MOBILE (6)

Metro Model MQ.MBL-SIZE PER PLAN

MetroMax Q Shelving Unit, open grid polymer with Microban antimicrobial protection, epoxy coat steel frame, wedge connectors. Size and quantity per the plan with five (5) tiers of shelving. Posts to be 63" high with four (4) casters, two (2) brakes.

ITEM 1.30 - DESK (1)

NIC / BY GC

This item is not in the Kitchen Equipment Contract

KEC to coordinate the size and utility requirements of this item

ITEM 1.31 - WALL SHELVING (1)

NIC / BY GC

This item is not in the Kitchen Equipment Contract

KEC to coordinate the size and utility requirements of this item

ITEM 1.32 - CORNER GUARD (2)

Custom Model DETAIL 7-5

Corner guard per Detail 7-5. Refer to Section 2.05B for approved manufacturer(s).

ITEM 2.00 - *FRONT OF HOUSE*****

ITEM 2.01 - REFRIGERATED MERCHANDISER (1)

Turbo Air Model TSR-49GSD-N

Super Deluxe Glass Door Refrigerator, two-section, 54-3/8"W x 31-7/8"D x 83-1/4"H, 44.14 cu. ft., self-contained, self-cleaning condenser device, front aluminum door frame, stainless steel top, sides & bottom grille, stainless steel interior, (2) hinged double pane glass doors with Low-E glass, LED interior lighting, (6) PE coated wire shelves, LED digital thermometer, door open beep, self-diagnostic monitoring system, turbo cooling, automatic fan motor delays, door locks, bottom mount compressor, R290 Hydrocarbon refrigerant, 1/3 HP, 115v/60/1-ph, 3.1 amps, NEMA 5-15P, cETLus, ETL-Sanitation, ENERGY STAR®

(1) 5 year parts & labor warranty, standard

(1) 7 year compressor warranty (self-contained only)

- (1) Self-cleaning condenser device equipped, standard
- (1) Caster Set, swivel, locking front wheels, standard

ITEM 2.02 - MILLWORK COUNTER (1)

Custom Model CUSTOM

Millwork counter to be fabricated and installed by the KEC. Refer to the drawings for size and details. Refer to the architectural drawings for finishes and additional details. KEC to coordinate any cutouts in the countertop for foodservice equipment. Refer to Section 2.05B for approved manufacturer(s).

Model FAB-MW-TOP KEC to provide a solid surface / stone top. Refer to the architectural drawings for finishes and details.

ITEM 2.03 - MILLWORK COUNTER WITH SINKS (1)

Custom Model CUSTOM

Millwork counter to be fabricated and installed by the KEC. Refer to the drawings for size and details. Refer to the architectural drawings for finishes and additional details. KEC to coordinate any cutouts in the countertop for foodservice equipment. Refer to Section 2.05B for approved manufacturer(s).

Model FAB-MW-CLADDING KEC to clad the front of the counter. Refer to the architectural drawings for finishes and details.

Model FAB-MW-TOP KEC to provide a solid surface / stone top. Refer to the architectural drawings for finishes and details.

- (1) Model DETAIL 3-1 SINK Integral sink per Detail 3-1
- (1) Model DETAIL 3-3 Stainless steel sink cover and holder per Detail 3-3
- (1) Model DETAIL 3-5 HAND SINK Recessed hand sink per Detail 3-5

ITEM 2.04 - SOUP WELL, DROP-IN (1)

Hatco Model RHW-1B

Round Food Warmer/Cooker, electric, built-in, (1) 11 qt. round pan capacity, dry operation, thermostatic controls, 122° - 212°F, includes pan, lid & remote control, stainless steel construction, 1.3kW, 10.4 amps, 120v/60/1-ph, NEMA 5-15P, cULus, UL EPH Classified

- (1) Model RHW-11QT-POT Food Pan, round, 11 qt. capacity, for RHW
- (1) Model RHW-11QT-LID-HG Lid, hinged, for RHW 11 qt. round pan

ITEM 2.05 - DISPLAY CASE, NON-REFRIGERATED (1)

Structural Concepts Model NR3647DSV

Reveal® Service Non-Refrigerated Display Case, freestanding, 35-3/4"W x 33"D x 47-1/8"H, (2) removable & adjustable clear glass shelving, LED top & shelf lights, vertical, fixed front & side uv frameless glass, full end panels, clear glass rear sliding doors, one piece formed ABS plastic tub, black exterior & interior, adjustable locking casters, cETLus, ETL-Sanitation

- (1) Warranty: 1 year parts & labor warranty, standard
- (1) Electrical: 110-120v/60/1-ph, 0.70 amps, 11.0 watts, standard
- (1) Electrical Connection: 6' Straight blade power cord with NEMA 5-15P, standard
- (1) Interior Color: Powder coated SCC Standard Silversan Black (FDA compliant)
- (1) Frame Exterior: Powder coated SCC Standard Silversan Black (FDA compliant), standard
- (1) Panel Exterior Color: Laminate standard color 909-58 Black
- (1) Model GRAIN DIRECTION Standard laminate grain directions (when applicable):
 - Front Panels (Upper Header and Lower Panels): Horizontal grain direction

- End Panels: Vertical grain direction
- Blend & Reveal Cases Only: Horizontal grain direction on front and end panels
- (1) End Panel Left: Full end panel
- (1) End Panel Right: Full end panel
- (1) Lower Front Panel Color: Powder coated SCC Standard Silversan Black (FDA compliant), standard
- (1) Lower Rear Panel Color: Powder coated SCC Standard Silversan Black (FDA compliant), standard
- (1) Rear Doors: Clear glass rear sliding doors, standard
- (1) Lights: LED 3500K with frost lens, standard
- (1) Base Support: Adjustable, locking casters (self-cont.), standard
- (1) Base Support: Adjustable, locking casters (self-cont.), standard
- (1) Architect to verify color
- (1) Provide shop drawing for review

ITEM 2.06 - DISPLAY CASE, REFRIGERATED (1)

Structural Concepts Model NR3647RSV

Reveal® Service Refrigerated Case, freestanding, 35-3/4"W, 47-1/4"H, Breeze-E (Type II) with EnergyWise self-contained refrigeration, (2) removable & adjustable clear glass shelving, LED top & shelf lights, vertical, fixed front & side uv frameless glass, full end panel, clear glass rear sliding doors, coated coil, condensate pan, cETLus, ETL-Sanitation

- (1) 1 yr. parts & labor warranty, 5 yr. compressor warranty, standard
- (1) Refrigeration: Breeze-E (Type II) self-contained refrigeration, rear access (R290) standard
- (1) Electrical Connection: 10' NEMA 5-15P, 110-120v/60/1-ph straight blade power cord, standard
- (1) Clean Sweep: None, standard
- (1) Base Support: Adjustable, locking casters (self-cont.), standard
- (1) Interior Color: Powder coated SCC Standard Silversan Black (FDA compliant)
- (1) Frame Exterior: Powder coated SCC Standard Silversan Black (FDA compliant), standard
- (1) Panel Exterior Color: Laminate standard color 909-58 Black
- (1) Model GRAIN DIRECTION Standard laminate grain directions (when applicable):
 - Front Panels (Upper Header and Lower Panels): Horizontal grain direction
 - End Panels: Vertical grain direction
 - Blend & Reveal Cases Only: Horizontal grain direction on front and end panels
- (1) End Panel Left: Full end panel
- (1) End Panel Right: Full end panel
- (1) Lower Front Panel Color: Powder coated SCC Standard Silversan Black (FDA compliant), standard
- (1) Rear Doors: Clear glass rear sliding doors, standard
- (1) Lower Rear Panel Color: Powder coated SCC Standard Silversan Black (FDA compliant), standard
- (1) Lights: LED 3500K with frost lens, standard
- (1) Architect to verify color
- (1) Provide shop drawing for review

ITEM 2.07 - KIOSK ORDERING SYSTEM (2)

NIC / BY OWNER

This item is not in the Kitchen Equipment Contract
KEC to coordinate the size and utility requirements of this item

ITEM 2.08 - TRASH CONTAINER (3)

Rubbermaid Commercial Products Model FG354060GRAY

Slim Jim® Container, 23 gallon, 22"W x 11"D x 30"H, with venting channels, molded-in handles, general purpose waste, open type without lid, high-impact plastic construction, gray, Made in USA

(3) Model FG267360GRAY Slim Jim® Swing Lid, for Slim Jim® Container, gray

ITEM 2.09 - COMPOST CONTAINER (1)

Rubbermaid Commercial Products Model FG354007GRN

Slim Jim® Station Recycling Container, 23 gallon, 22"W x 11"D x 30"H, with "We Recycle" symbol, durable, easy-to-clean, green, Made in USA

(1) Model FG267360BLA Slim Jim® Swing Lid, for Slim Jim® Container, black, S.O.S.

ITEM 2.10 - FOOD GUARD (1)

NIC / BY MILLWORK

This item is not in the Kitchen Equipment Contract
KEC to coordinate any built-in and/or drop-in foodservice equipment

ITEM 2.11 - COLD BREW COFFEE DISPENSER (1)

Espresso Parts Model BRODRNXDUO

BROOD DRNX SLM DUO Nitro & Still Beverage Dispenser, two taps, flash chills each serving to 36°C, plug & play, Keg-free, pulls nitrogen from the atmosphere, compact design, 120v

ITEM 2.12 - DRIP TROUGH (1)

Glastender, Inc. Model DI-RF12

Drop-In Rinser Faucet Drain Tray, 12"W, 1/2" tray flange, 1/2" drain, stainless steel, installation kit includes: 10 ft. clear vinyl tubing, (5) 4" Ty-wraps, (2) 1/2" plastic elbows, ETL-Sanitation

(1) 1 year parts & labor warranty

ITEM 2.13 - SPARE NUMBER

ITEM 2.14 - ESPRESSO CAPPUCCINO MACHINE (1)

Eversys Inc. Model ENIGMA ST E'4M

Enigma E'4M Automated Espresso Coffee Machine, 2 group, super automatic, up to 350 espresso per hour production capacity, (2) 10" touch screen controls, electronic e'Foam Micro Air Dosing (MAD) system, electronic milk texturing system, includes: (2) Everfoam steam arms, (2) ceramic burr grinders, (2) 3.3 lb coffee bean hoppers, (1) 1.5 lb grounds drawer, (1) hot water spout, (1) 5.4 liter steam boiler, (2) 1.5 liter coffee boilers, black exterior

(1) 1 year labor & service, 2 year parts, standard

(1) Model ENIGMA DUAL MILK OPTION Dual Milk Upgrade

(1) Model VITRIFRIGO FG14 STAINLESS STEEL Milk Refrigerator, holds (2) one gallon containers, internal thermometer, (6) tube holes, stainless steel construction, 110-120v/50/60/1-ph, NSF, UL

(1) Model ENIGMA 1.5 STEP OPTION 1.5 Step Option, automated milk steaming wand, for Enigma E'4m machines

ITEM 2.15 - BLENDER (2)

Vitamix Model 36019

Quiet Blending Technology

The ultimate blender with unparalleled sound reduction, exceptional beverage blends, and improved speed of service.

ITEM 2.16 - ICE CADDY, MOBILE (1)

BK Resources Model BK-MIB-2422

Mobile Ice Bin, with sliding lid, 22"W x 24"D x 29"H, stainless steel, 117lb. capacity, removable bottom tray, drain valve in rear of unit, 3" casters with brake

ITEM 2.17 - CONVECTION OVEN, VENTLESS (1)

TurboChef (Middleby) Model DOUBLE BATCH, 3P

(QUICK SHIP) HHD-9500-814-DL Double Batch™ Oven, electric, 3-phase ventless, countertop, stackable, (2) independent decks, store up to 800 recipes (400 per cavity), smart voltage sensor technology (North America only), internal catalytic converters, 16" pizza capacity per deck, (1) oven cleaner, (1) oven guard, (1) aluminum paddle, (2) trigger sprayers, (2) standard racks, (2) top & bottom jetplates, stainless steel front, top & sides, rubber seal for surface mounting, cULus, UL EPH Classified, TÜV, CE (Max qty - 5 per order, ships within 4 days)

(1) Model MDD-1001 Open Kitchen bundle, includes - 1 x ConnectWare module, 1 x Secure Access Point (SAP), 3 year subscription for Open Kitchen (NET price displays when item is added to quote)

(1) One year parts and labor warranty

(1) (DOUBLE BATCH, 1P-14-DL) 208/240v/60/3-ph, 30.0 amps, 8.32/9.6 kW, 6 ft. cord & plug (nominal), NEMA 15-30P

ITEM 2.18 - RAPID COOK OVEN (1)

TurboChef (Middleby) Model EL BANDIDO (I1 SOTA W/ PANINI PRESS)

i1-9500-938 El Bandido Panini Press Oven, Rapid Cook, electric, countertop, externally actuated panini press mechanism, top-launched microwave system, external air filtration, LED timer, smart menu system, One Touch Controls, single or dual-temperature, built-in self diagnostics, smart voltage sensor technology (US only), includes: TurboChef Cleaner and Guard Starter Kit, includes (1) cleaner packet, (1) 24 oz bottle, (1) foam trigger sprayer, (1) oven guard, (1) aluminum paddle (I1-9716), (2) solid PTFE baskets (105696), rear air filter, die-cast aluminum front panel, 4" adjustable legs, 6.2kW, cULus, CE, UL EPH Classified, TÜV

(1) Model MDD-1001 Open Kitchen bundle, includes - 1 x ConnectWare module, 1 x Secure Access Point (SAP), 3 year subscription for Open Kitchen (NET price displays when item is added to quote)

(1) One year parts and labor warranty

(1) 208/240v/60/1-ph, 30.0 amps, 6 foot cord (nominal), NEMA 6-30P, standard

(1) Model I1-9500-921 Custom color red

(1) Architect to verify color

ITEM 2.19 - POS PRINTER (2)

NIC / BY OWNER

This item is not in the Kitchen Equipment Contract
KEC to coordinate the size and utility requirements of this item

ITEM 2.20 - REFRIGERATOR, UNDERCOUNTER (1)

Existing Model RELOCATED

KEC to coordinate the size and utility requirements of this item

ITEM 2.21 - MOBILE COUNTER (2)

NIC / BY MILLWORK

This item is not in the Kitchen Equipment Contract
KEC to coordinate any built-in and/or drop-in foodservice equipment

ITEM 2.22 - COFFEE DISPENSER (2)

FETCO Model D449

L4D-15 LUXUS® Thermal Dispenser, 1.5 gallon, Freshness Timer®, Volume Indicator™, vacuum insulated, flip & hide fill-through lid, base with built-in handles and drip tray

(2) 1 year parts warranty, standard

(2) Black dispenser faucet, standard

ITEM 2.23 - POP-UP TOASTER (1)

Waring Model WCT850

Commercial Switchable Bagel/Bread Toaster, heavy-duty, (4) 1-1/2" slots, (4) slice capacity (up to 360 slices/hr), (2) rotary dial to adjust browning controls, removable crumb tray, carriage control levers, replaceable industrial heating plates, brushed stainless steel finish, NEMA 6-20P, 208v/50/60/1-ph, 13.5 amps, 2800 watts, cETLus, NSF

(1) 1 year limited warranty, standard

ITEM 2.24 - MICROWAVE OVEN (1)

Panasonic / NE-1054F

PRO Commercial Microwave Oven, 1000 watts, 0.8 cu. ft. capacity, (6) power levels, 2- & 3-stage cooking, 20 program memory capacity, touch control pad with Braille, 99-minute timer, programmable and manual operation, program list/cycle counter, self diagnostics, tone control, bottom energy feed, interior light, see-through door with "grab & go" handle, stainless steel front, 120v/60/1-ph, 13.4 amps, cord, NEMA 5-15P, cULus, NSF

(1) 1 year parts & labor warranty (or 18,000 cycles) which ever comes first and 3 year magnetron warranty (or 54,000 cycles) which ever comes first

ITEM 2.25 - SPARE NUMBER

ITEM 2.26 - TRASH COUNTER (1)

NIC / BY MILLWORK

This item is not in the Kitchen Equipment Contract
KEC to coordinate any built-in and/or drop-in foodservice equipment

ITEM 2.27 - COMPOST CONTAINER (2)

Rubbermaid Commercial Products Model 1955960

Slim Jim® Container, 16 gallon, 22"L x 11"W x 25"H, with venting channels, molded-in handles, general purpose waste, open type without lid, high-impact plastic construction, green, Made in USA

ITEM 2.28 - RECYCLING CONTAINER (2)

Rubbermaid Commercial Products Model 1971257

Slim Jim® Container, 16 gallon, 22"L x 11"W x 25"H, with venting channels, molded-in handles, general purpose waste, open type without lid, high-impact plastic construction, blue, Made in USA

ITEM 2.29 - TRASH CONTAINER (2)

Rubbermaid Commercial Products Model 1971258

Slim Jim® Container, 16 gallon, 22"L x 11"W x 25"H, with venting channels, molded-in handles, general purpose waste, open type without lid, high-impact plastic construction, gray, Made in USA

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Jobsite Supervision: Provide competent supervision for installation of all foodservice equipment including uncrating, assembling, fitting, setting-in-place, and leveling.
- B. Schedule: Deliver equipment when the site is ready and per the project schedule. Provide hangers, brackets, and supports as required during early stages of construction to prevent delay of the work of other Trades.
- C. Hours: Deliver and set in place during regular working hours, unless otherwise directed.
- D. Inspection: Prior to all work of this section, carefully inspect the installed work of all other Trades and verify that work is complete to the point where this installation may properly commence.
 - 1. Discrepancies: In the event of a discrepancy, immediately notify the Owner and Contractor in writing.
 - 2. Rough-Ins: Check the location and utility size of all rough-ins for compatibility with equipment before floors, walls, and/or ceilings are finished and equipment is delivered. If any discrepancies will affect the installation or efficiency of the equipment, immediately inform the Contractor.
 - 3. Resolution: Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
- E. Coordination with Trades: Coordinate with the GC, all Trades, and Subcontractors where their work affects the foodservice equipment under this contract. Share all dimensions and requirements that impact other Trades, such as cutouts in millwork.
- F. Inspection: Inspect all equipment for concealed damage at the warehouse and repack for shipment to the job site. Return any damaged items to the supplier and obtain a replacement.
- G. Shipping: Do not ship any items uncrated except for fabricated items shipped by furniture type delivery trucks.
- H. Set in Place: Set all equipment level, plumb and true. Anchor to the floor, walls, and/or ceiling as required. Leave all equipment ready to receive plumbing, steam, electric, gas and ventilation connections by Trades.
- I. Completeness: Complete work in all respects and detail, include all necessary bolts, hangers, brackets, screws, and/or other necessary hardware.
- J. Protection: Use all means necessary to protect the foodservice equipment during and after installation, and to avoid impact on the installed work.
 - 1. Protective Covering: Deliver all stainless steel fabricated items covered with protective coating. Do not remove until ready for inspection and demonstration.
 - 2. Repair surfaces: Restore scratched or marred surfaces to their original finish.
 - 3. Replacement: Repair or replace damaged items that were not properly protected at no additional cost to the Owner.
- K. Small Items: Deliver all small equipment and parts to the job site when instructed.

- L. Seamless Assembly: Fully assemble any items that were delivered to the job site in sections. For stainless steel work surfaces, seamlessly weld and polish so that the finish is smooth, even, and true.
- M. Trim and Seal: Neatly trim and/or seal all fixed equipment that is shown in the contract documents as adjoining equipment, walls, and ceilings.
 - 1. Seal: For gaps of 1/8" or less, seal with an NSF food-grade silicone sealant.
 - 2.
 - 2. Trim: For gaps over 1/8", get direction from Owner or JDB. Trim is not an acceptable substitute for accuracy and neatness. Where accepted, trim with stainless steel angle trim of 20 gauge stainless steel.
 - 3. Walk-Ins and Hoods: Where the top of the walk-in or exhaust hood is lower than the finished ceiling, provide closure panels matching the finish of the item.

3.02 TESTING & STARTUP

- A. Equipment Testing: Test all equipment for proper operation. Adjust, repair, or replace any equipment or parts that operate below required capacity or operate with excessive noise or vibration.
 - 1. Attendance: Where required, perform tests in the presence of the Owner and AHJ. Resolve all defects disclosed by the tests to the satisfaction of the Owner and retest the corrected areas.
 - 2. Material and Labor: Provide the labor, materials, and equipment necessary to conduct these tests.
 - 3. Schedule: Provide the Owner a schedule of testing, date, and results.
 - 4. Refrigeration: Test the refrigeration system in heavy-use conditions to ensure it maintains temperature and meets all requirements detailed in Section 2.05. Have a representative of the local servicing organization present at a startup and adjustment of the various systems. Ensure the representative is familiar with the requirements and characteristics of each system.
 - 5. Fire Protection System: Obtain all necessary permits and approvals for the fire protection system. Complete a pre-test of the system(s) and a test in the presence of the AHJ.
- B. Written Certification: Upon successful completion of all testing, submit written certification to the Owner that all items conform to the requirements of the Contract Documents.

3.03 TURNOVER

- A. Cleaning: At the conclusion of work, clean the interior and exterior of all foodservice equipment to completely remove all traces of grease, stains, protective coatings, abrasive dust, markings, scratches, and other foreign matter. Clean in a manner that eliminates the need for any further cleaning prior to use, except for typical daily cleaning for sanitation and appearance.
- B. Trash & Material Removal: Place all trash, crating, boxes, and coverings pertaining to the foodservice equipment in a central location on the floor or in containers furnished by the general contractor. Remove all excess material from the site.
- C. Protective Coverings: When directed by the General Contractor or Owner, remove all protective covering and labels from foodservice equipment.

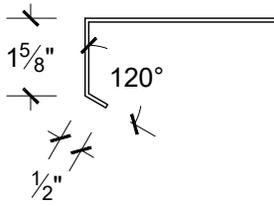
- D. Equipment Demonstrations: Arrange for properly trained personnel to demonstrate to the Owner's operators the operation of all foodservice equipment, including the refrigeration system.
- E. Operations and Maintenance Manual: Provide the Owner a PDF with the manufacturer's current printed installation, operation, maintenance and parts manuals for all specified foodservice equipment including all accessories and components.
 - 1. Item Numbering: Clearly label each item with its item number.
 - 2. Table of Contents: Include a table of contents with item number, quantity, item description, manufacturer and model, serial number, warranty durations, and page number.
 - 3. Service Agency Listing: Include the complete name, address and telephone number of the local service agencies for all foodservice equipment.
 - 4. Maintenance Schedule: Include a schedule for all appropriate equipment maintenance.
 - 5. Maintenance Instructions: Include repair and maintenance instructions for each item of mechanically-operated equipment with each item identified by number.
 - 6. Provide contact information for the service bureau.
- F. As-Built Drawings: Provide as-built rough-in drawings reflecting the exact dimensions, geometry, and locations of the final foodservice equipment layout. Ensure these reflect all modifications, field condition changes, shop drawing changes, and design adjustments.

PART 4 – FABRICATION

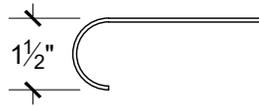
4.01 TYPICAL FABRICATION DETAILS

- A. Typical Details: The following pages contain all typical details. Refer to the itemized specifications Section 2.05C for the details that are relevant to this project.
- B. Abbreviations: The details contain abbreviations as follows.
 - 1. S/S – Stainless steel
 - 2. GA. – Gauge
 - 3. A.F.F. – Above finished floor
 - 4. O.C. – On center
 - 5. O.D. – Overall diameter
 - 6. U.O.N. – Unless otherwise noted
 - 7. SF – Square feet
 - 8. LBS – Pounds

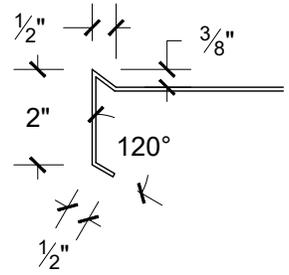
END OF SECTION



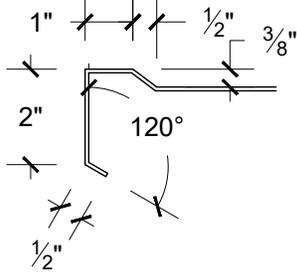
(A) SQUARE EDGE



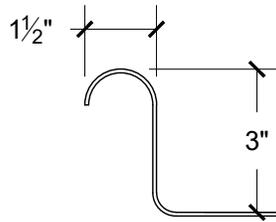
(B) ROLLED EDGE



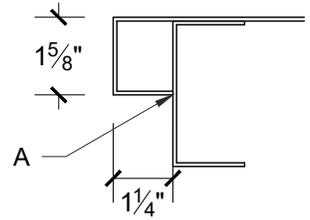
(C) INVERTED "V" EDGE



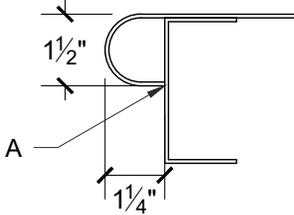
(D) MARINE EDGE



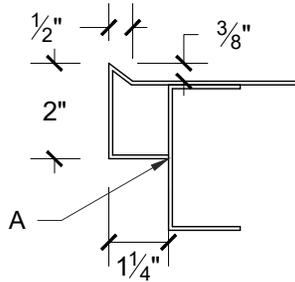
(E) RAISED ROLLED EDGE



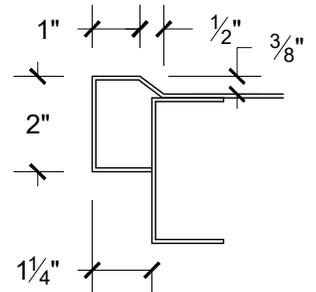
(F) COUNTER CHANNEL EDGE



(G) COUNTER ROLLED EDGE



(H) COUNTER INVERTED "V" EDGE

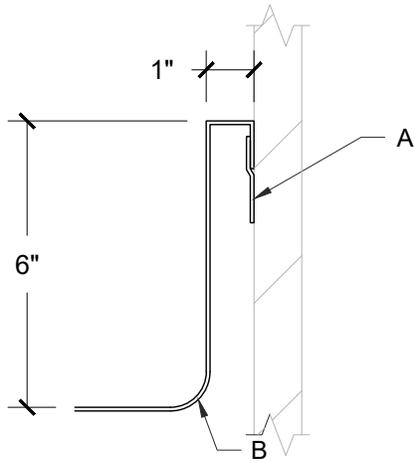


(I) COUNTER MARINE EDGE

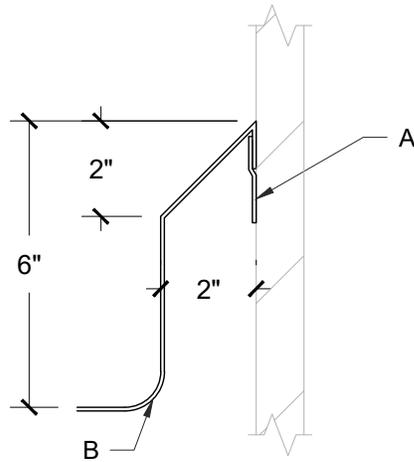
SECTIONS

3" = 1'-0"

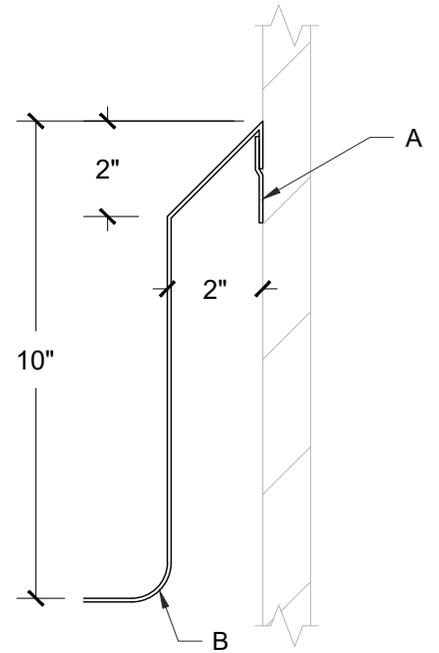
A. EDGE TO BE TIGHT TO COUNTER AND SEALED



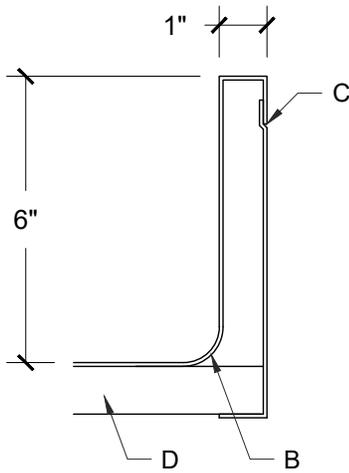
(A) 1" SPLASH



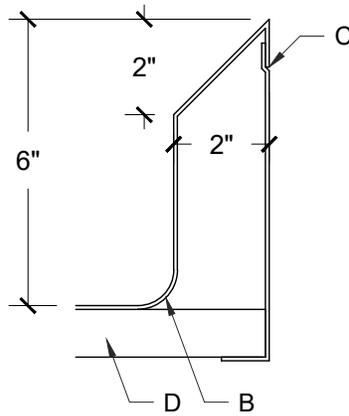
(B) 2" SPLASH



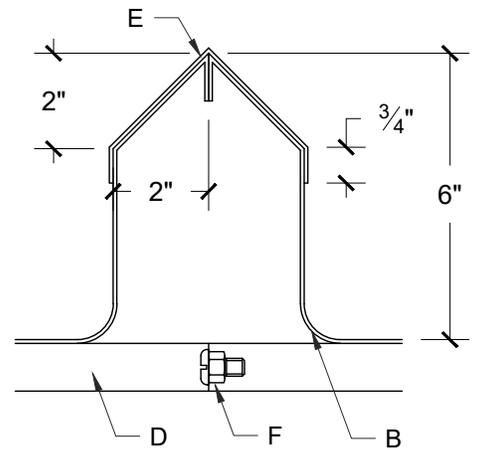
(C) DISHTABLE SPLASH



(D) ENCLOSED 1" SPLASH



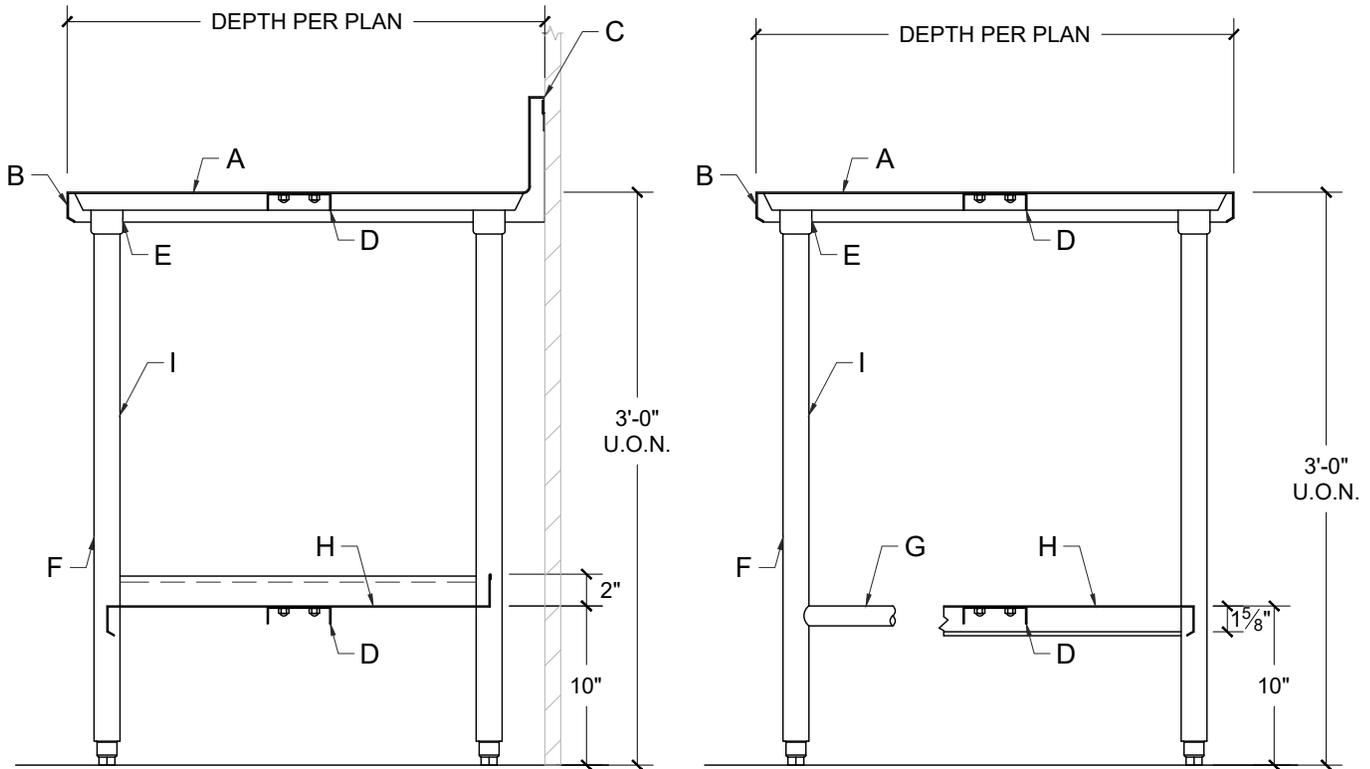
(E) ENCLOSED 2" SPLASH



(F) CAPPED SPLASHES

SECTIONS
3" = 1'-0"

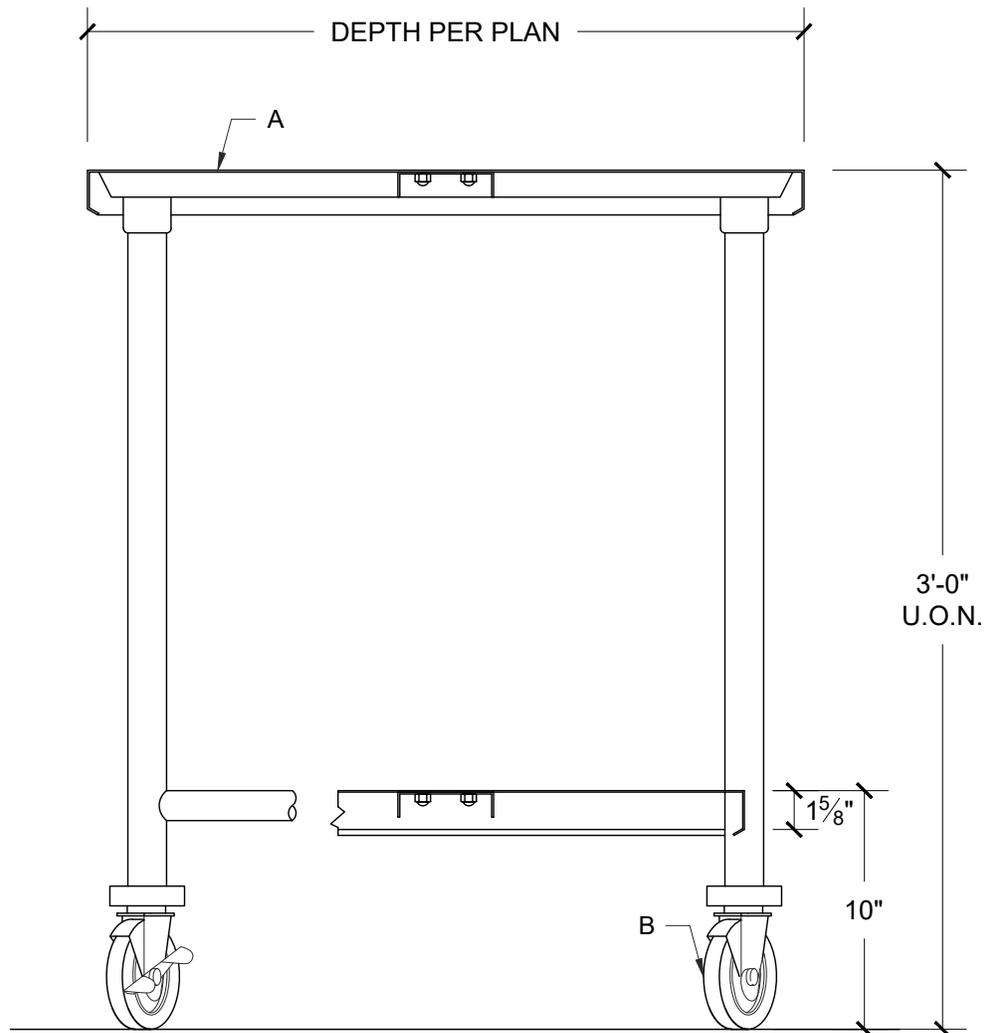
- A. Z CLIP 2" WIDE, 42" O.C. MAX
- B. 3/8" RADIUS
- C. TACK WELD AND SEAL
- D. CHANNEL OR ANGLE
- E. 16 GA S/S CAP PIECE TACK WELDED AND POLISHED
- F. BOLT CHANNELS OR ANGLES TOGETHER



SECTIONS

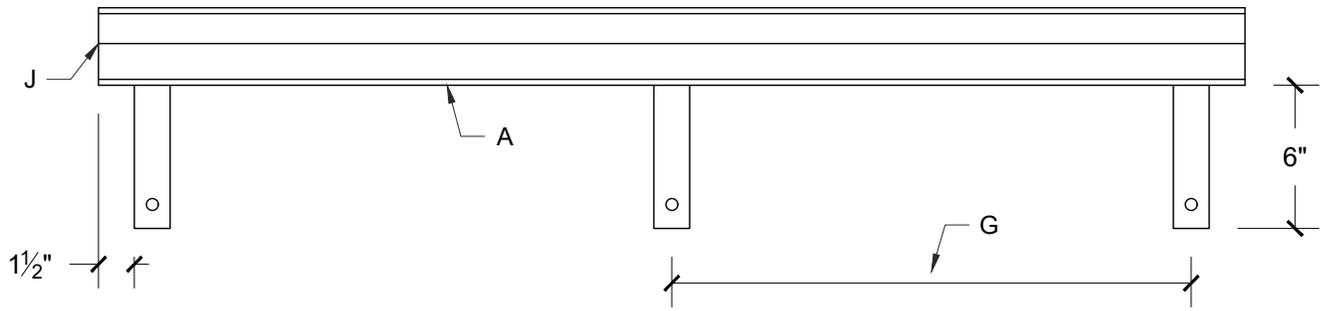
1" = 1'-0"

- A. 14GA. TYPE 304 S/S TOP WITH SOUND DEADENING
- B. EDGE PER DETAIL 1-1A UNLESS OTHERWISE SPECIFIED
- C. BACK AND/OR SIDE SPLASHES PER THE PLAN AND DETAIL 1-2; SPLASH TYPE PER SPECIFICATIONS
- D. 4"X1" 14 GA. S/S HAT CHANNEL; CAP WITH S/S ACORN NUTS
- E. S/S GUSSETS FULLY WELDED TO 14 GA. S/S HAT CHANNELS
- F. 1-5/8" O.D. 16 GA. S/S LEGS WITH ADJUSTABLE S/S BULLET FEET
- G. WHERE CROSSBRACING IS SPECIFIED, PROVIDE 16 GA. 1-1/4" O.D. S/S CROSSRAIL FULLY WELDED, GROUND & POLISHED AT JUNCTURES, SIDES AND REAR
- H. WHERE UNDERSHELF IS SPECIFIED, PROVIDE 16 GA. S/S SHELF WITH EDGE PER DETAIL 1-1 TYPE A
- I. 5'-0" MAXIMUM O.C. BETWEEN LEGS U.O.N



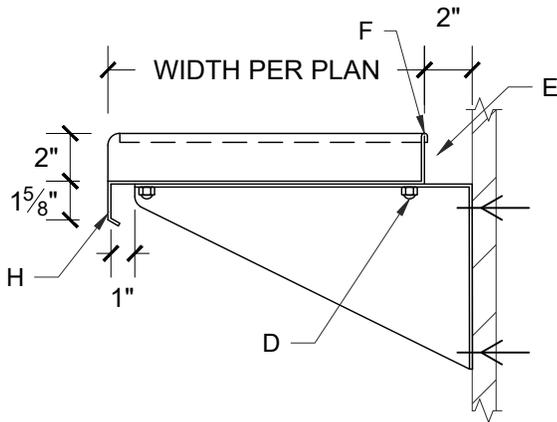
SECTION
 1-1/2" = 1'-0"

- A. WORKTABLE PER DETAIL 1-3
- B. 6" HEAVY DUTY CASTERS; FRONT CASTERS TO HAVE BRAKES



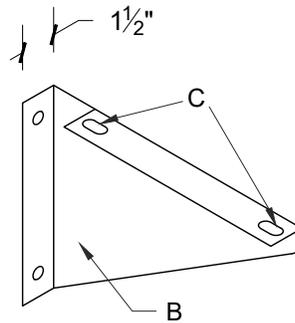
ELEVATION

1-1/2" = 1'-0"



SECTION

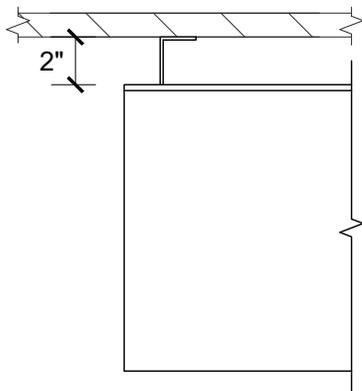
1-1/2" = 1'-0"



BRACKET DETAIL

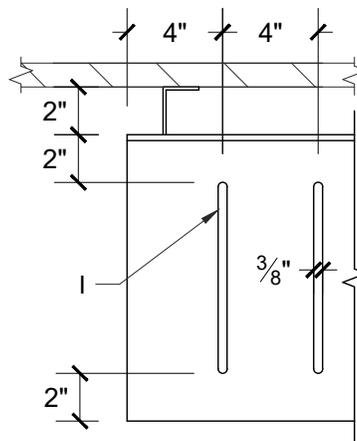
1-1/2" = 1'-0"

- A. 16 GA S/S SHELF
- B. 14 GA S/S BRACKET
- C. ELONGATED STUD HOLES FOR FIELD ADJUSTMENTS
- D. WELD STUDS TO UNDERSIDE OF SHELF; CAP WITH S/S ACORN NUTS
- E. 2" STAND OFF FROM WALL
- F. TURN UP AND HEM
- G. BRACKETS SPACED NO MORE THAN 5'-0" APART O.C.
- H. SQUARE EDGE PER DETAIL 1-1 TYPE A
- I. WHERE SLOTTED SHELF SPECIFIED, PROVIDE CUTOUTS 4" APART O.C.
- J. FIRST SHELF MOUNTED AT 1'-8" ABOVE WORK SURFACE; ANY ADDITIONAL SHELVES MOUNTED 1'-0" ABOVE THE SHELF BELOW U.O.N.



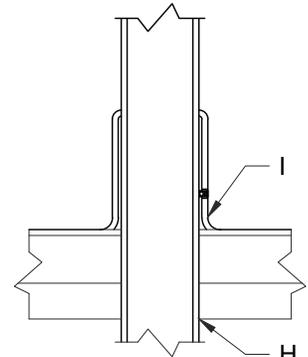
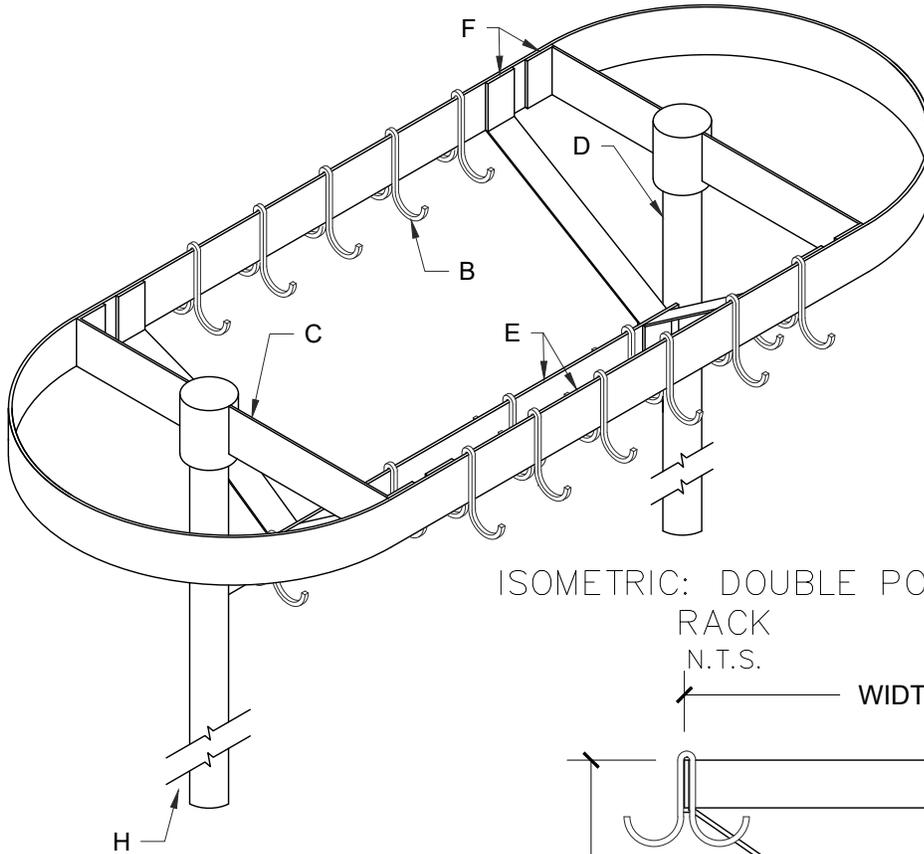
PLAN

1-1/2" = 1'-0"



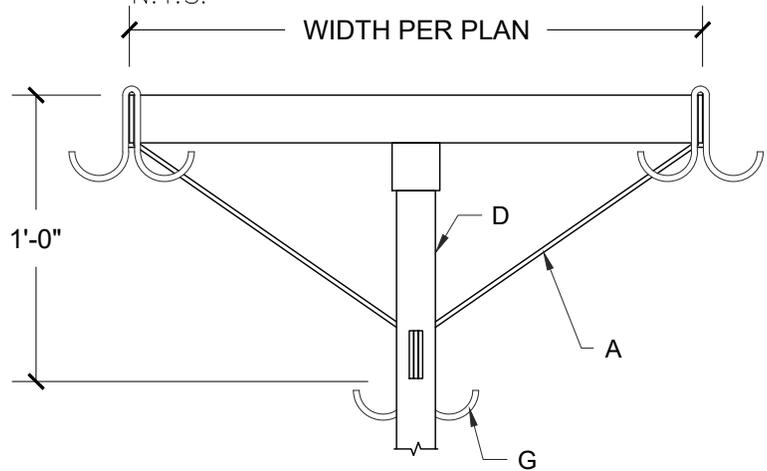
PLAN: SLOTTED SHELF

1-1/2" = 1'-0"

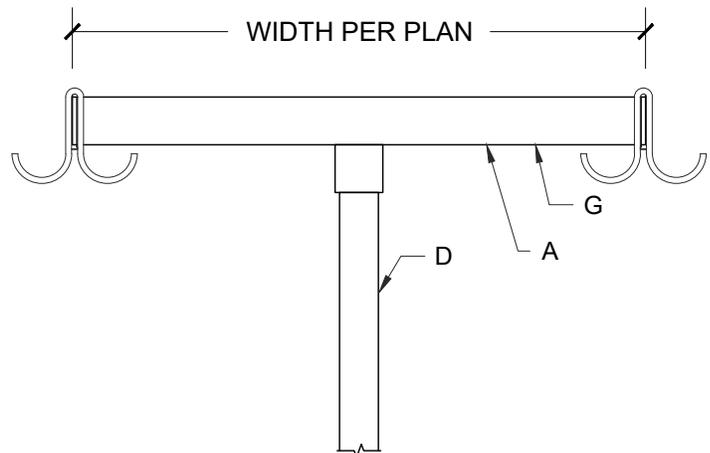


DETAIL: TABLE MOUNTING
3" = 1'-0"

ISOMETRIC: DOUBLE POT RACK
N.T.S.

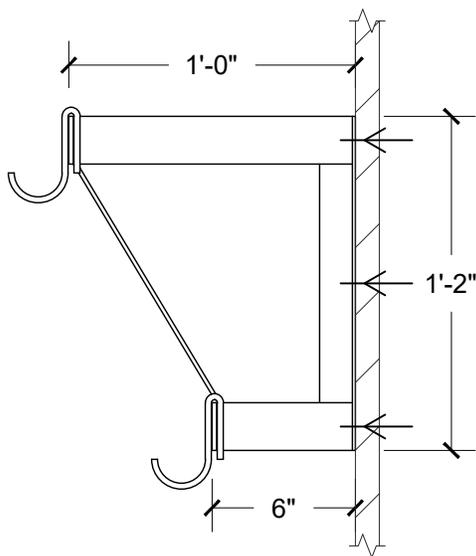
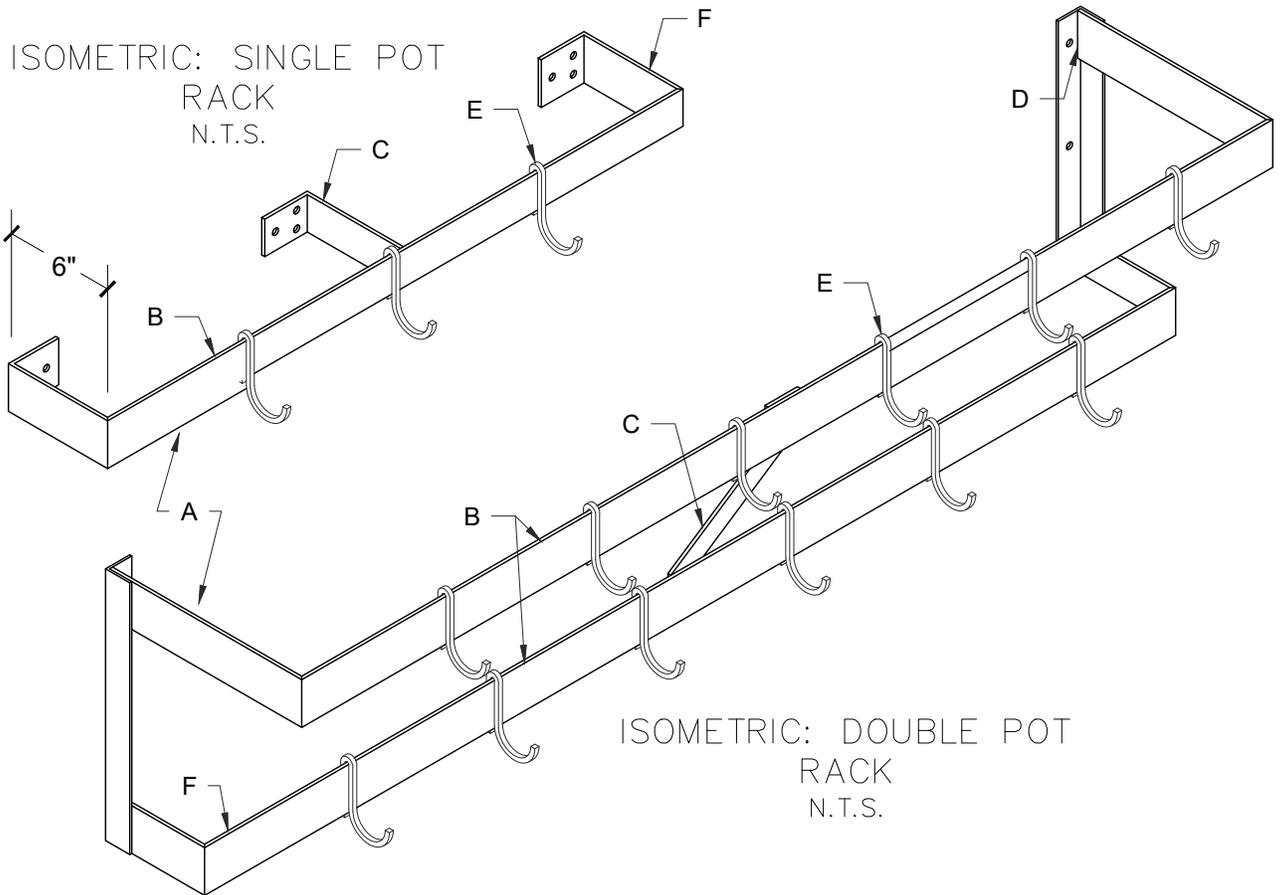


SECTION: DOUBLE POT RACK
1-1/2" = 1'-0"



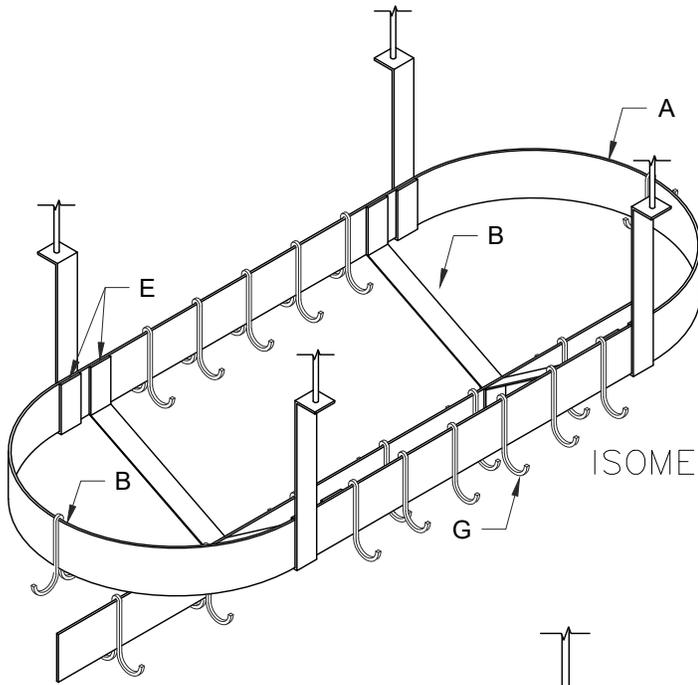
SECTION: SINGLE POT RACK
1-1/2" = 1'-0"

- A. SINGLE OR DOUBLE BAR DESIGN PER THE SPECIFICATIONS
- B. PROVIDE WITH A S/S DOUBLE SERVICE POT HOOK EVERY 6"
- C. 2" X 3/16" S/S FLAT BAR SUPPORT; SPACED NO MORE THAN 5'-0" APART O.C.
- D. 1-5/8" S/S ROUND POSTS ON CENTER
- E. 2" X 3/16" S/S FLAT BAR CONSTRUCTION
- F. FULLY WELDED TO S/S ANGLES
- G. MOUNT AT 6'-6" A.F.F. TO BOTTOM OF RACK U.O.N.
- H. EXTEND THROUGH TABLE AND FASTEN TO CROSSBRACING OR UNDERSHELF BELOW
- I. FULLY WELDED S/S GUSSET WITH SET SCREW



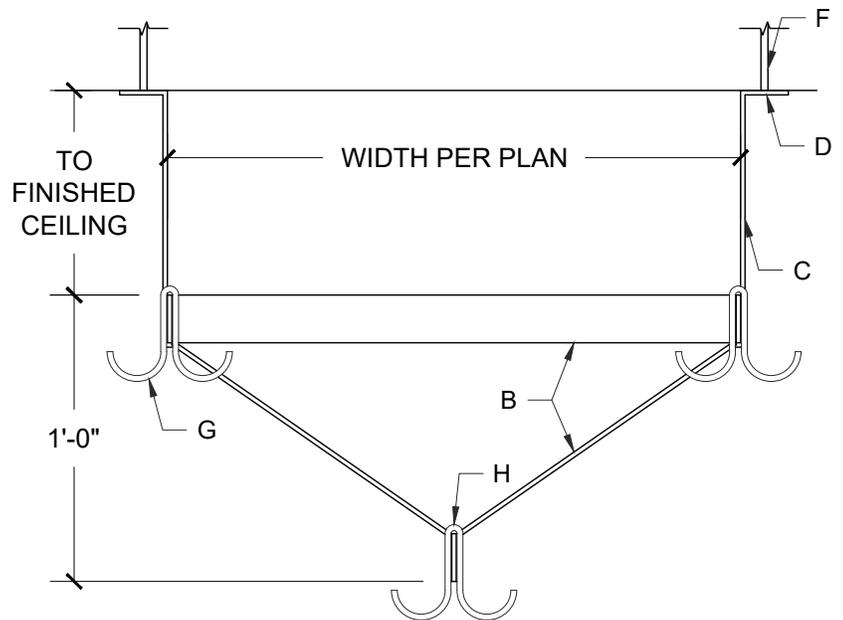
SECTION: DOUBLE POT RACK
 $1-1/2" = 1-0"$

- A. SINGLE OR DOUBLE BAR DESIGN PER SPECIFICATIONS
- B. 2" x 3/16" S/S FLAT BAR CONSTRUCTION
- C. 2" x 3/16" S/S FLAT BAR SUPPORT; NO MORE THAN 5'-0" APART O.C.
- D. FULLY WELDED TO S/S ANGLES AND SECURED TO WALL
- E. S/S SINGLE SERVICE POT HOOKS EVERY 6"
- F. MOUNT AT 6'-6" A.F.F. TO BOTTOM OF RACK U.O.N.



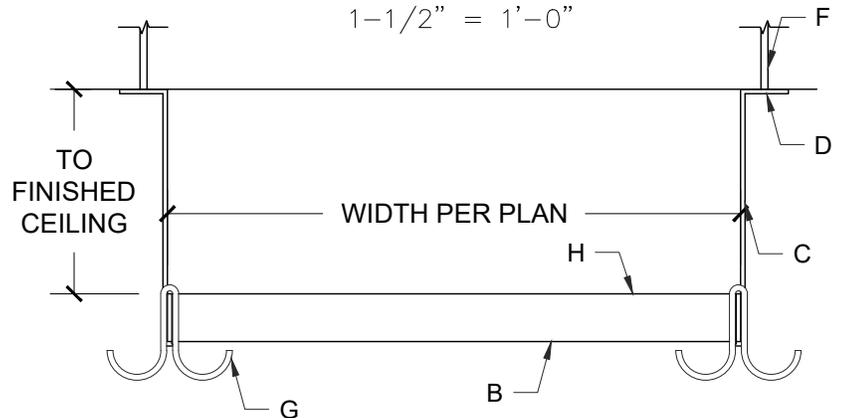
ISOMETRIC: DOUBLE POT RACK

1-1/2" = 1'-0"



SECTION: DOUBLE POT RACK

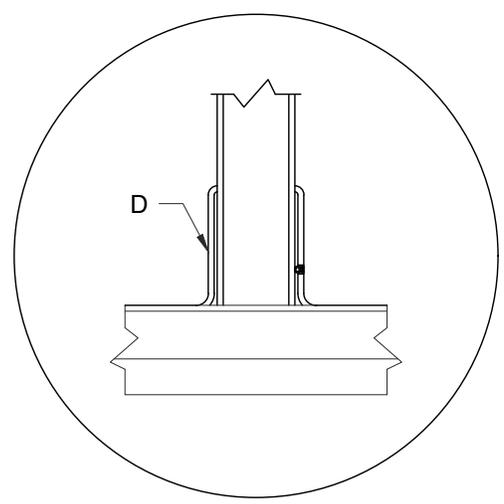
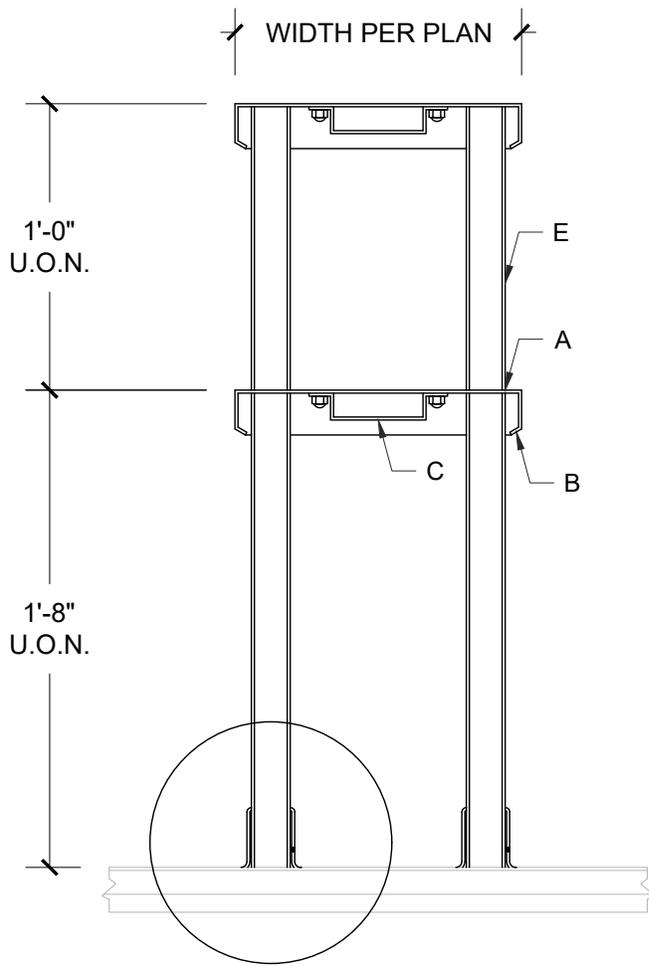
1-1/2" = 1'-0"



SECTION: SINGLE POT RACK

1-1/2" = 1'-0"

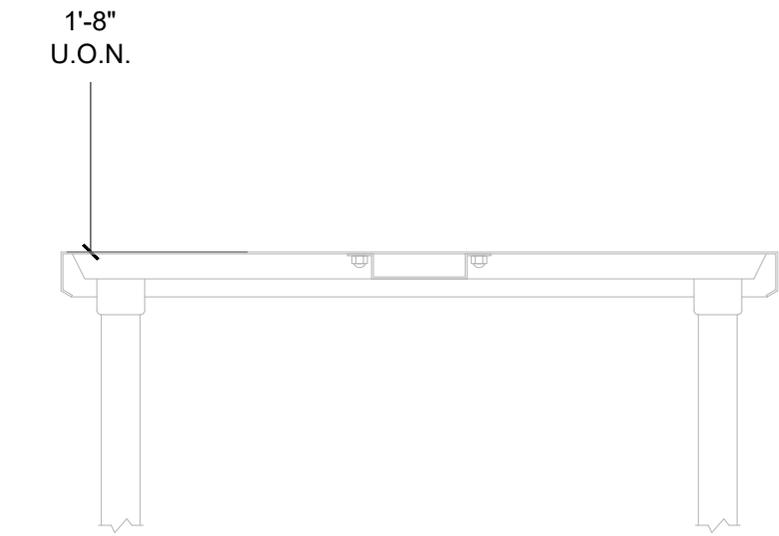
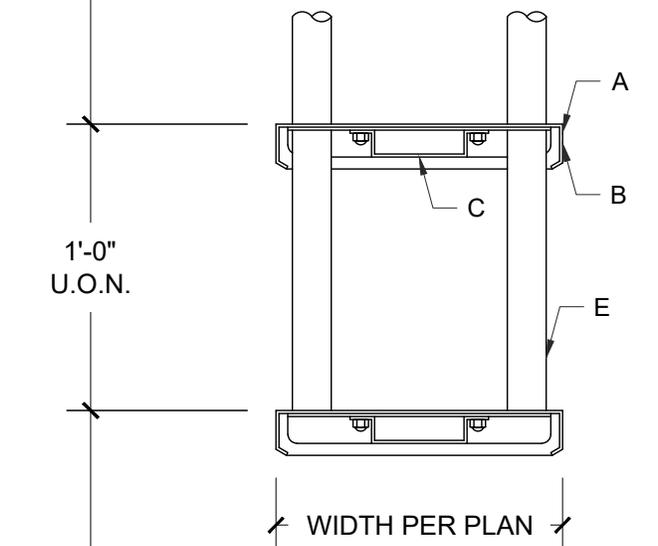
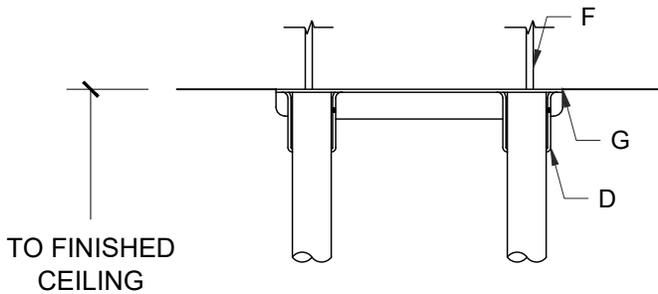
- A. SINGLE OR DOUBLE BAR DESIGN PER SPECIFICATIONS
- B. 2" X 3/16" S/S FLAT BAR SUPPORT; 48" MAX O.C.
- C. 2" X 3/16" S/S FLAT BAR HANGERS
- D. BRACKETS FLUSH WITH FINISHED CEILING
- E. FULLY WELDED TO S/S ANGLES
- F. 1/2" O.D. S/S ROD BY KEC, EXTEND AND SECURE TO STRUCTURE ABOVE
- G. PROVIDE WITH A S/S DOUBLE SERVICE POT HOOK EVERY 6"
- H. MOUNT AT 6'-6" A.F.F. TO BOTTOM OF RACK U.O.N.



DETAIL: TABLE MOUNTING
3" = 1'-0"

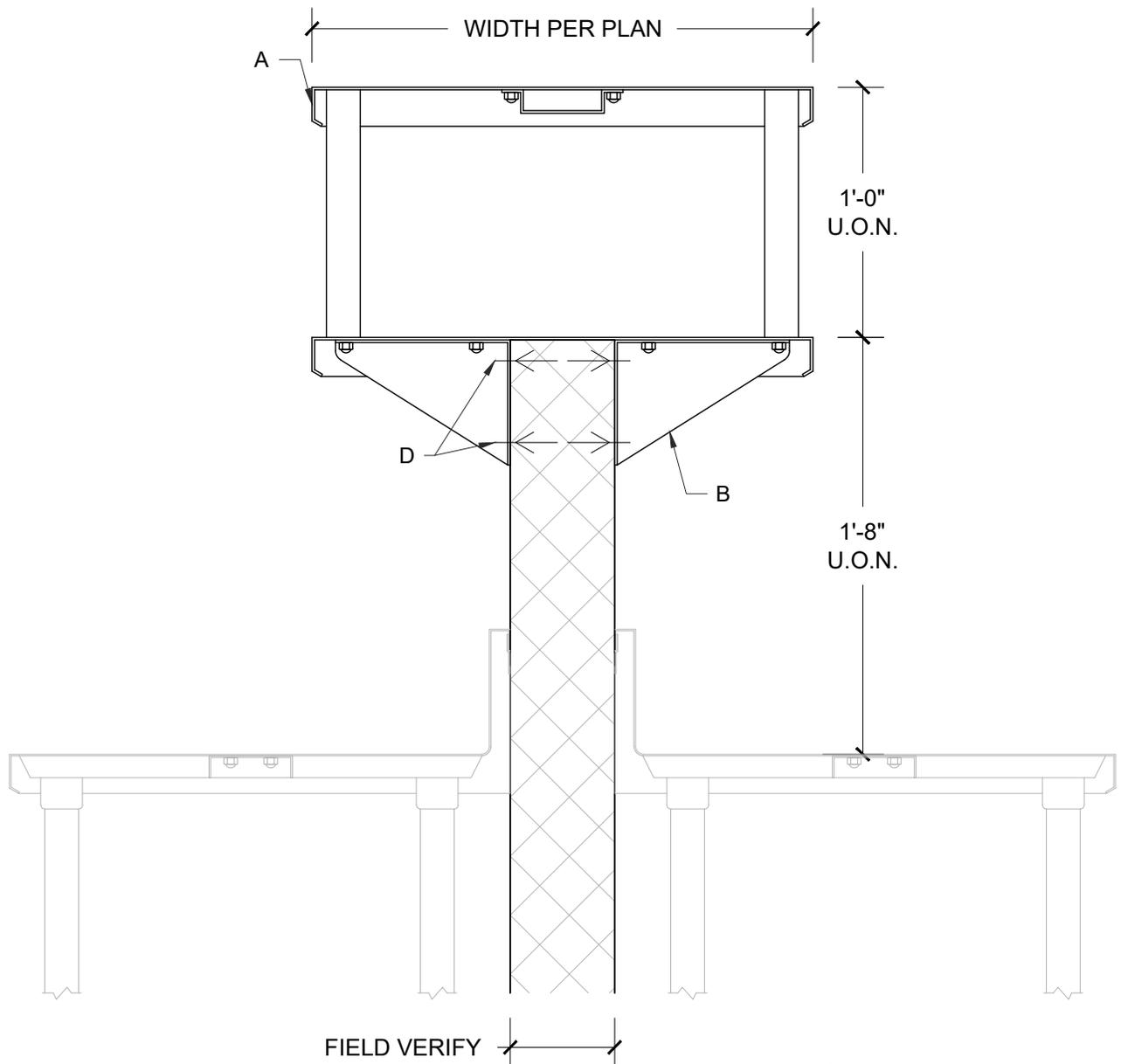
SECTION
1-1/2" = 1'-0"

- A. 16 GA S/S SHELF
- B. SQUARE EDGE PER DETAIL 1-1 TYPE A
- C. 1" X 4" X 1" 18 GA S/S HAT CHANNEL; CAP WITH S/S ACORN NUTS
- D. FULLY WELDED S/S GUSSET WITH SET SCREW
- E. 1-5/8" DIA S/S TUBING

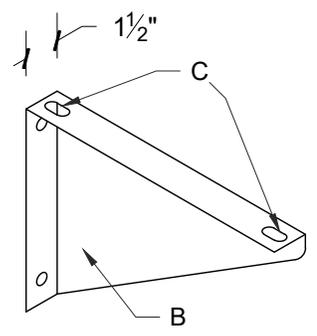


SECTION
1-1/2" = 1'-0"

- A. 16 GA S/S SHELVES
- B. SQUARE EDGE PER DETAIL 1-1 TYPE A
- C. 1" X 4" X 1" S/S HAT CHANNEL; CAP WITH S/S ACORN NUTS
- D. FULLY WELDED S/S GUSSET WITH SET SCREW
- E. 1-5/8" DIA S/S TUBING
- F. 1/2" O.D. S/S ROD BY KEC, EXTEND AND SECURE TO STRUCTURE ABOVE
- G. TOP OF MOUNTING BRACKET TO BE FLUSH WITH FINISHED CEILING

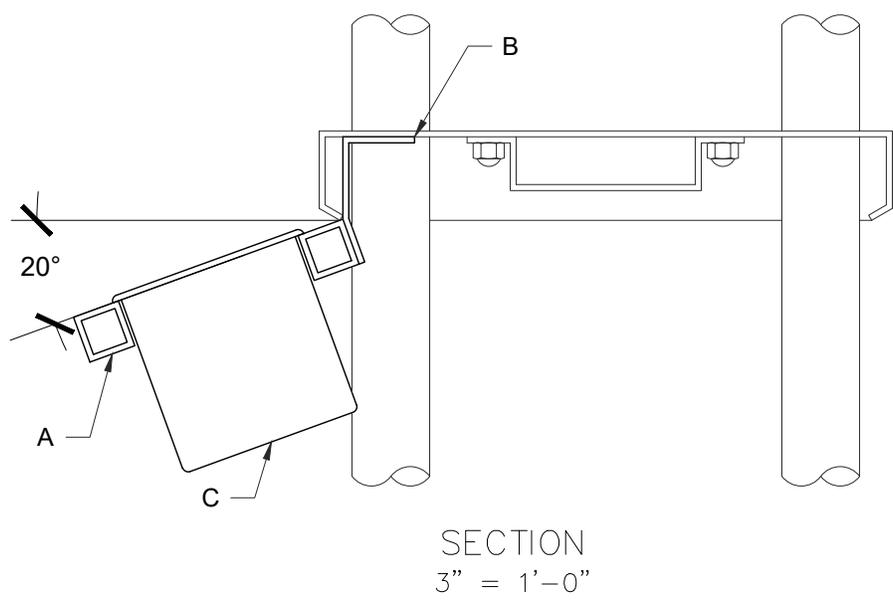
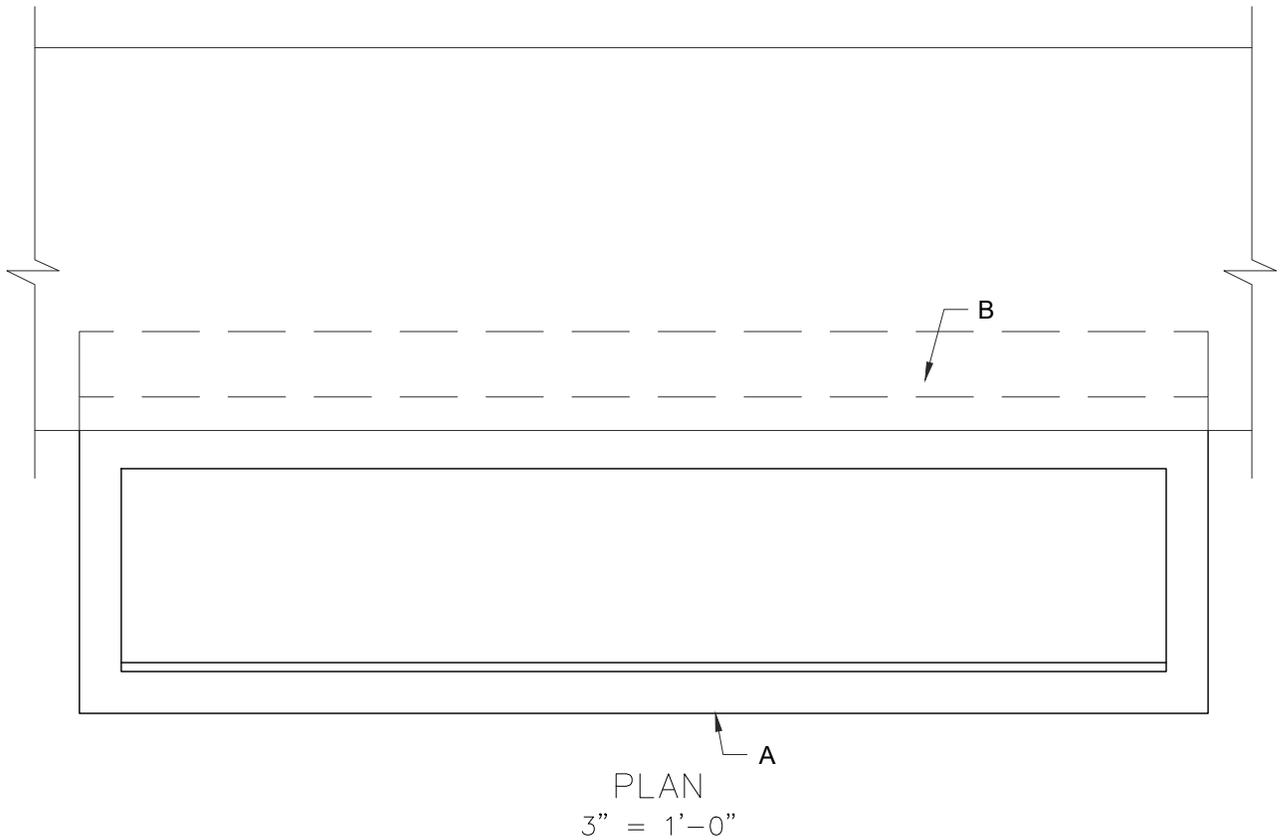


SECTION
 1-1/2" = 1'-0"

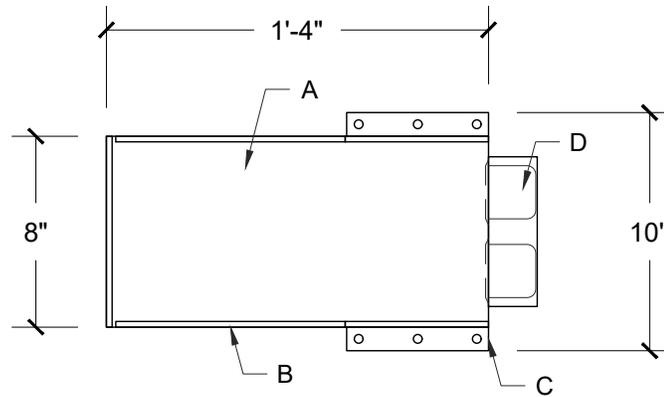


BRACKET DETAIL
 1-1/2" = 1'-0"

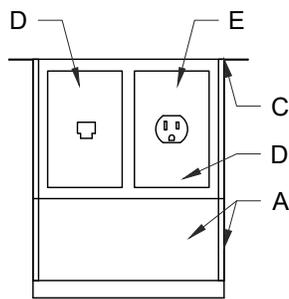
- A. OVERSHELF CONSTRUCTION PER DETAIL 2-5
- B. 14 GA S/S BRACKET
- C. ELONGATED STUD HOLES FOR FIELD ADJUSTMENTS
- D. SECURED TO WALL



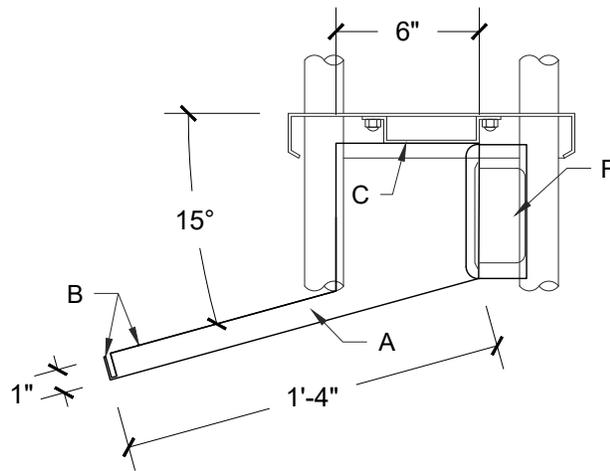
- A. FULLY WELDED AND POLISHED 1"x1" S/S SQUARE TUBING FRAME
- B. FULLY WELDED TO UNDERSIDE OF SHELF
- C. NINTH SIZE HOTEL PAN, U.O.N. - (BY OTHERS)



PLAN
1-1/2" = 1'-0"

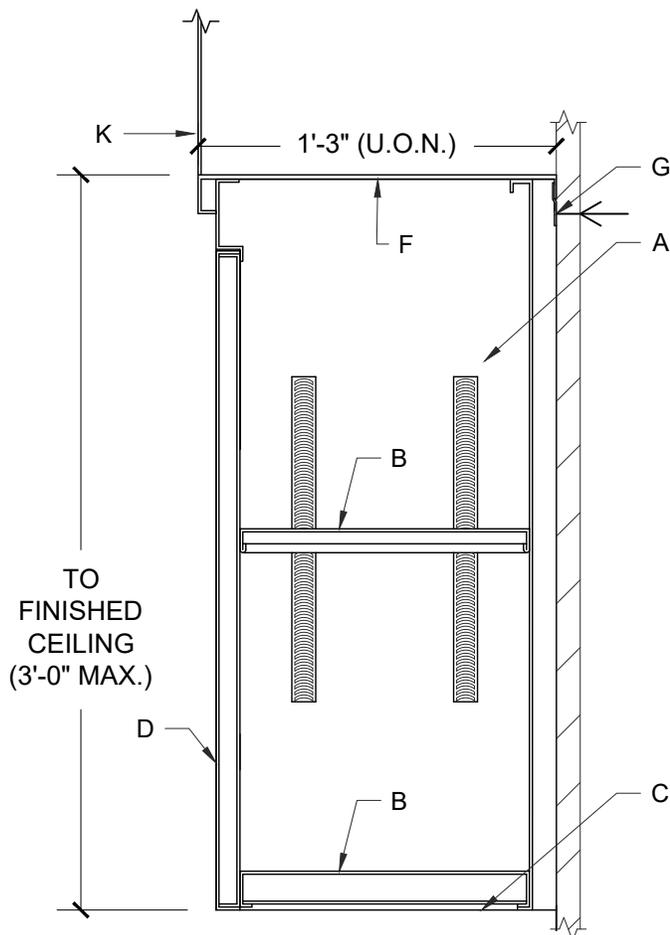


ELEVATION
1-1/2" = 1'-0"

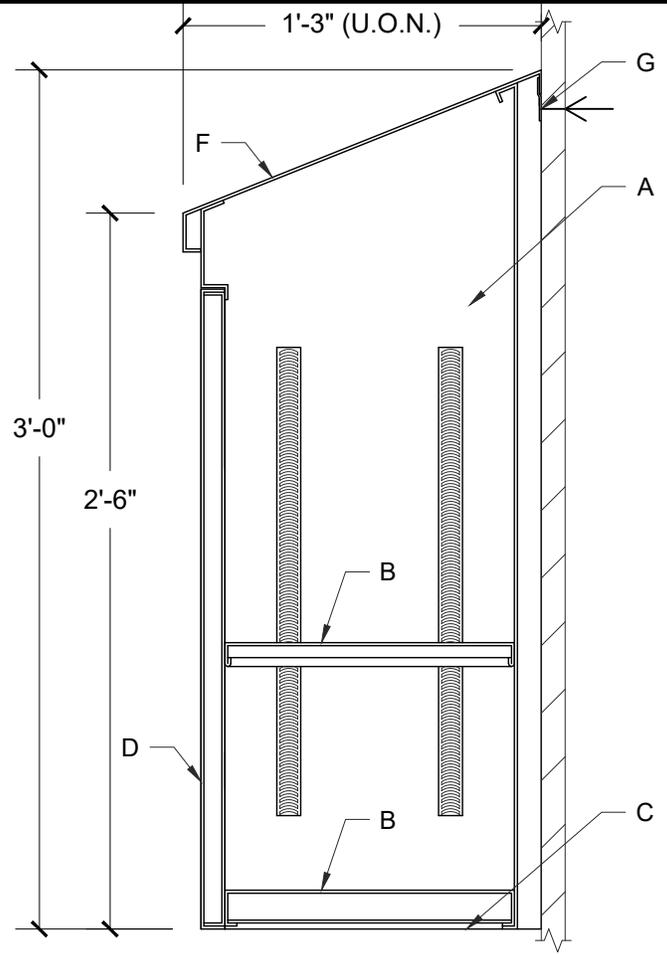


SECTION
1-1/2" = 1'-0"

- A. 16 GA. TYPE 304 S/S
- B. 1" TURN UP AT FRONT AND ENDS
- C. WELDED TO UNDERSIDE OF SHELF
- D. CAT-5 RECEPTACLE INSTALLED FLUSH
- E. SINGLE NEMA 5-15R RECEPTACLE INSTALLED FLUSH
- F. POWER AND DATA CONNECTED AT REAR OF UNIT BY OTHERS

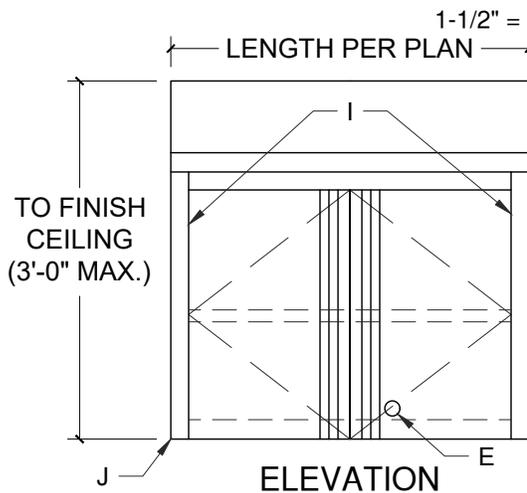


SECTION: FLAT TOP

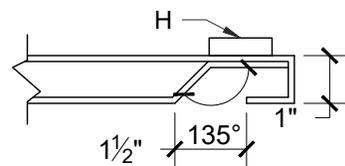


SECTION: SLOPED TOP

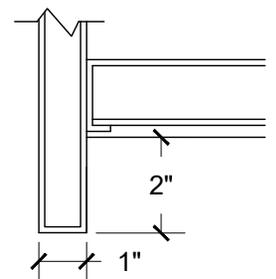
- A. 18 GA. S/S BODY
- B. 16 GA. S/S SHELVES
- C. CAP BOTTOM
- D. S/S DOUBLE PAN HINGED DOOR: 16 GA. EXTERIOR, 18 GA. INTERIOR
- E. PROVIDE CYLINDER LOCKS, MASTER-KEYED, U.O.N.
- F. SLOPED TOP OR FLAT TOP AS SPECIFIED
- G. "Z" CLIP, 2" WIDE, 42" O.C. MAX
- H. MAGNETIC LATCH
- I. FULL LENGTH PIANO HINGE
- J. MOUNTED AT 2'-0" ABOVE WORK SURFACE U.O.N.
- K. IF OVER 3'-0", PROVIDE 16 GA. S/S TRIM TO FINISHED CEILING



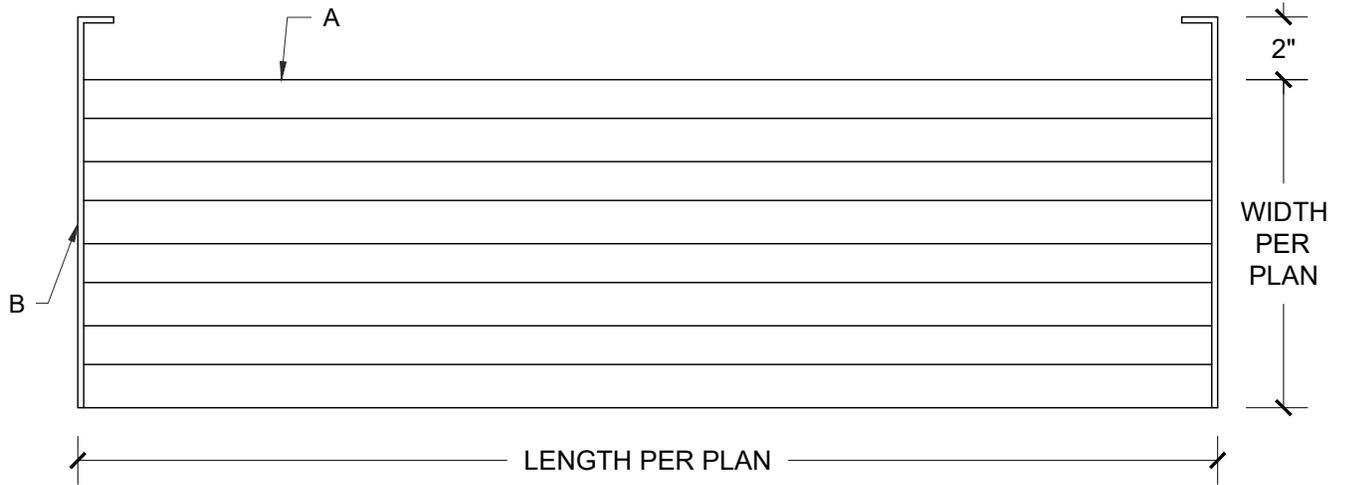
ELEVATION



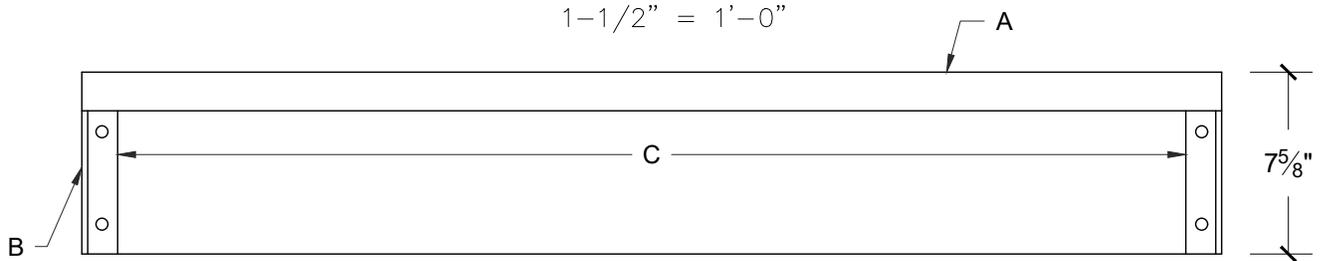
PLAN: DOOR PULL DETAIL
3" = 1'-0"



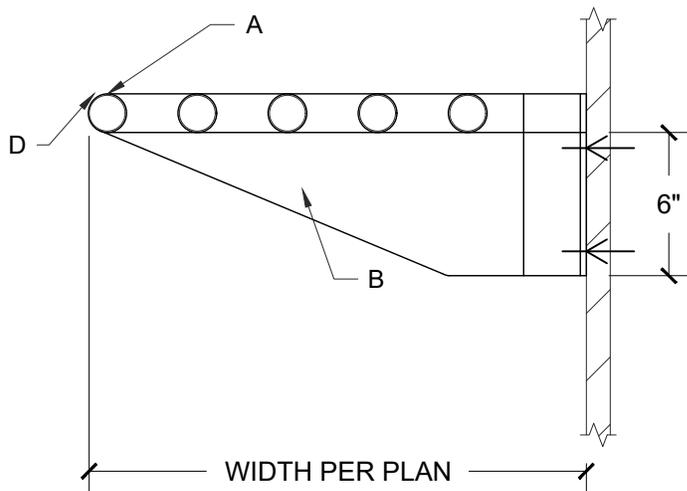
SECTION: CONCEALED DOOR PULL DETAIL (WHERE SPECIFIED)
3" = 1'-0"



PLAN
 $1-1/2'' = 1'-0''$

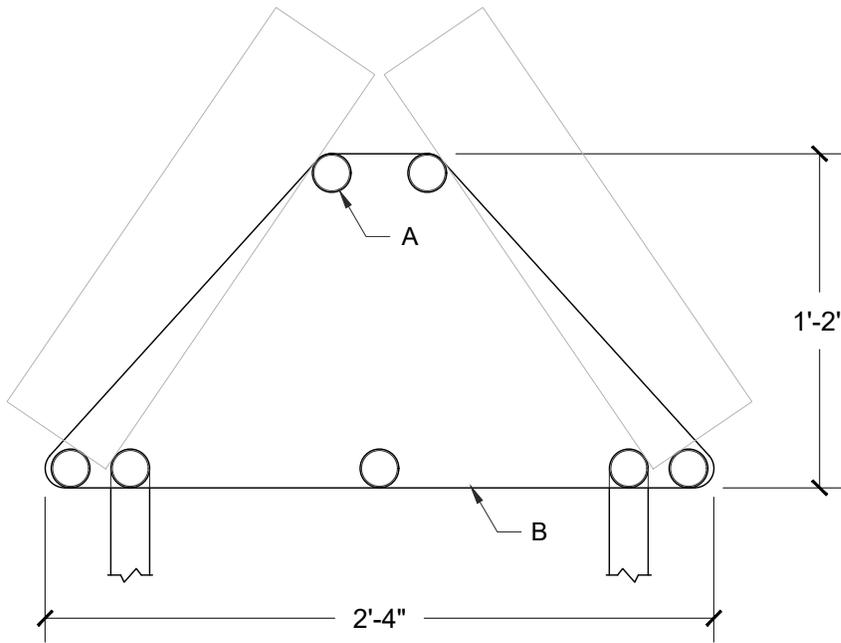


ELEVATION
 $1-1/2'' = 1'-0''$



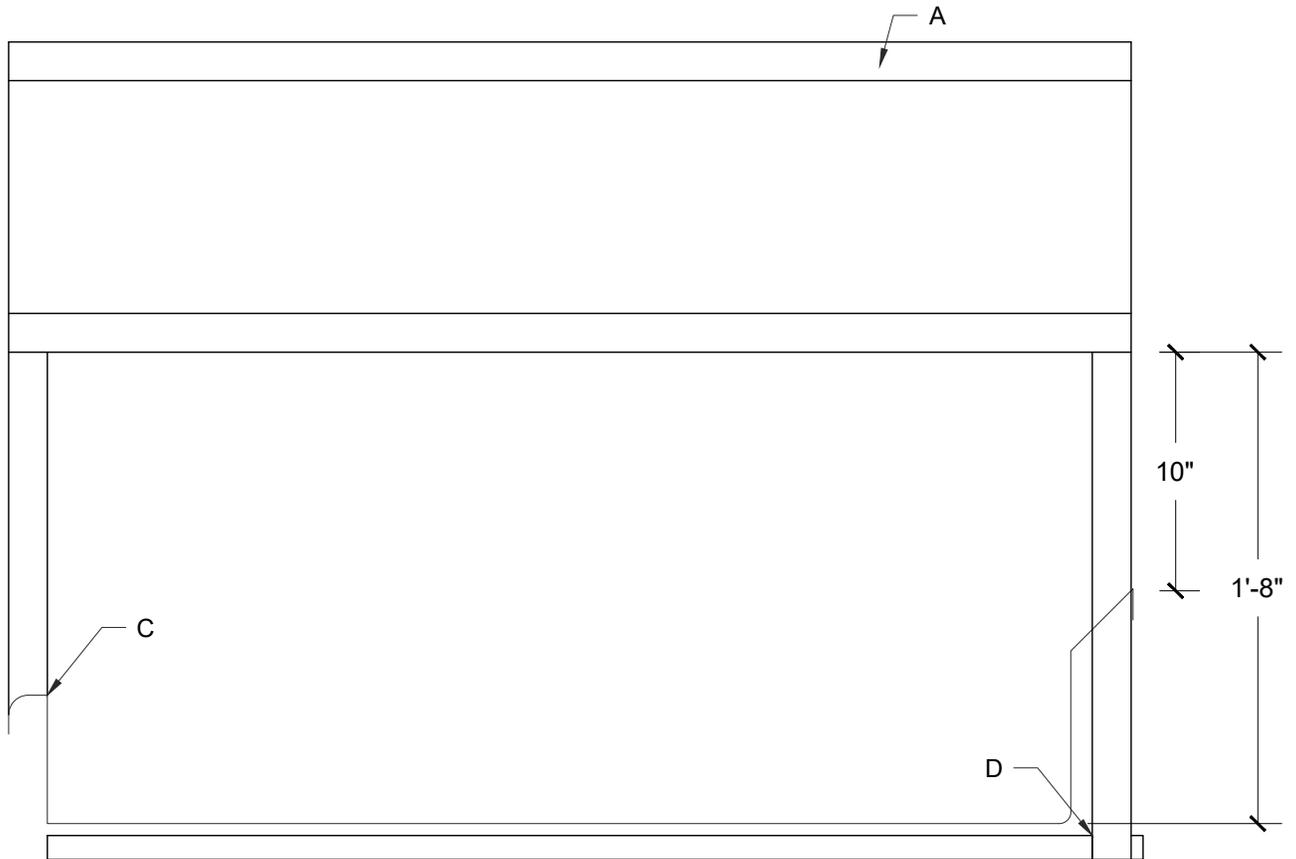
SECTION
 $1-1/2'' = 1'-0''$

- A. 1-5/8" 16 GA S/S TUBING
- B. 16 GA. S/S PANEL ENDS
- C. BRACKETS SPACED NO MORE THAN 5'-0" APART O.C.
- D. MOUNTED AT 2'-0" ABOVE WORK SURFACE U.O.N.

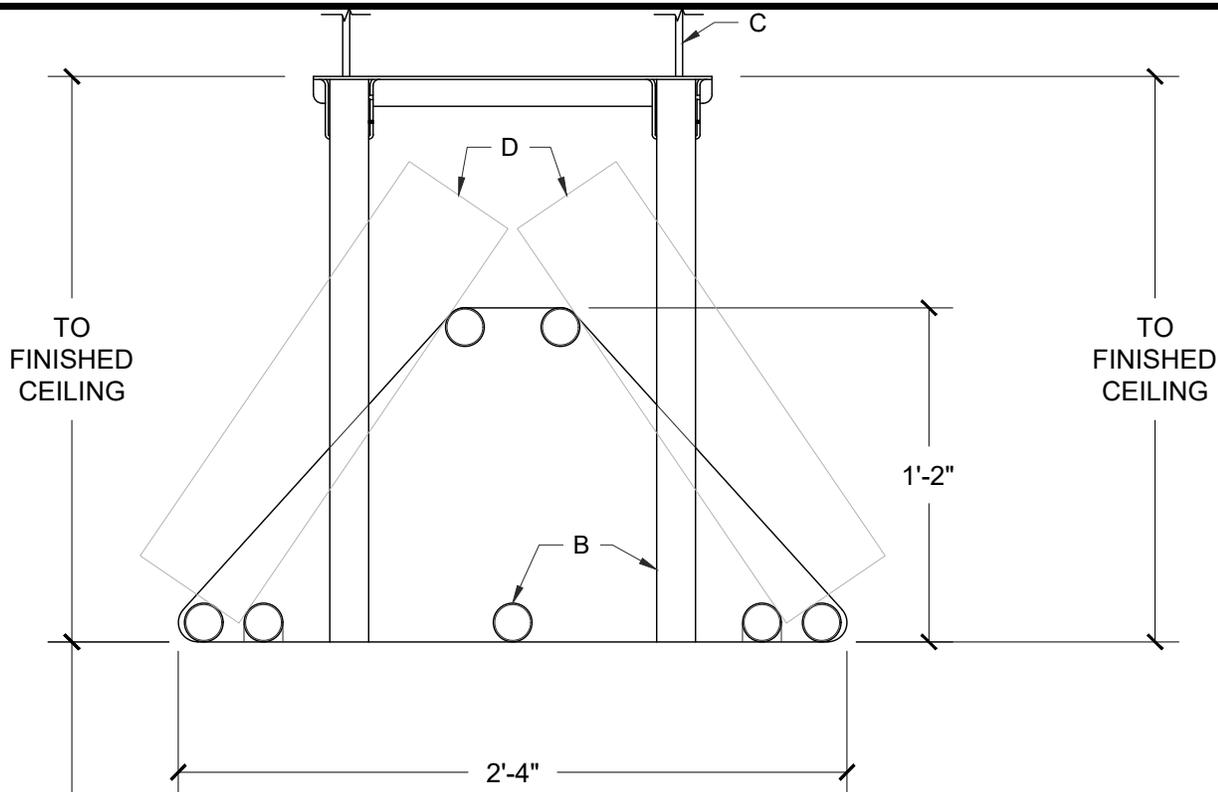


- A. 1-5/8" 16 GA. S/S TUBING
- B. 16 GA. S/S PANEL ENDS
- C. CUT AND FULLY WELDED AND POLISHED
- D. POST TO EXTEND THROUGH BACKSPLASH AND ATTACH TO CHANNEL UNDER COUNTERTOP

SECTION
 1-1/2" = 1'-0"

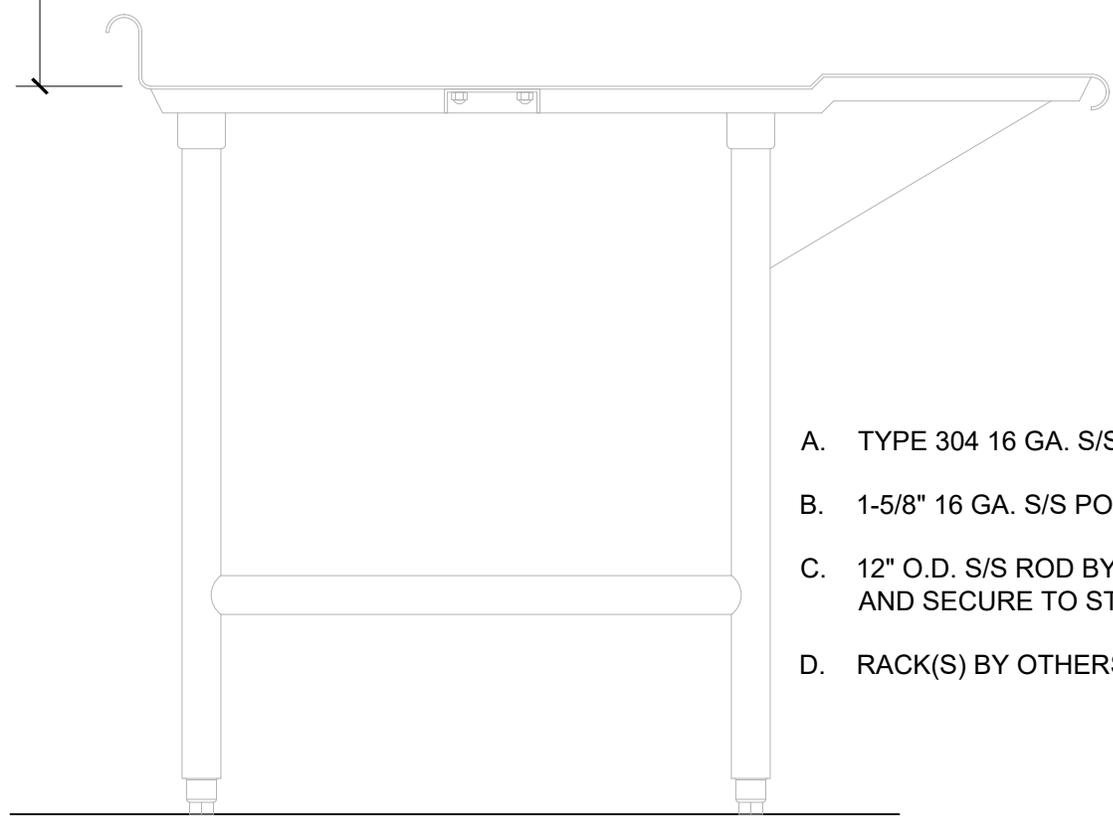


ELEVATION
 1-1/2" = 1'-0"

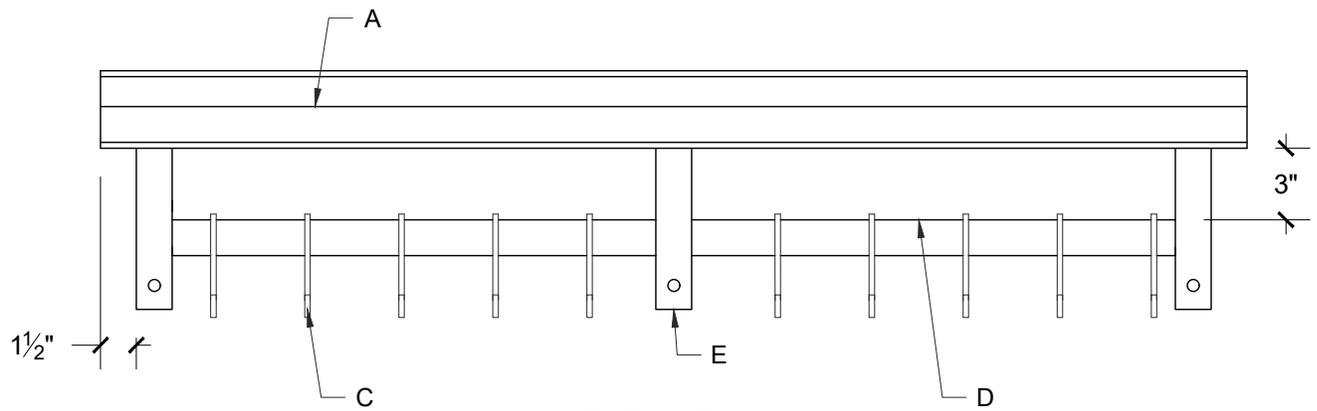


SECTION
 $1-1/2" = 1'-0"$

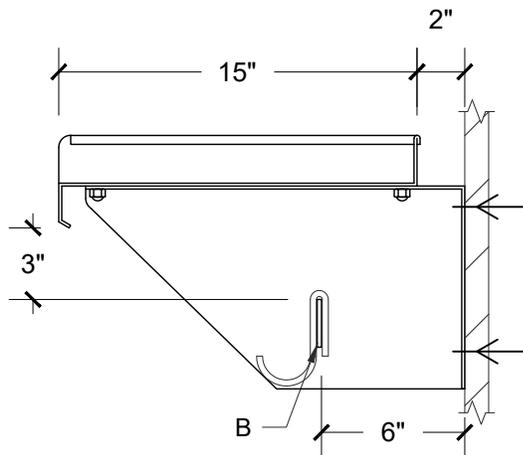
2'-0" U.O.N.



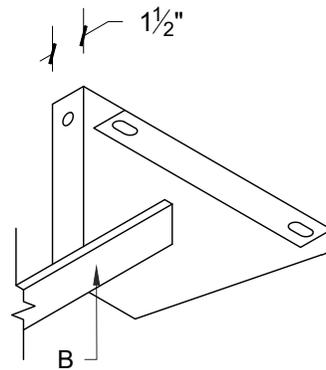
- A. TYPE 304 16 GA. S/S
- B. 1-5/8" 16 GA. S/S POST
- C. 12" O.D. S/S ROD BY K.E.C., EXTEND AND SECURE TO STRUCTURE ABOVE
- D. RACK(S) BY OTHERS



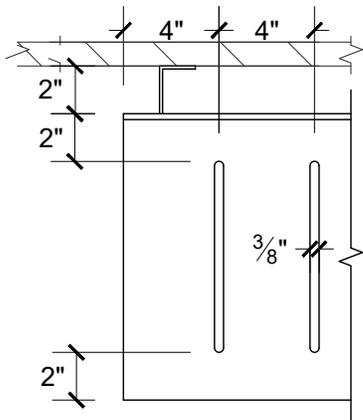
ELEVATION
1-1/2" = 1'-0"



SECTION
1-1/2" = 1'-0"

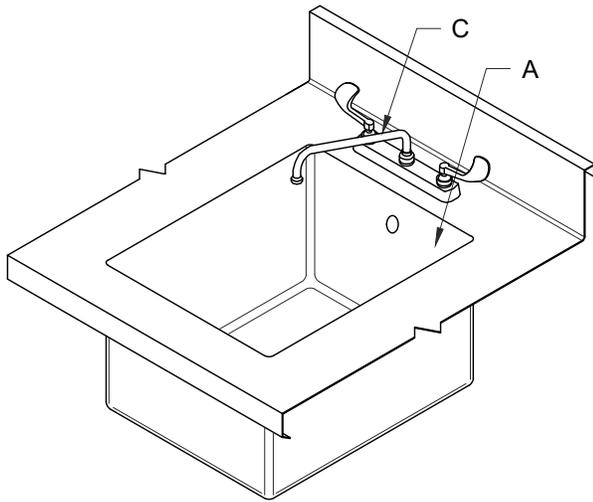


BRACKET DETAIL
1-1/2" = 1'-0"

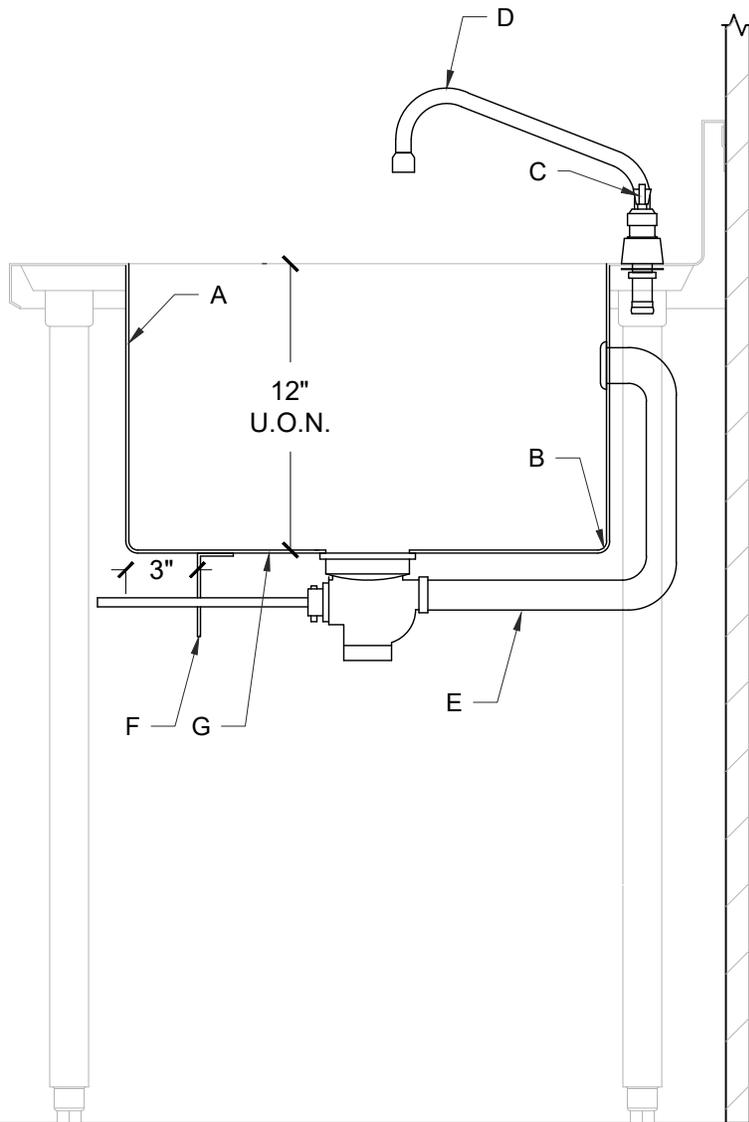


PLAN: SLOTTED SHELF
1-1/2" = 1'-0"

- A. WALL SHELF PER DETAIL 2-1
- B. 2" X 3/16" S/S FLAT BAR, FULLY WELDED TO BRACKETS
- C. S/S SINGLE-SERVICE POT HOOKS EVERY 6"
- D. MOUNT AT 5'-6" A.F.F. TO BOTTOM OF RACK U.O.N.
- E. 2" X 3/16" S/S FLAT BAR SUPPORT; NO MORE THAN 5'-0" APART O.C.

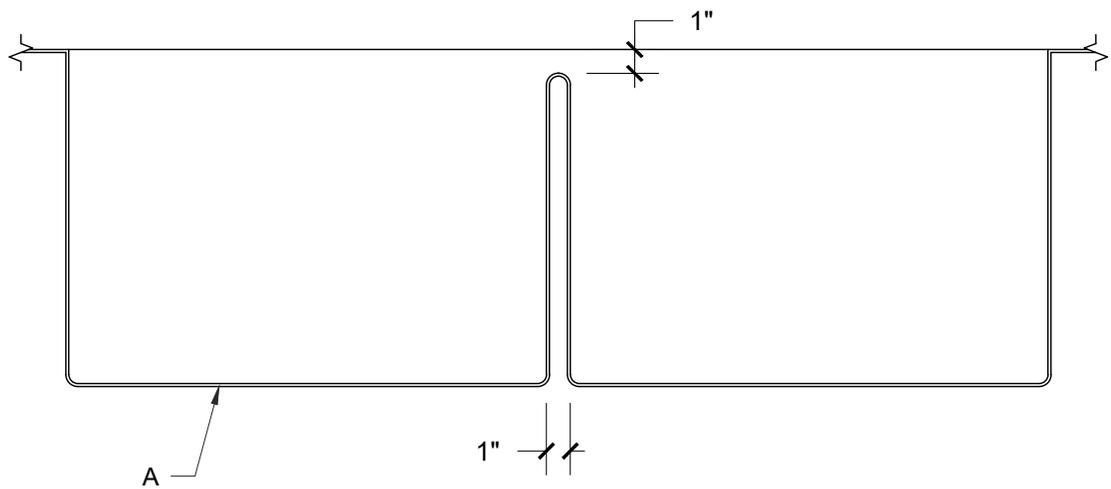


ISOMETRIC
3/4" = 1'-0"

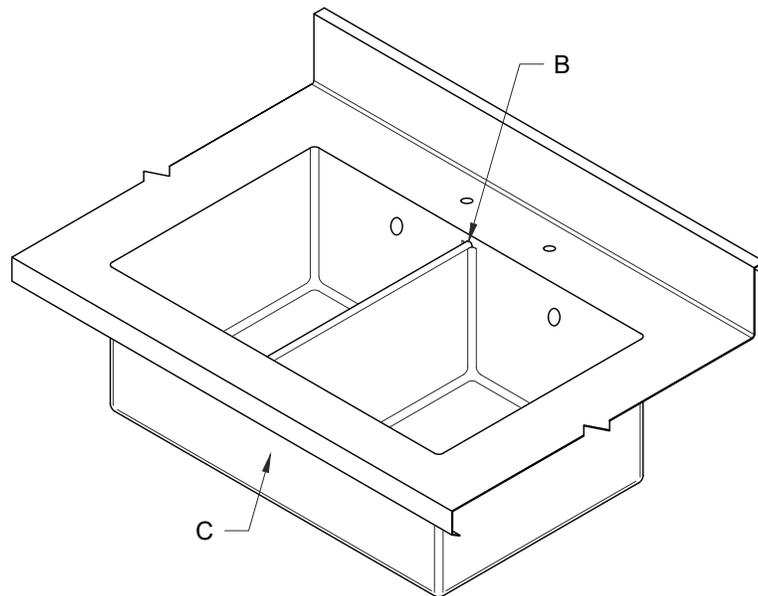


SECTION
1-1/2" = 1'-0"

- A. 14 GA. S/S SINK, SIZED PER PLAN
- B. 3/8" RADIUS COVED CORNER CONSTRUCTION
- C. WRIST HANDLES ON FAUCET
- D. SIZE FAUCET TO ALIGN OVER THE DRAIN. PROVIDE A DECK-MOUNTED FAUCET U.O.N.
 - 8": FISHER MODEL 3511 OR T&S BRASS MODEL B-1111
 - 10": FISHER MODEL 3312 OR T&S BRASS MODEL B-1122
 - 12": FISHER MODEL 3313 OR T&S BRASS MODEL B-1123
- WHERE SPLASH-MOUNTED FAUCETS ARE SPECIFIED, PROVIDE:
 - 8": FISHER MODEL 3611 OR T&S BRASS MODEL B-1116
 - 10": FISHER MODEL 3252 OR T&S BRASS MODEL B-1127
 - 12": FISHER MODEL 13269 OR T&S BRASS MODEL B-0231
- E. DRAIN VALVE WITH OVERFLOW ASSEMBLY: FISHER MODEL 2232 OR T&S BRASS MODEL B-3992-01
- F. 14 GA S/S VALVE BRACKET
- G. SOUND DEADEN UNDER SINK

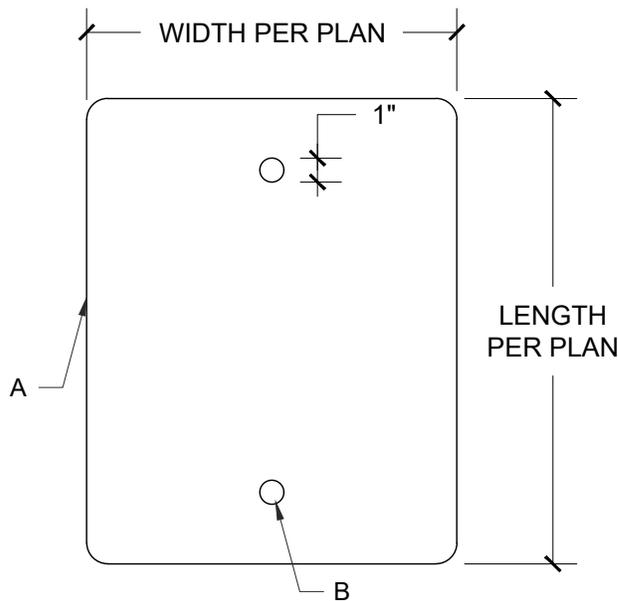


SECTION
1-1/2"=1'-0"

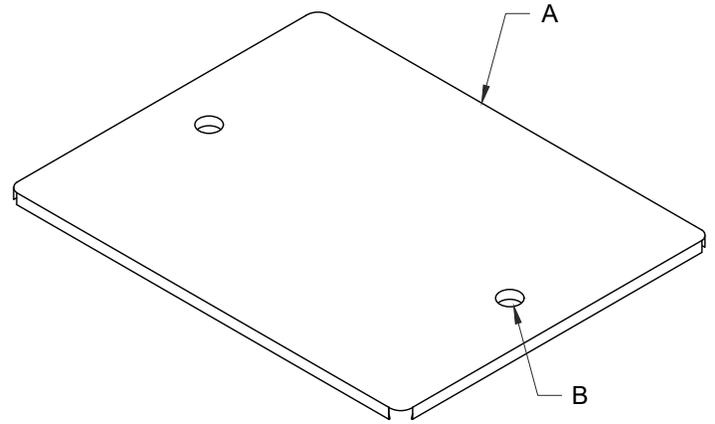


ISOMETRIC
3/4"=1'-0"

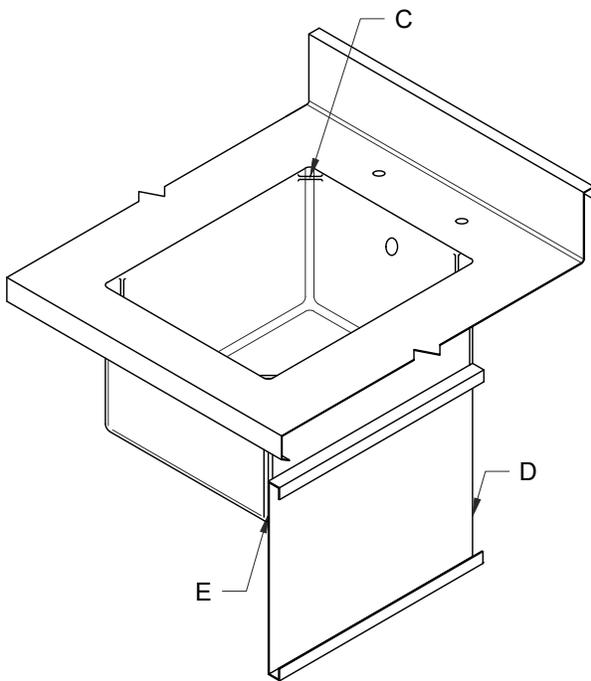
- A. SINK PER DETAIL 3-1
- B. 1" SINK DIVIDER BETWEEN SINKS
- C. SEAMLESS FLUSH FRONT CONSTRUCTION



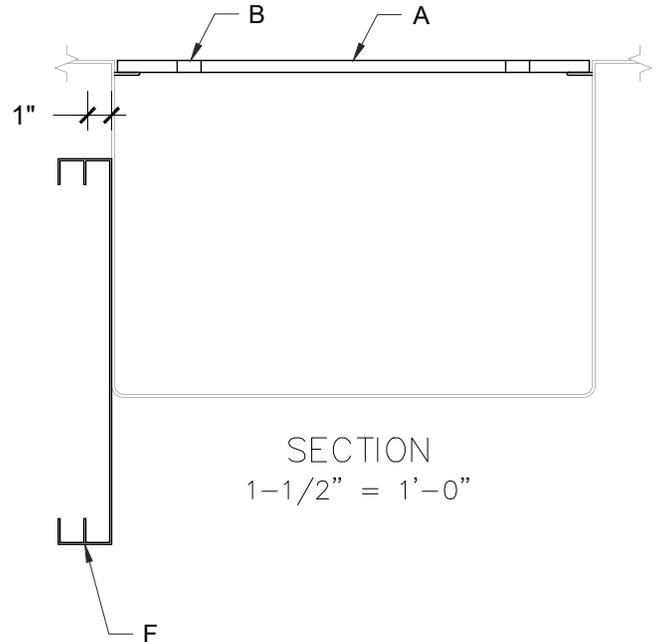
COVER PLAN
1-1/2" = 1'-0"



COVER ISOMETRIC
1-1/2" = 1'-0"

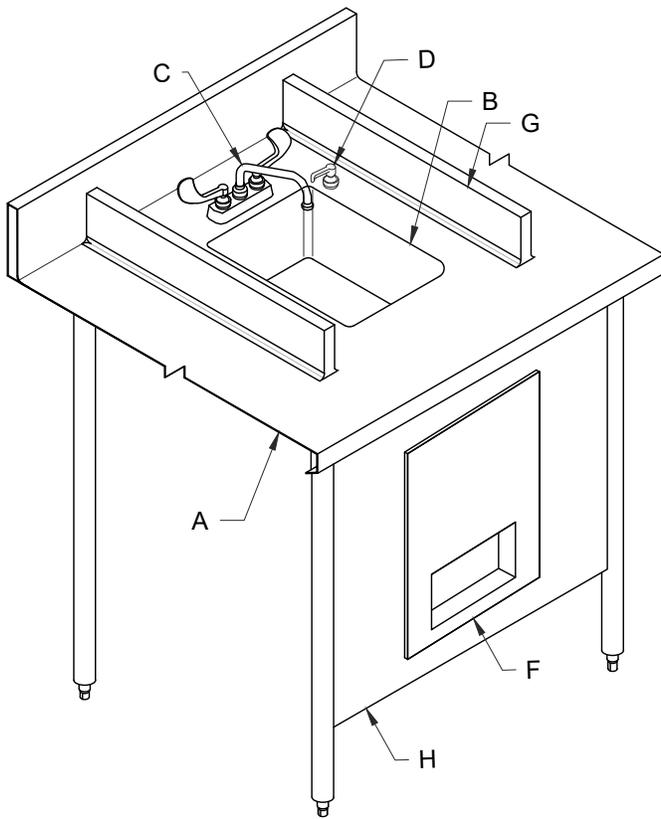


COVER HOLDER
ISOMETRIC
3/4" = 1'-0"

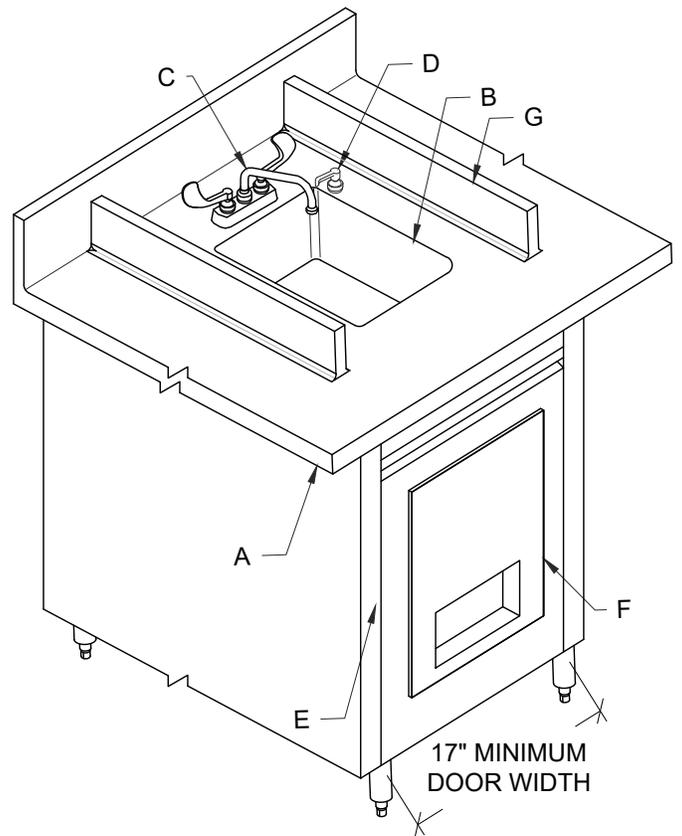


SECTION
1-1/2" = 1'-0"

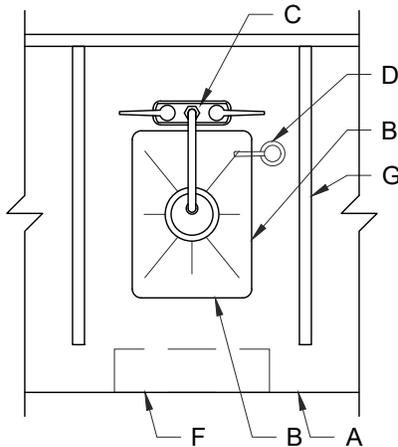
- A. POLYETHYLENE CUTTING BOARD OR 14 GA TYPE 304 SINK COVER WITH TURNED DOWN EDGES TO SIT FLUSH WITH WORK SURFACE
- B. 1" FINGER HOLE
- C. S/S ROD SUPPORTS 1/2" BELOW TOP SURFACE; FULLY WELDED TO SINKS
- D. S/S SINK COVER HOLDER
- E. TO BE WELDED FLUSH ALONG SIDE OF SINK
- F. DIVIDE HOLDER FOR MULTIPLE SINKS



ISOMETRIC: SINK IN WORKTABLE
3/4"=1'-0"

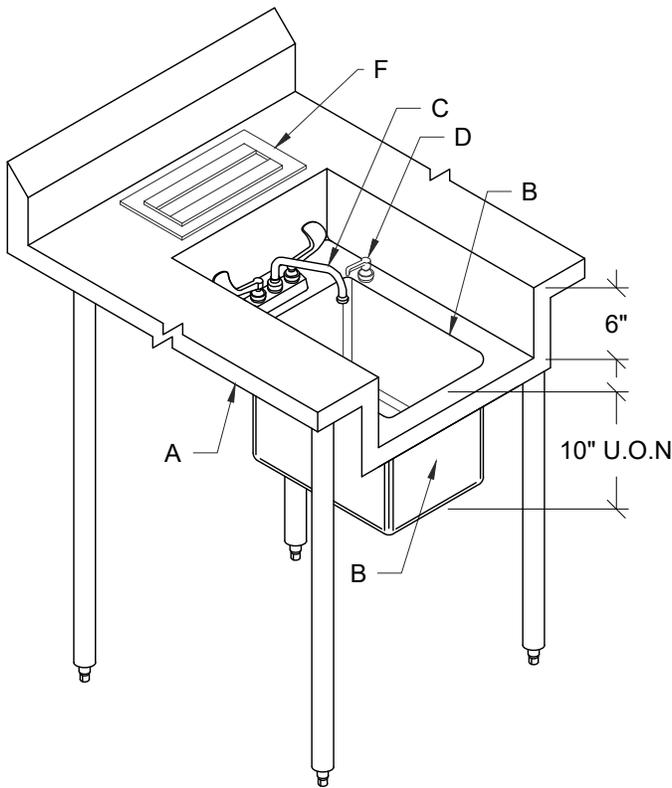


ISOMETRIC SINK IN COUNTER
3/4"=1'-0"

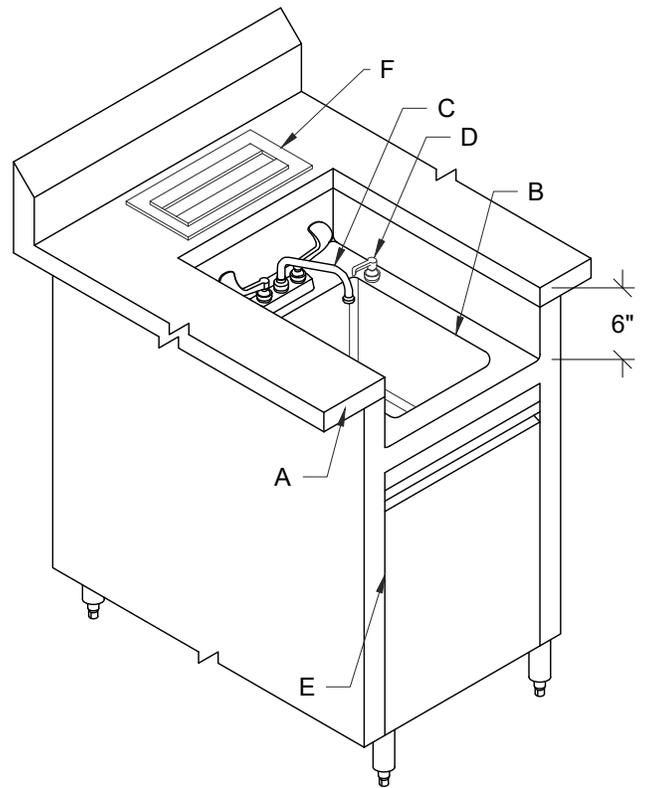


PLAN
3/4"=1'-0"

- A. COUNTER OR WORKTABLE, AS SPECIFIED
- B. HAND SINK PER DETAIL 3-1, WITHOUT ROTARY WASTE OR OVERFLOW ASSEMBLY ON HAND SINKS
- C. FAUCET WITH WRIST HANDLES AND 0.5 GPM AERATOR
 1. DECK-MOUNTED, 8" SWING NOZZLE
 - a. FISHER MODEL 3511
 - b. T&S BRASS MODEL B-1111
- D. PROVIDE SOAP DISPENSER BOBRICK MODEL B-822 OR EQUAL. LOCATE SOAP DISPENSER SO THAT IT DOES NOT CONFLICT WITH WRIST HANDLES
- E. HINGED DOOR PER DETAIL 5-3
- F. PROVIDE PAPER TOWEL DISPENSER BOBRICK MODEL B-35903 OR EQUAL
- G. PROVIDE DOUBLE WALLED 1" THICK COVERED SPLASH(ES) PER THE PLAN
- H. S/S APRON

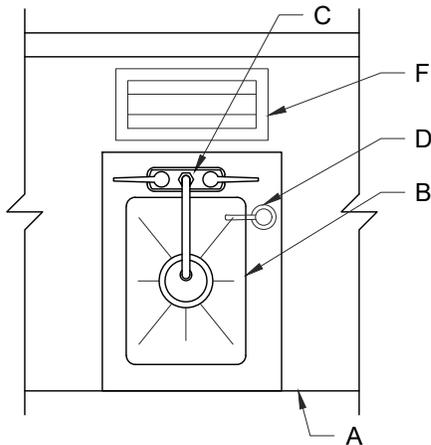


ISOMETRIC: SINK IN WORKTABLE
3/4"=1'-0"

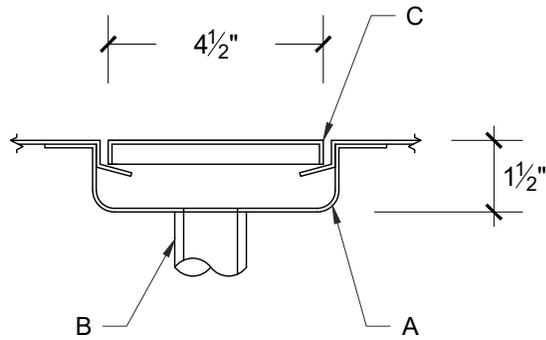


ISOMETRIC: SINK IN COUNTER
3/4"=1'-0"

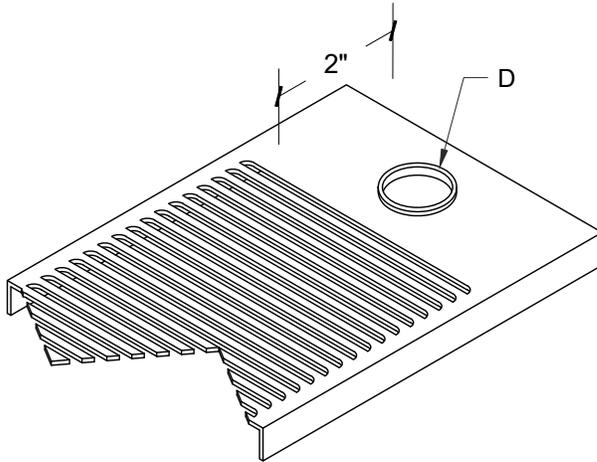
- A. COUNTER OR WORKTABLE, AS SPECIFIED
- B. HAND SINK PER DETAIL 3-1, WITHOUT ROTARY WASTE OR OVERFLOW ASSEMBLY ON HAND SINKS
- C. FAUCET WITH WRIST HANDLES AND 0.5 GPM AERATOR
 1. DECK-MOUNTED, 8" SWING NOZZLE
 - a. FISHER MODEL 3511
 - b. T&S BRASS MODEL B-1111
- D. PROVIDE SOAP DISPENSER BOBRICK MODEL B-822 OR EQUAL. LOCATE SOAP DISPENSER SO THAT IT DOES NOT CONFLICT WITH WRIST HANDLES
- E. HINGED DOOR PER DETAIL 5-3
- F. PROVIDE PAPER TOWEL DISPENSER BOBRICK MODEL B-526 OR EQUAL



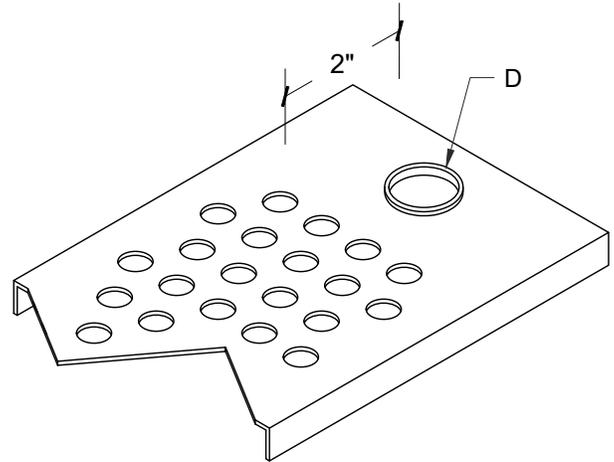
PLAN
3/4"=1'-0"



SECTION
3" = 1'-0"

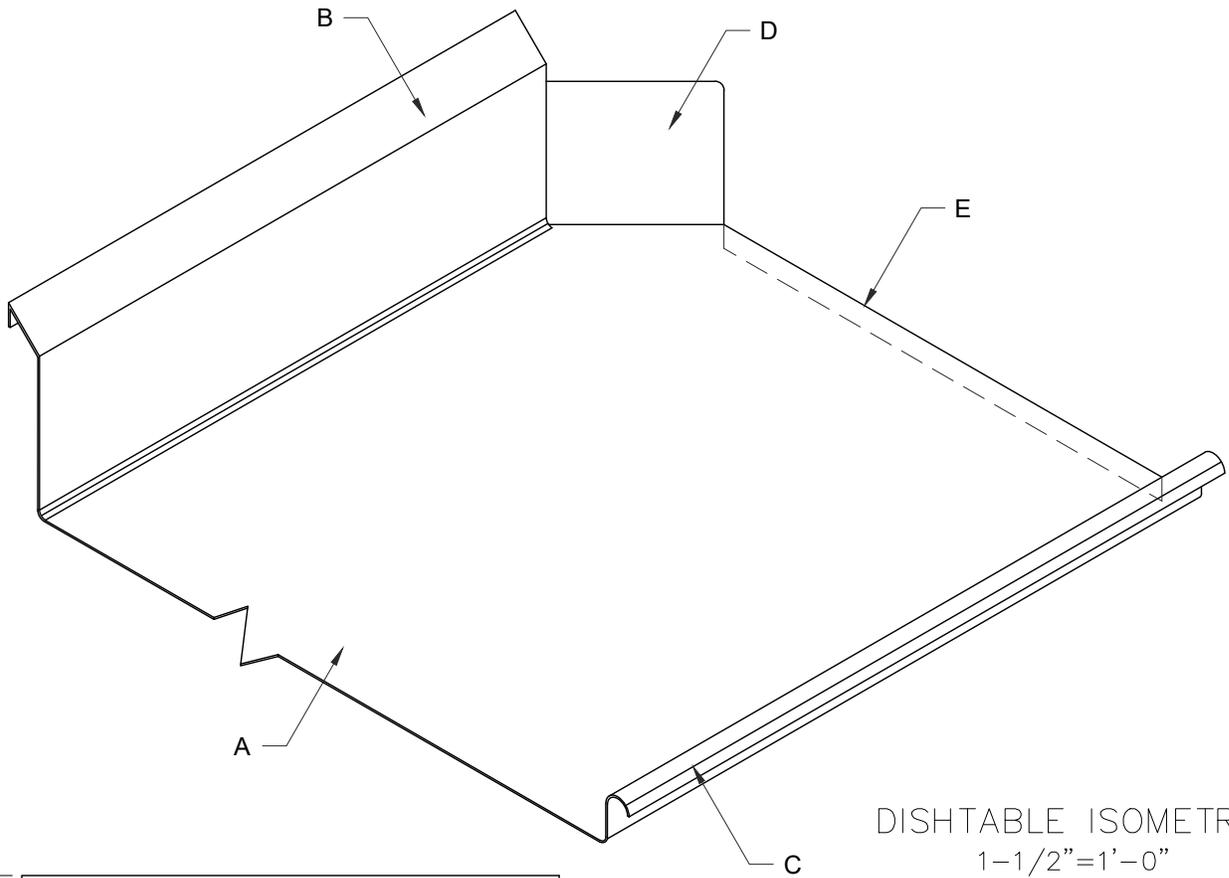


ISOMETRIC; ANTI-SPLASH DRIP TROUGH
1/2"=1'-0"

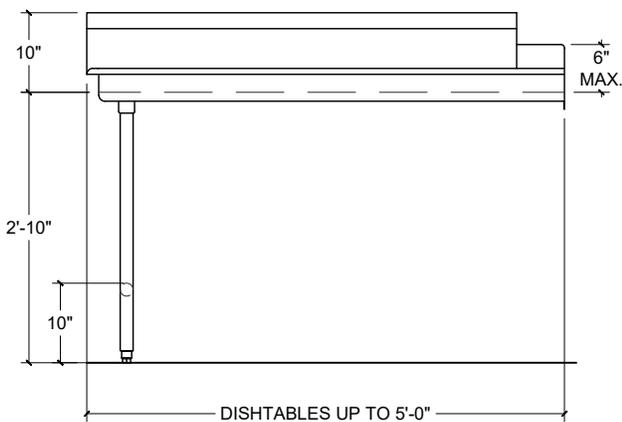
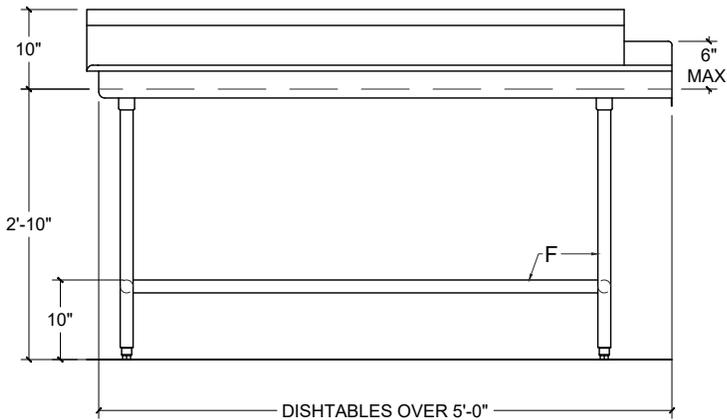


ISOMETRIC; FLUSH DRIP TROUGH
1/2"=1'-0"

- A. TROUGH TO BE FULLY WELDED AND COVERED CORNERED. PITCHED 1/4" PER FOOT TO DRAIN
- B. 1" DIA. S/S DRAIN CUT AND FULLY WELDED
- C. S/S ANTI-SPLASH GRATING; BOTH ENDS WELDED CLOSED. MAXIMUM LENGTH OF ANY (1) GRATE TO BE 2'-0"
- D. PROVIDE FINGER RING AT (1) END PER SECTION



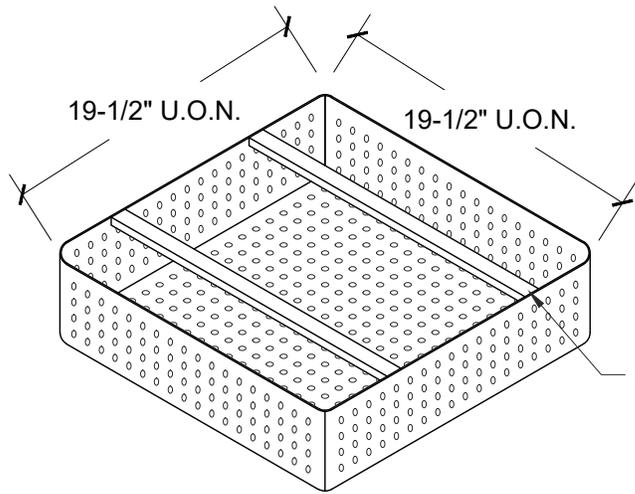
DISHTABLE ISOMETRIC
 1-1/2" = 1'-0"



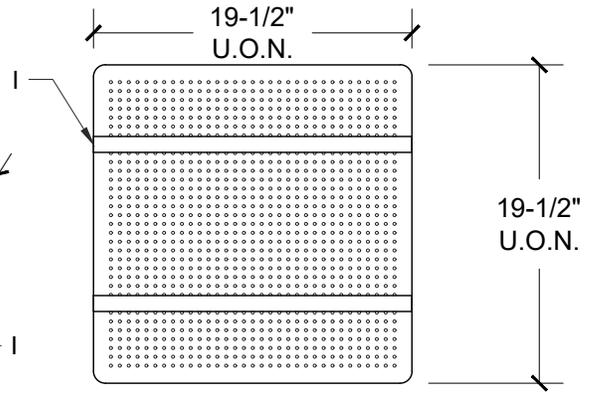
ELEVATIONS

1/2" = 1'-0"

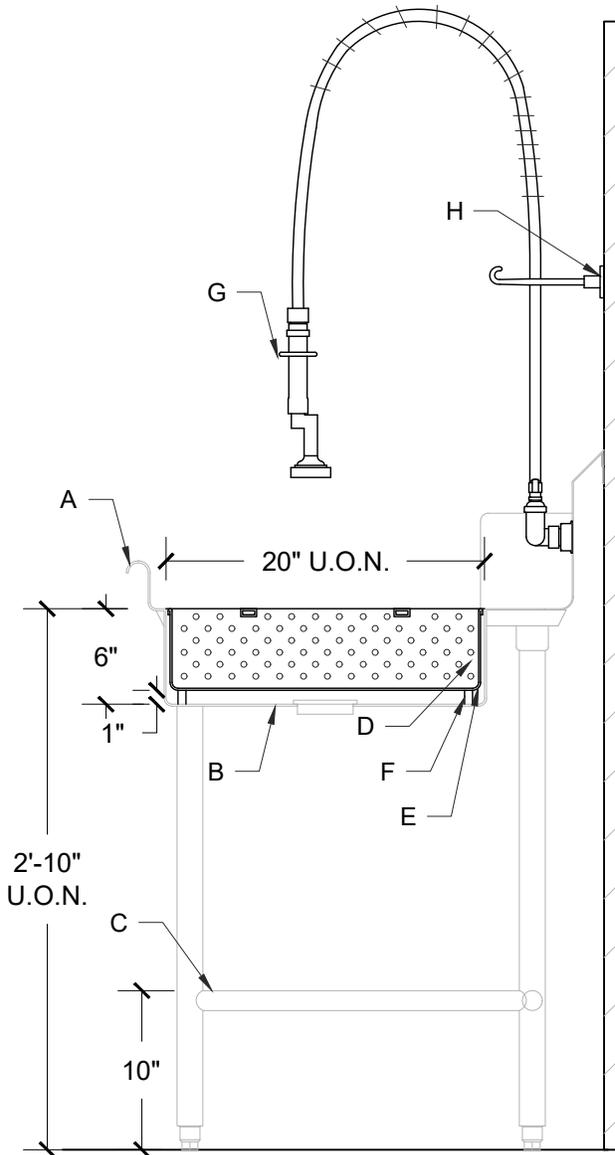
- A. TABLE PER DETAIL 1-3
- B. SPLASH PER DETAIL 1-2 TYPE C
- C. RAISED ROLLED EDGE PER DETAIL 1-1 TYPE E
- D. 6" HIGH MAXIMUM; COORDINATE WITH DISHWASHER REQUIREMENTS
- E. TURN DOWN 1" AT MACHINE; VERIFY OPENING SIZE WITH MACHINE
- F. PROVIDE REAR & SIDE CROSS BRACING FOR DISHTABLES OVER 60"



SCRAP BASKET
ISOMETRIC
1"=1'-0"

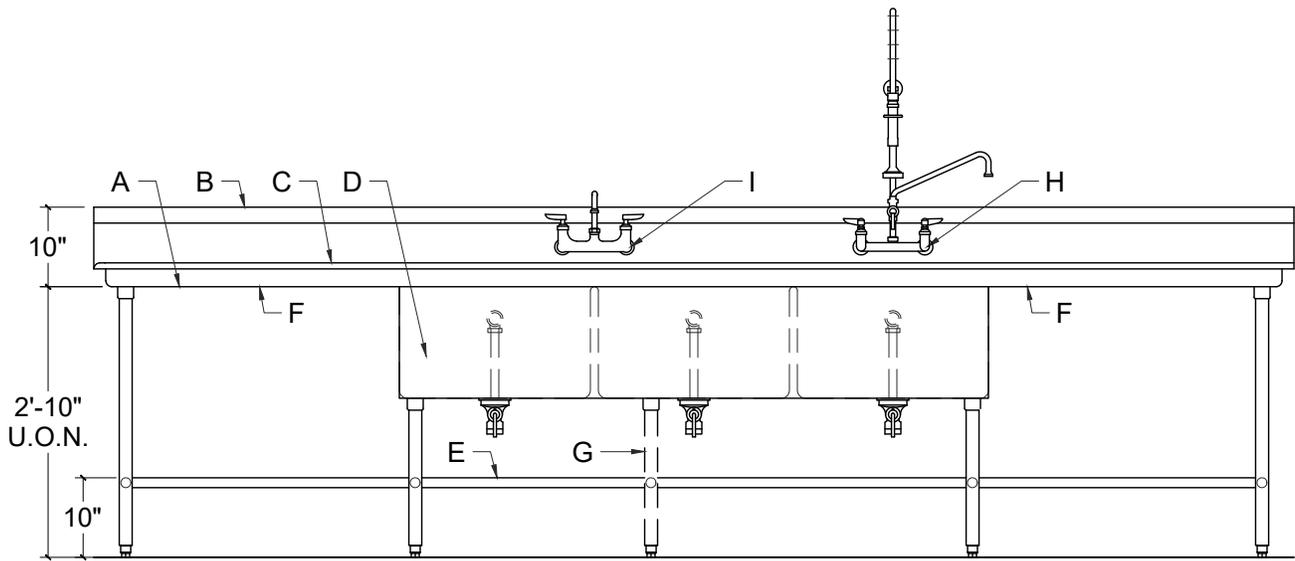


SCRAP BASKET PLAN
1"=1'-0"

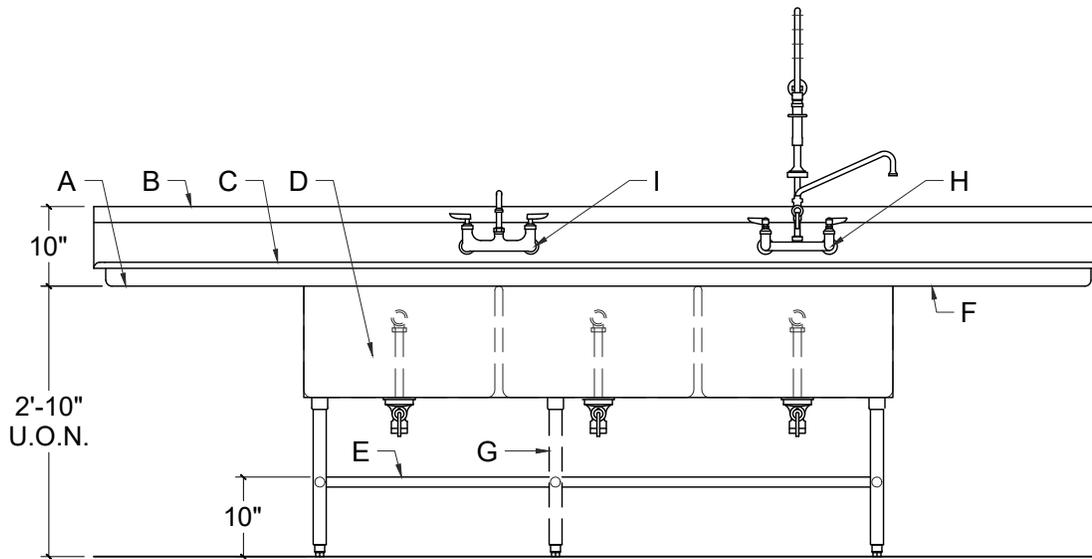


SECTION
1"=1'-0"

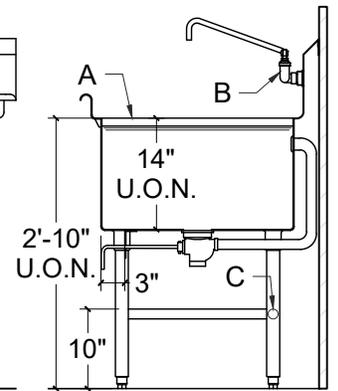
- A. DISHTABLE PER DETAIL 4-1
- B. SINK PER DETAIL 3-1, WITHOUT ROTARY WASTE OR OVERFLOW ASSEMBLY
- C. 16 GA. 1-1/4" O.D. S/S CROSSRAIL FULLY WELDED, GROUND & POLISHED AT JUNCTURES
- D. 16 GA. S/S LIFT-OUT SCRAP BASKET WITH 5/16" DIA. HOLES 5/8" ON CENTER
- E. 3/4" RADIUS CORNERS ON SCRAP BASKET
- F. 1/2" DIA. 1" S/S ROD SPACERS FULLY WELDED TO UNDERSIDE OF BASKET
- G. PROVIDE A PRE-RINSE FAUCET W/ SPRING-ACTION FLEXIBLE GOOSENECK AND LOW-FLOW SPRAY VALVE; FISHER MODEL 13390 OR T&S BRASS MODEL B-01330-C
- H. EXTEND & SECURE TO WALL
- I. TWO 1/2" DIA. ROD HANDLES FULLY WELDED TO BASKET



DRAINBOARDS OVER 36" LONG



DRAINBOARDS UP TO 36"



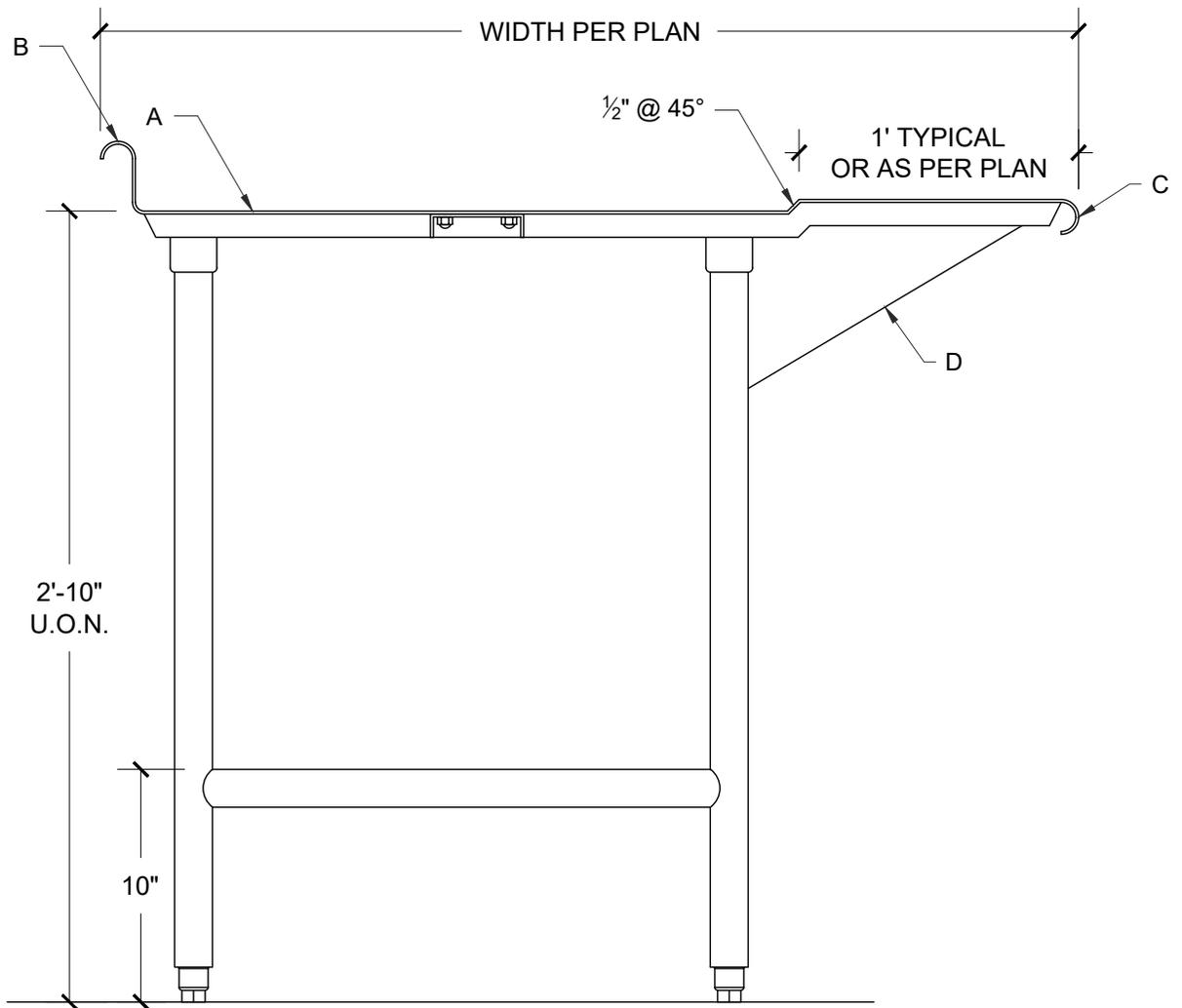
SECTION

ELEVATIONS

1/2"=1'-0"

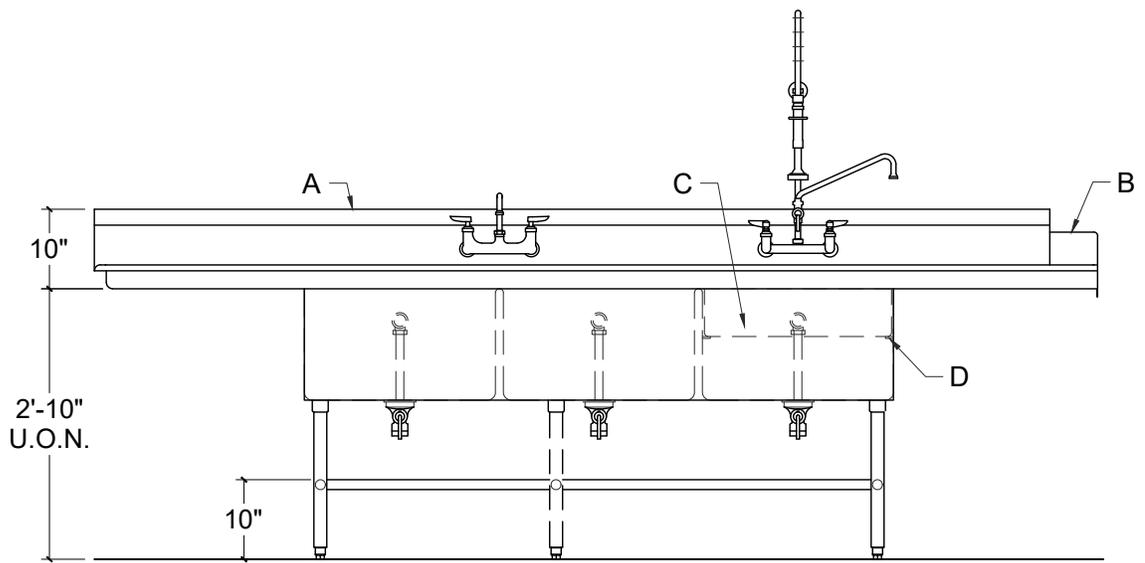
1/2"=1'-0"

- A. DISHTABLE PER DETAIL 1-3
- B. SPLASH PER DETAIL 1-2 TYPE C2
- C. RAISED ROLLED EDGE PER DETAIL 1-1 TYPE E
- D. SINKS SIZED PER THE PLAN, PER DETAIL 3-2
- E. REAR & SIDE CROSS BRACING PER DETAIL 1-3
- F. PITCH DRAINBOARDS TO SINKS
- G. ADD CENTER LEG WHEN LEGS ARE MORE THAN 5'-0" APART O.C.
- H. PROVIDE A PRE-RINSE FAUCET W/ SPRING-ACTION FLEXIBLE GOOSENECK AND LOW-FLOW SPRAY VALVE; FISHER MODEL 13390 OR T&S BRASS MODEL B-01330C
- I. PROVIDE A SPLASH-MOUNTED, 12" SWING NOZZLE; FISHER MODEL 13269 OR T&S BRASS MODEL B-0231



SECTION
 $1-1/2" = 1'-0"$

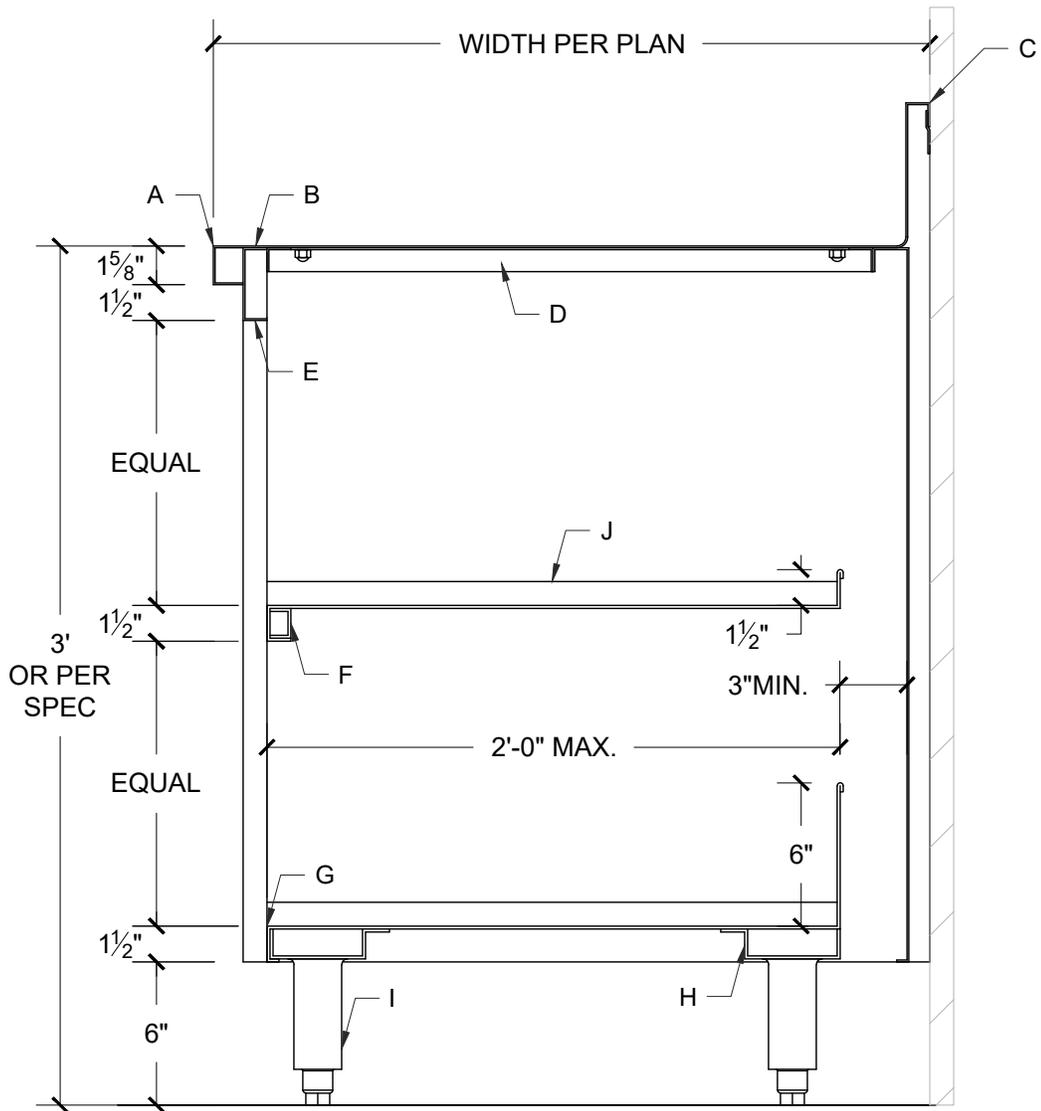
- A. DISHTABLE PER DETAIL 4-1 WITH CROSS BRACING
- B. RAISED ROLLED EDGE PER DETAIL 1-1 TYPE E
- C. ROLLED EDGE PER DETAIL 1-1 TYPE B
- D. 14 GA. S/S CANTILEVER BRACKET



ELEVATION

1/2"=1'-0"

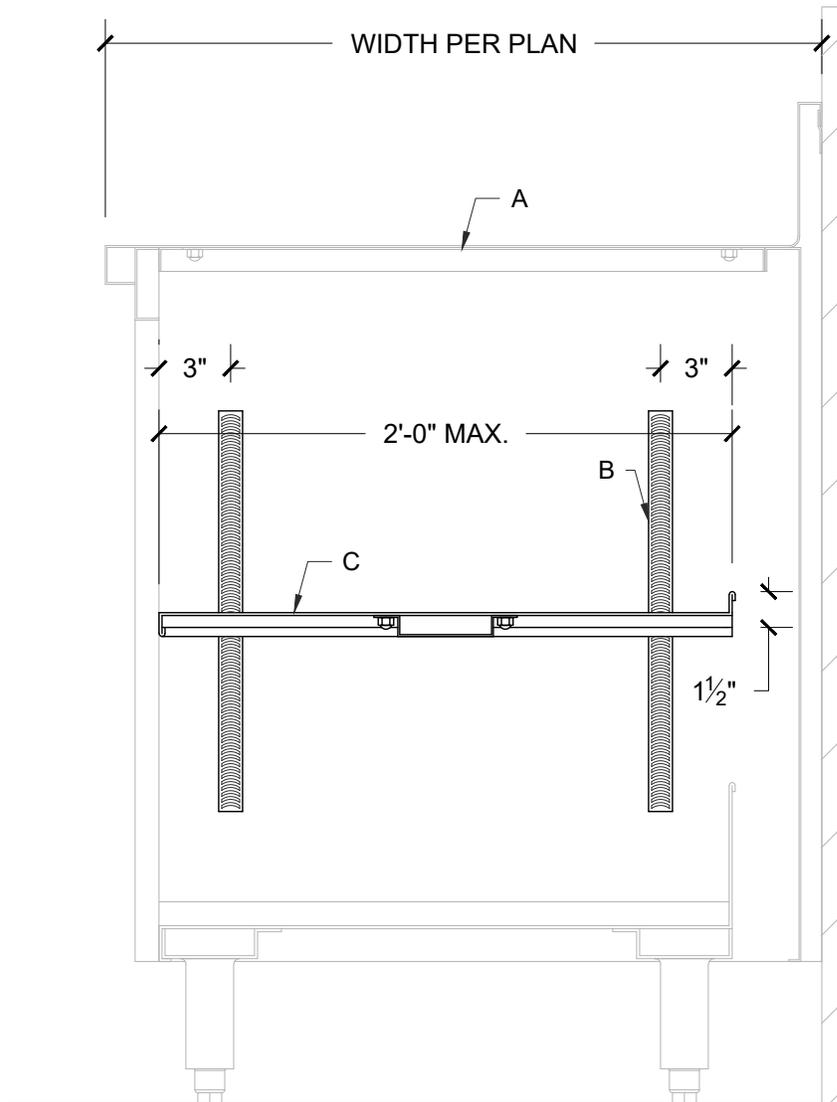
- A. THREE COMPARTMENT SINK PER DETAIL 4-3
- B. WHERE DISHTABLE MEETS THE DISHWASHER, TURN DOWN PER DETAIL 4-1 NOTE E
- C. LIFT-OUT SCRAP BASKET PER DETAIL 4-2
- D. ROD SUPPORTS IN EACH CORNER 6" BELOW WORK SURFACE PER DETAIL 3-3 NOTE C



SECTION

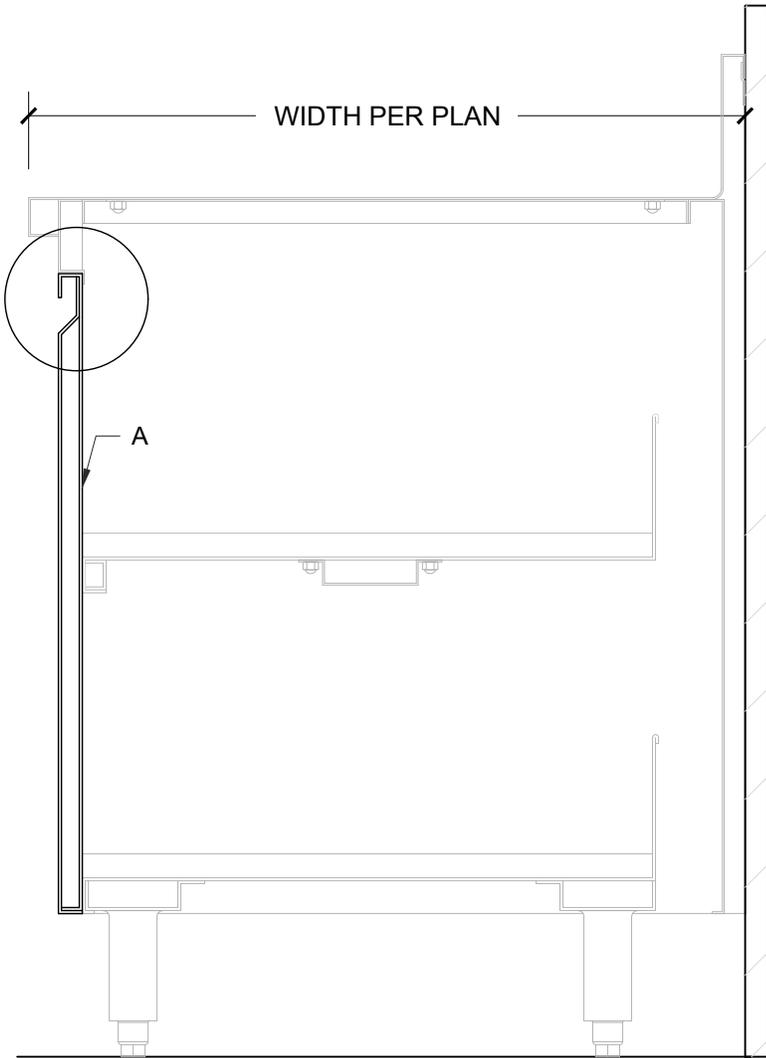
1-1/2"=1'-0"

- A. EDGE PER DETAIL 1-1F UNLESS OTHERWISE SPECIFIED
- B. 14 GA. TYPE 304 S/S TOP W/ SOUND DEADENING
- C. SPLASH PER DETAIL 1-2; SPLASH TYPE PER SPECIFICATIONS
- D. FRONT TO REAR ANGLES ALL FULLY WELDED, 2'-6" O.C. MAX
- E. 16 GA. S/S APRON & BODY
- F. CAP FRONT EDGE
- G. 16 GA. BOTTOM SHELF WELDED TO BODY
- H. 14 GA. S/S HAT CHANNEL REINFORCING
- I. 2" O.D. 16 GA. S/S LEGS WITH ADJUSTABLE S/S BULLET FEET FULLY WELDED TO CHANNELS
- J. WHERE FIXED MID-SHELF IS SPECIFIED, PROVIDE 16 GA. SHELF WELDED TO BODY

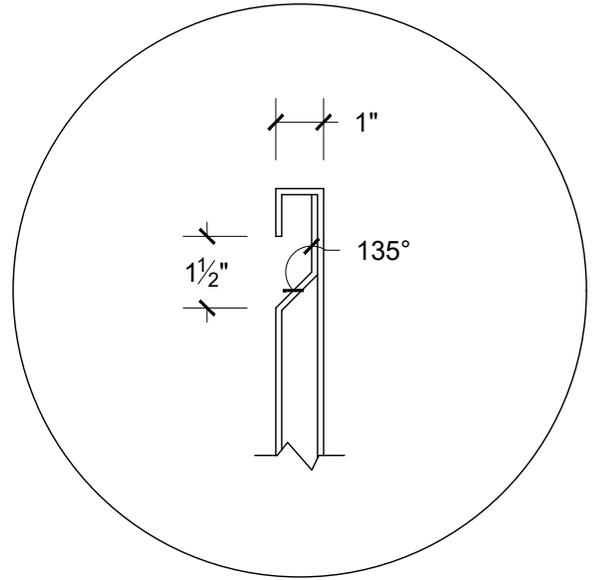


SECTION
 1-1/2" = 1'-0"

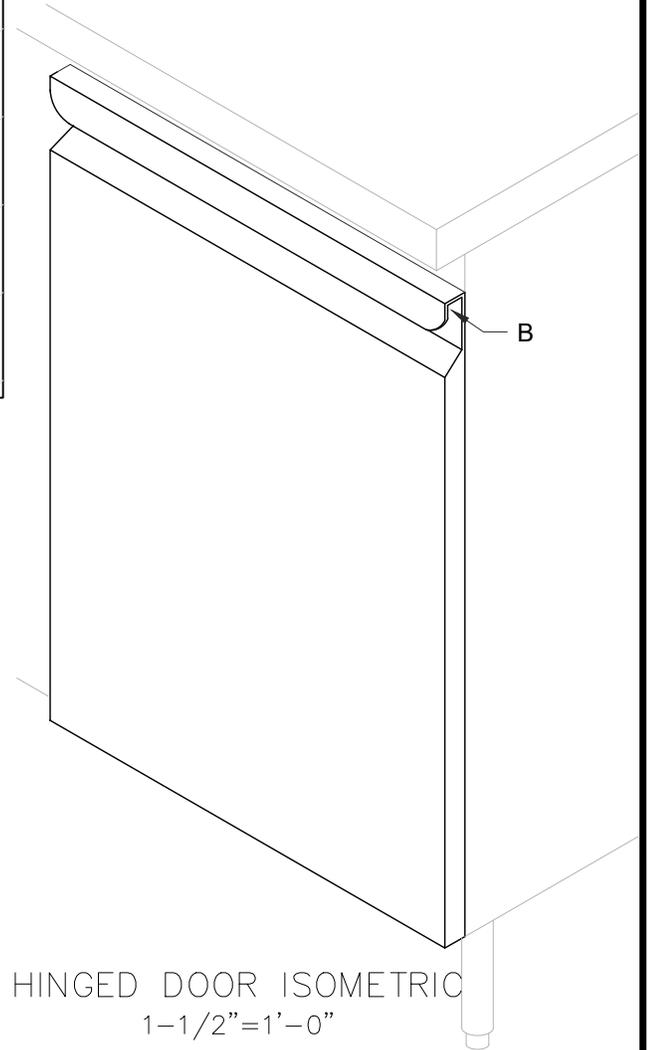
- A. COUNTER PER DETAIL 5-1
- B. PILASTER STRIPS
- C. 16 GA. S/S ADJUSTABLE SHELF



HINGED DOOR SECTION
1-1/2" = 1'-0"

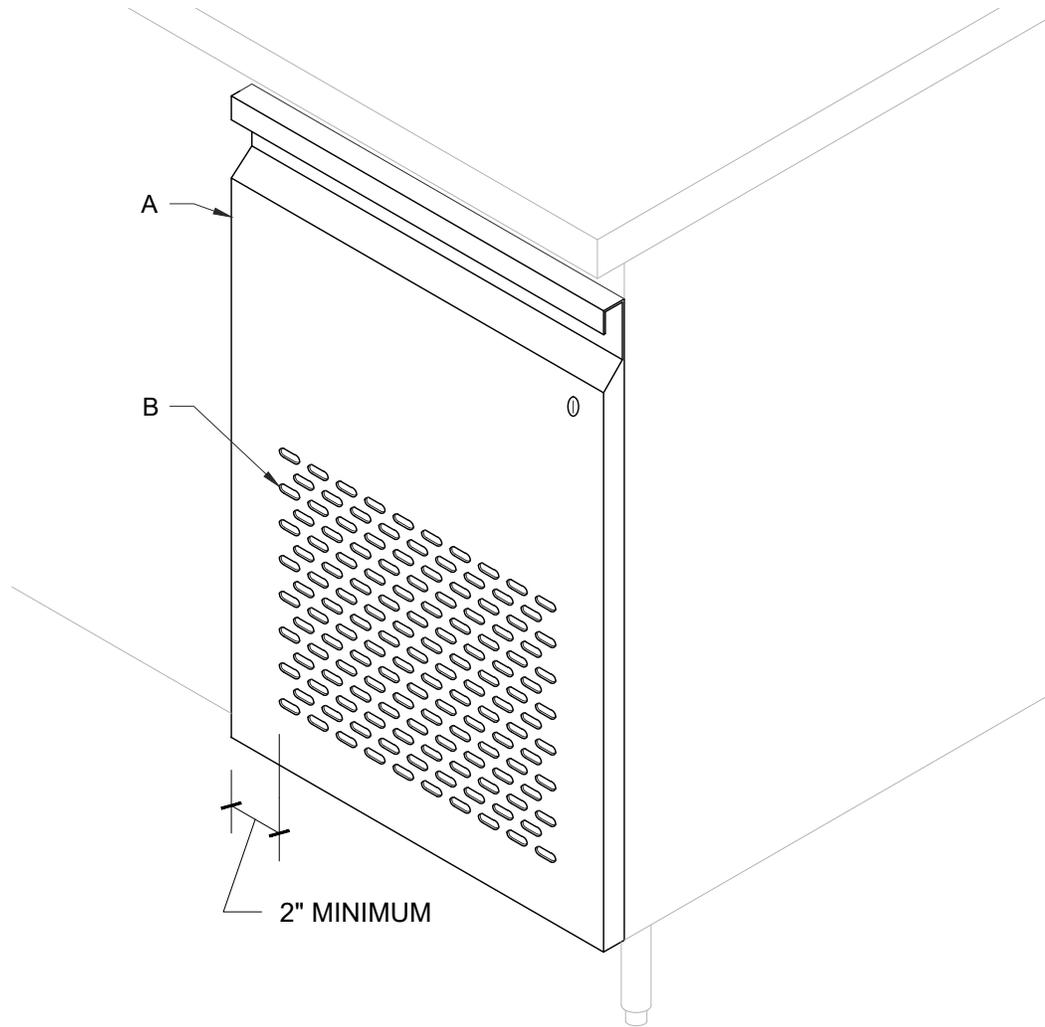


HINGED DOOR DETAIL
3" = 1'-0"



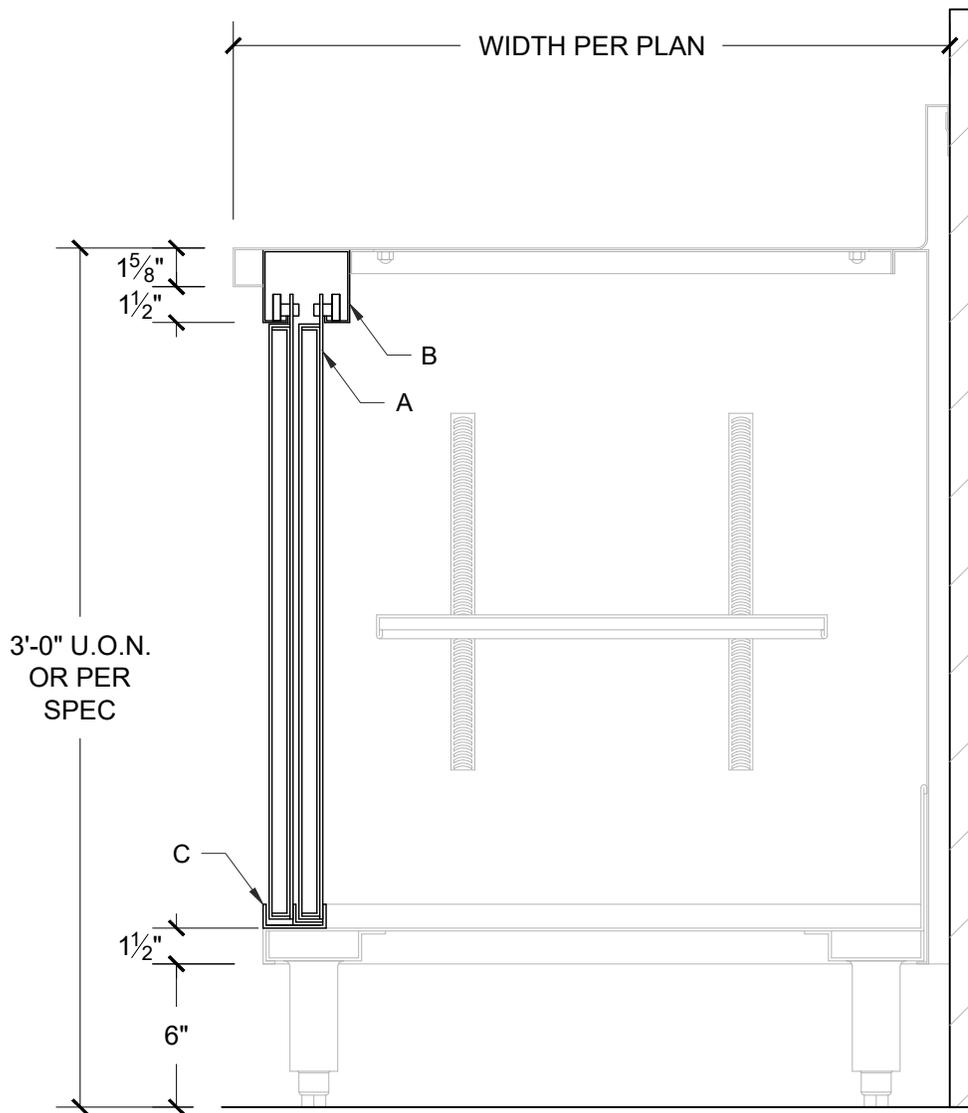
HINGED DOOR ISOMETRIC
1-1/2" = 1'-0"

- A. 20 GA. S/S DOUBLE PAN HINGED DOOR, FILLED WITH 1/2" THICK SOUND DEADENER
- B. ROUND EDGES ON DOOR PULL



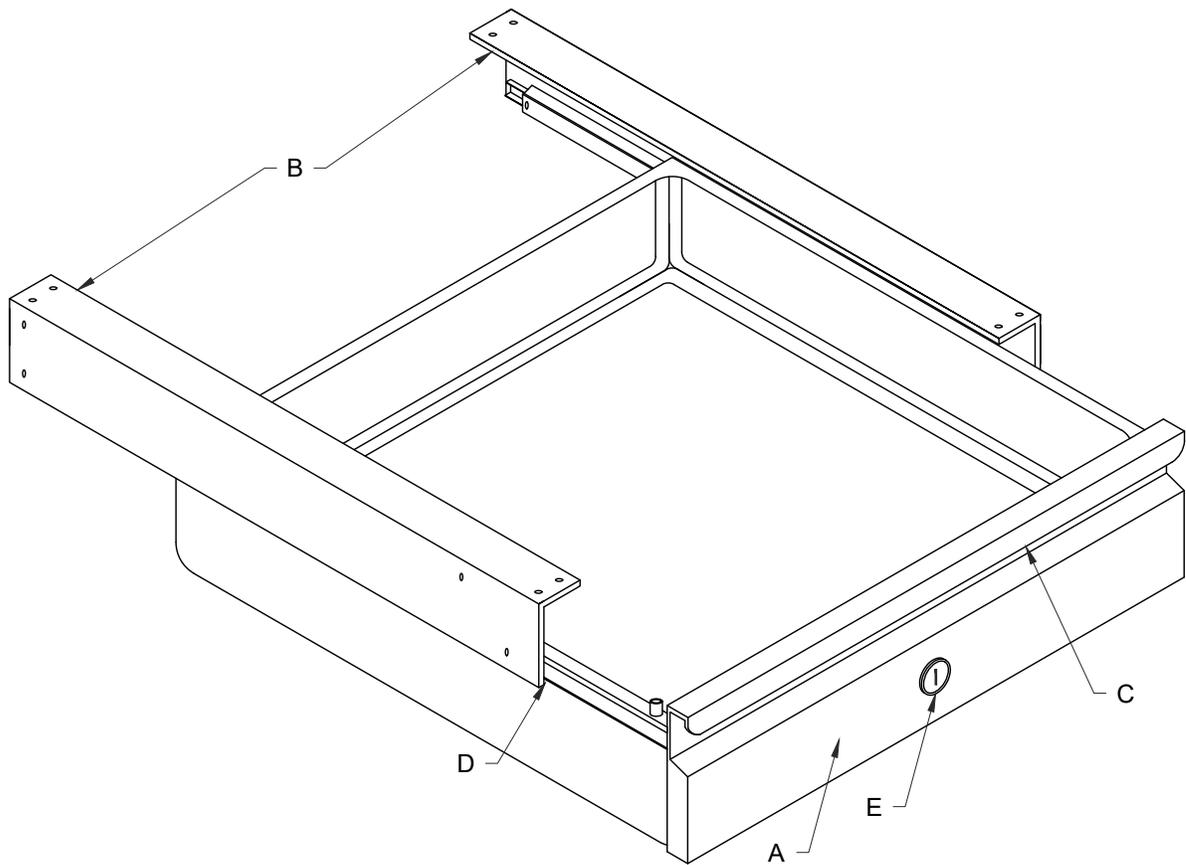
HINGED LOUVERED DOOR ISOMETRIC
 1-1/2"=1'-0"

- A. S/S DOUBLE PAN HINGED DOOR PER DETAIL 5-3
- B. WHERE LOUVERS ARE SPECIFIED PROVIDE A MINIMUM 50% FREE AIR, LOCATED PER EQUIPMENT REQUIREMENTS (SHAPE VARIES)

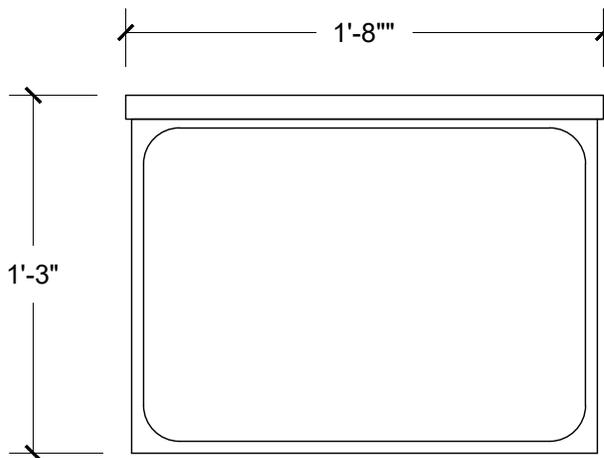


SECTION
 1-1/2"=1'-0"

- A. 20 GA. S/S DOUBLE PAN HINGED DOOR
- B. S/S SLIDING DOOR TRACK
- C. S/S DOOR GUIDE

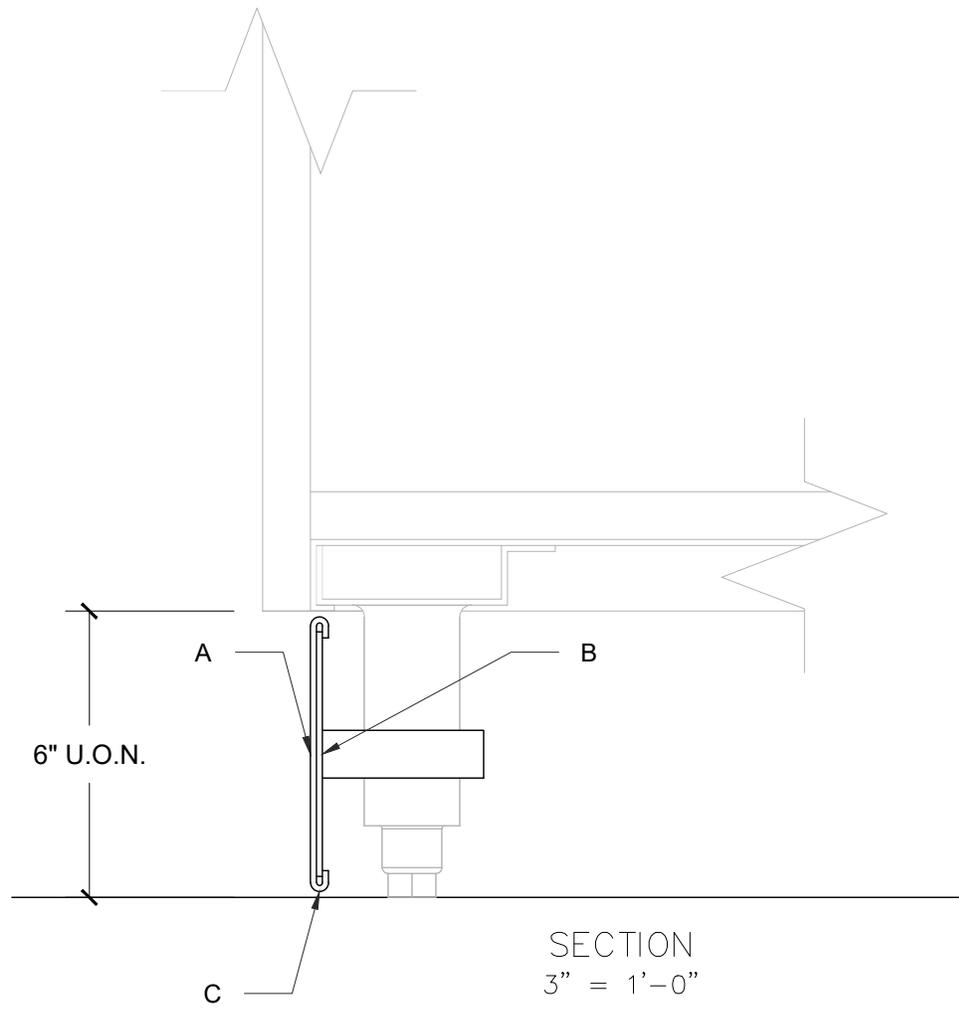


ISOMETRIC
3"=1'-0"

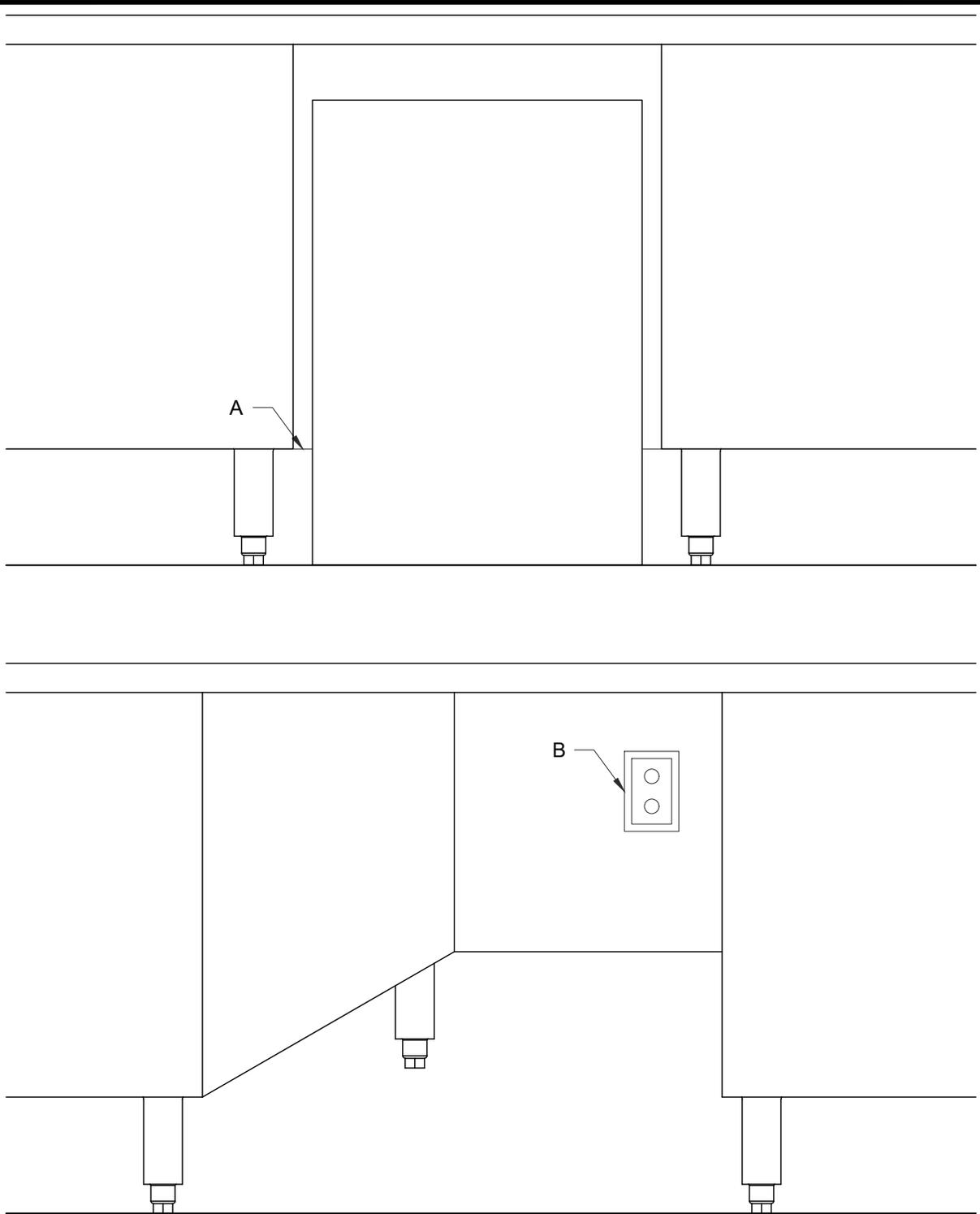


PLAN
1-1/2"=1'-0"

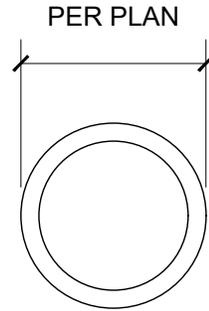
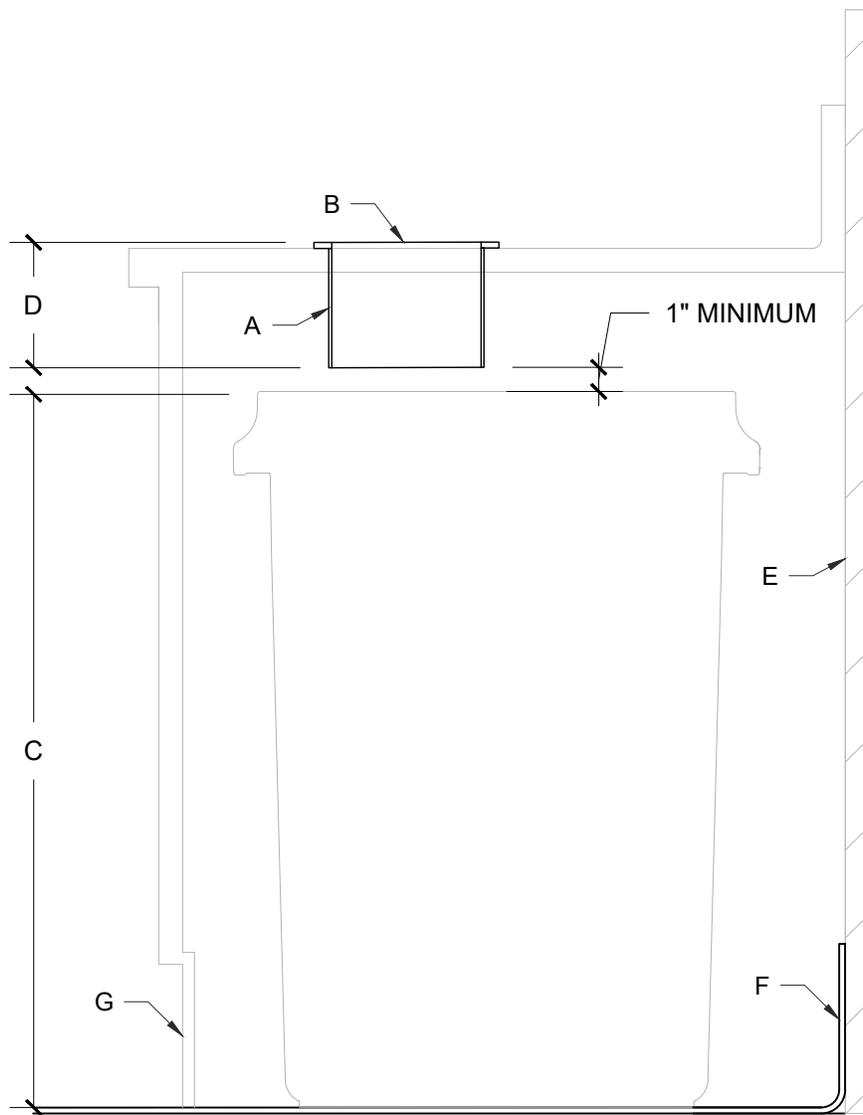
- A. 20 GA. S/S DOUBLE PAN, INSULATED DRAWER HEAVY DUTY HINGED WITH CYLINDER LOCKS
- B. ATTACH TO UNDERSIDE OF WORK SURFACE
- C. INTEGRAL S/S PULL
- D. SELF-CLOSING REMOVABLE SLIDES
- E. CYLINDER LOCK, KEYED ALIKE



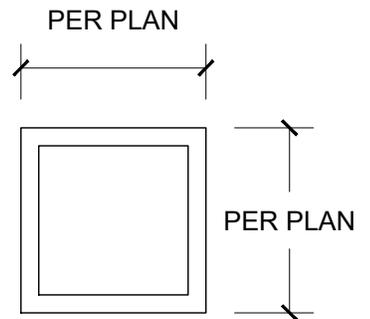
- A. 18 GA. S/S KICK PLATE
- B. CLIP FULLY WELDED TO S/S PLATE
- C. OPEN HEM TO ALLOW CLIP TO BE POSITIONED



- A. COORDINATE OPENING WITH DIMENSIONS OF UNDERCOUNTER EQUIPMENT; PROVIDE CLEAR SPACE BETWEEN EQUIPMENT AND COUNTER PER PLAN (1/2" MINIMUM)
- B. IF EQUIPMENT UNDERCOUNTER REQUIRES ELECTRICAL OR PLUMBING CONNECTION(S), PROVIDE A CLEAN, POLISHED CUTOUT AROUND THE ELECTRICAL OR WATER CONNECTION(S).



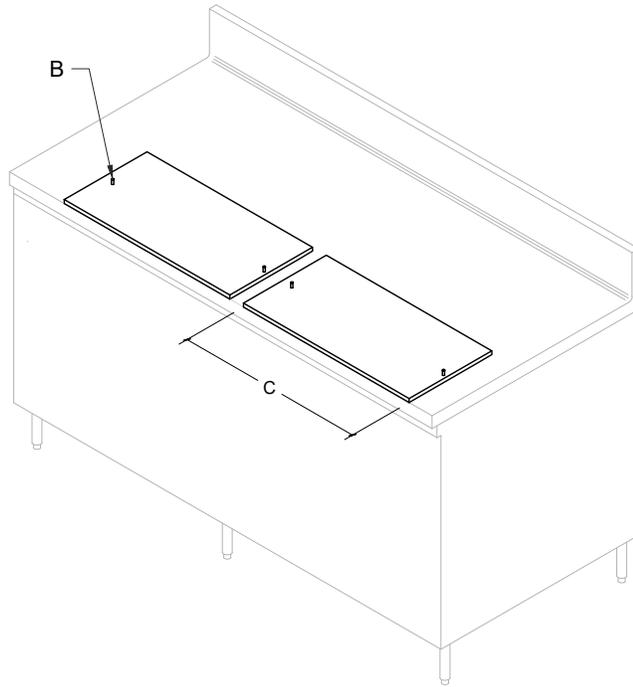
PLAN: ROUND
 $1-1/2"=1'-0"$



PLAN: RECTALINEAR
 $1-1/2"=1'-0"$

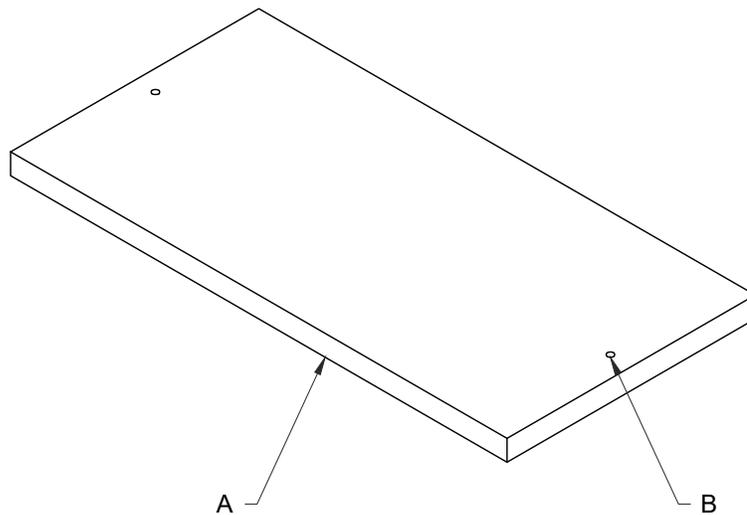
SECTION
 $1-1/2"=1'-0"$

- A. GROMMET TO BE 16 GA TYPE 304 STAINLESS STEEL
- B. GROMMET TO LIFT OUT FOR CLEANING
- C. VERIFY HEIGHT OF TRASH CONTAINER WITH DEPTH OF GROMMET
- D. 5" OR AS REQUIRED BY THE TRASH CONTAINER'S HEIGHT
- E. FULLY FINISHED INTERIOR INCLUDING FINISHED BACK
- F. COVERED FLOOR TO CONTINUE UP REAR AND SIDES OF COUNTER
- G. TOE KICK TO BE INTEGRAL WITH DOOR



ISOMETRIC: FRONT

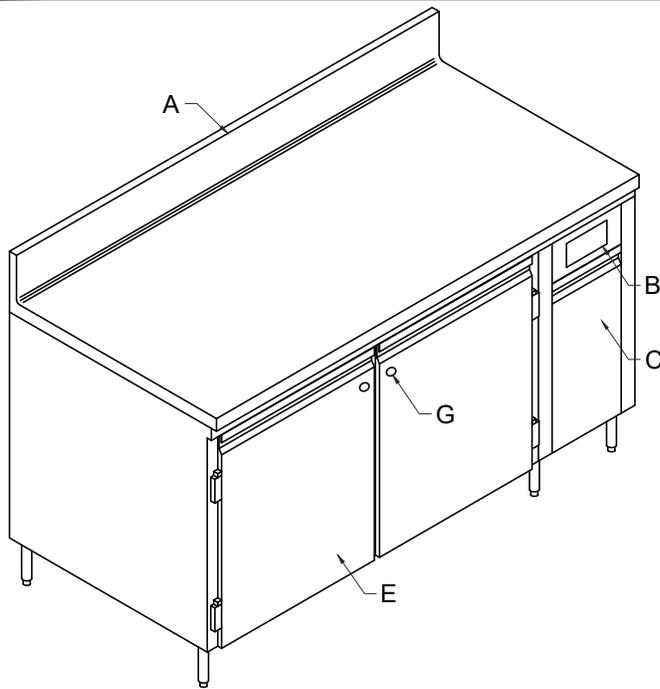
1/2" = 1'-0"



ISOMETRIC

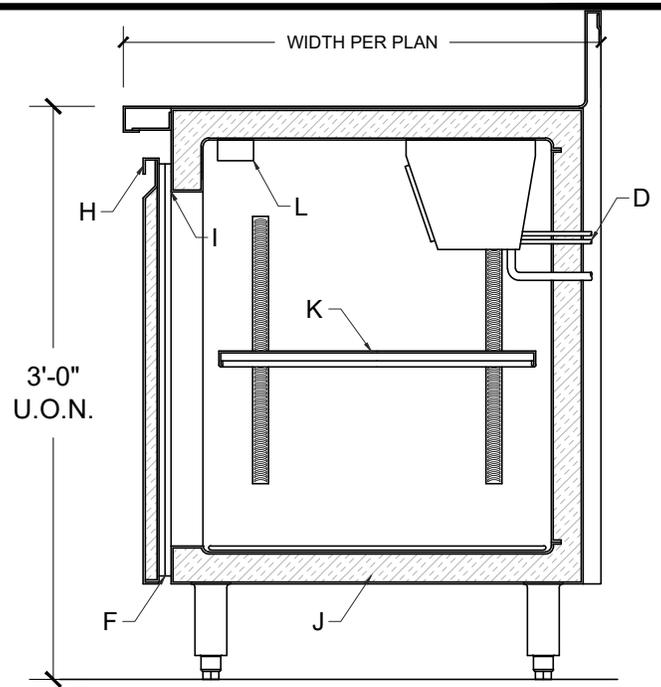
1-1/2" = 1'-0"

- A. CUTTING BOARD MATERIAL PER THE SPECIFICATIONS, 1/2" POLYURETHANE, 1/2" RICHLITE, OR 3/4" WOOD
- B. S/S PINS TO BE FULLY WELDED TO THE WORK SURFACE
- C. MAXIMUM LENGTH TO BE 2'-2"



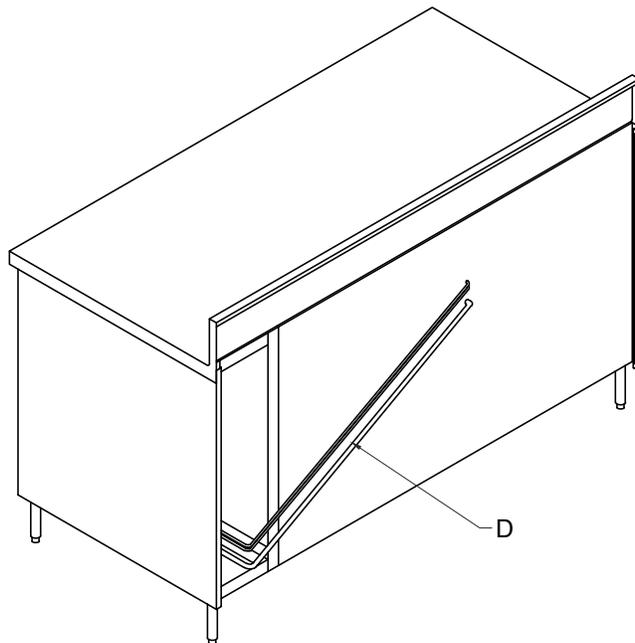
ISOMETRIC: FRONT

1/2" = 1'-0"



SECTION

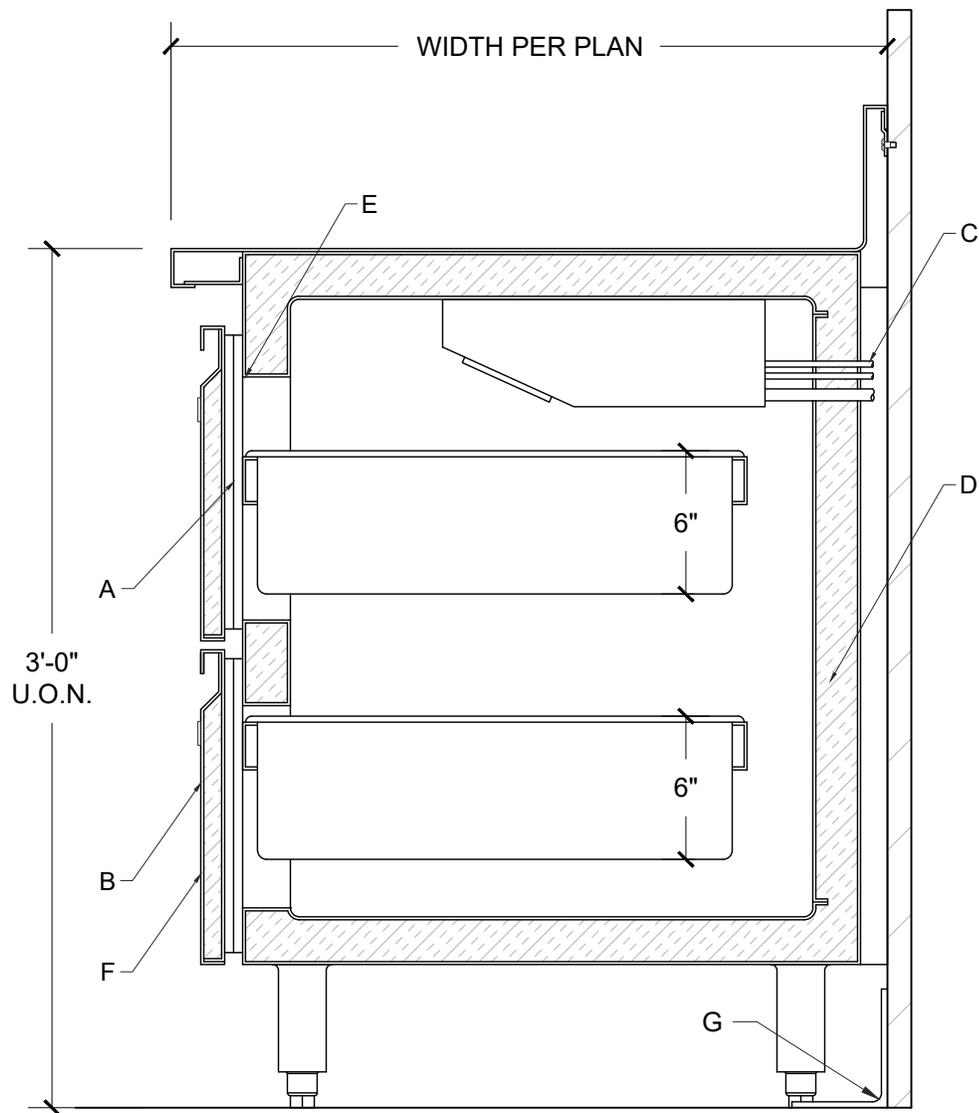
1" = 1'-0"



ISOMETRIC: REAR

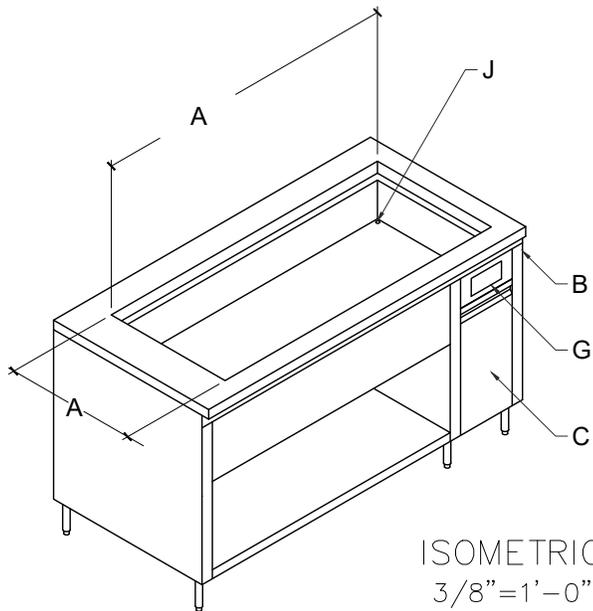
1/2" = 1'-0"

- A. COUNTER PER DETAIL 5-1
- B. EXTERNAL THERMOMETER
- C. REMOTE UNITS TO HAVE MECHANICAL COMPARTMENT BEHIND HINGED DOOR PER DETAIL 5-3; SELF-CONTAINED UNITS TO HAVE COMPRESSOR HOUSING BEHIND LOUVERED DOOR PER DETAIL 5-4
- D. EXTEND REFRIGERATION, ELECTRICAL, AND DRAIN LINES TO MECHANICAL COMPARTMENT
- E. 20 GA. S/S DOUBLE PAN DOORS
- F. VINYL MAGNETIC GASKET
- G. CYLINDER LOCK KEYED ALIKE, U.O.N
- H. DOOR CONSTRUCTION PER DETAIL 5-3 WITH FOAMED-IN-PLACE INSULATION
- I. DOOR AND FRAME INSULATION TO OVERLAP
- J. 2" THICK URETHANE RIGID BOARD INSULATION
- K. TRAY SLIDES OR S/S ADJUSTABLE SHELVING AS SPECIFIED
- L. (1) VAPOR PROOF LED LIGHT FIXTURE FOR EACH SECTION (1-2 DOORS)

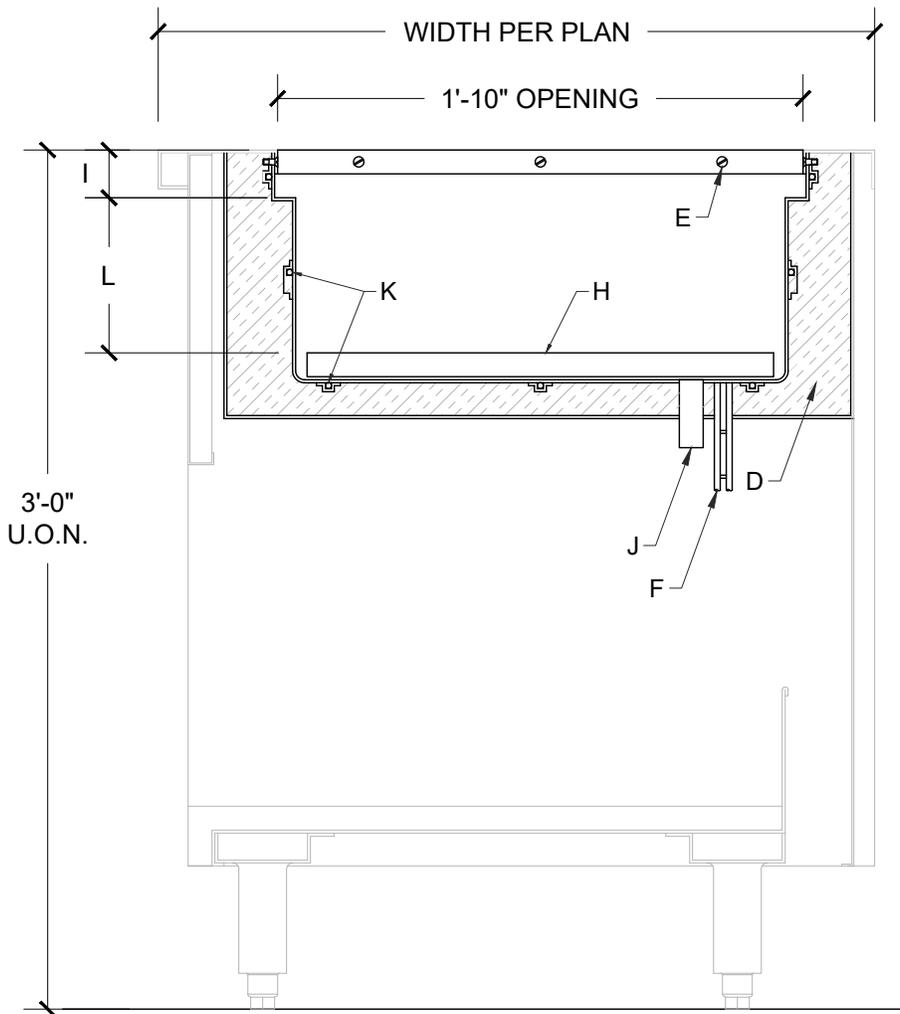


SECTION
 $1-1/2''=1'-0''$

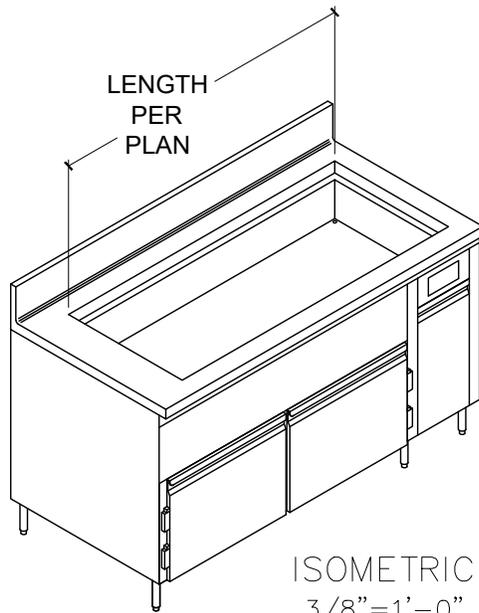
- A. VINYL MAGNETIC GASKET
- B. 20 GA. S/S DOUBLE PAN, INSULATED DRAWERS WITH CYLINDER LOCKS KEYED ALIKE, U.O.N.
- C. EXTEND REFRIGERATION, ELECTRICAL, AND DRAIN LINES TO MECHANICAL COMPARTMENT
- D. 2" THICK URETHANE RIGID BOARD INSULATION, FOAM OR FOAMED-IN-PLACE
- E. DRAWER AND FRAME INSULATION TO OVERLAP
- F. DRAWER FACE PER DOOR DETAIL 5-3 WITH FOAMED-IN-PLACE INSULATION
- G. COVED FLOOR TO CONTINUE UP REAR AND SIDES OF COUNTER, BY OTHERS



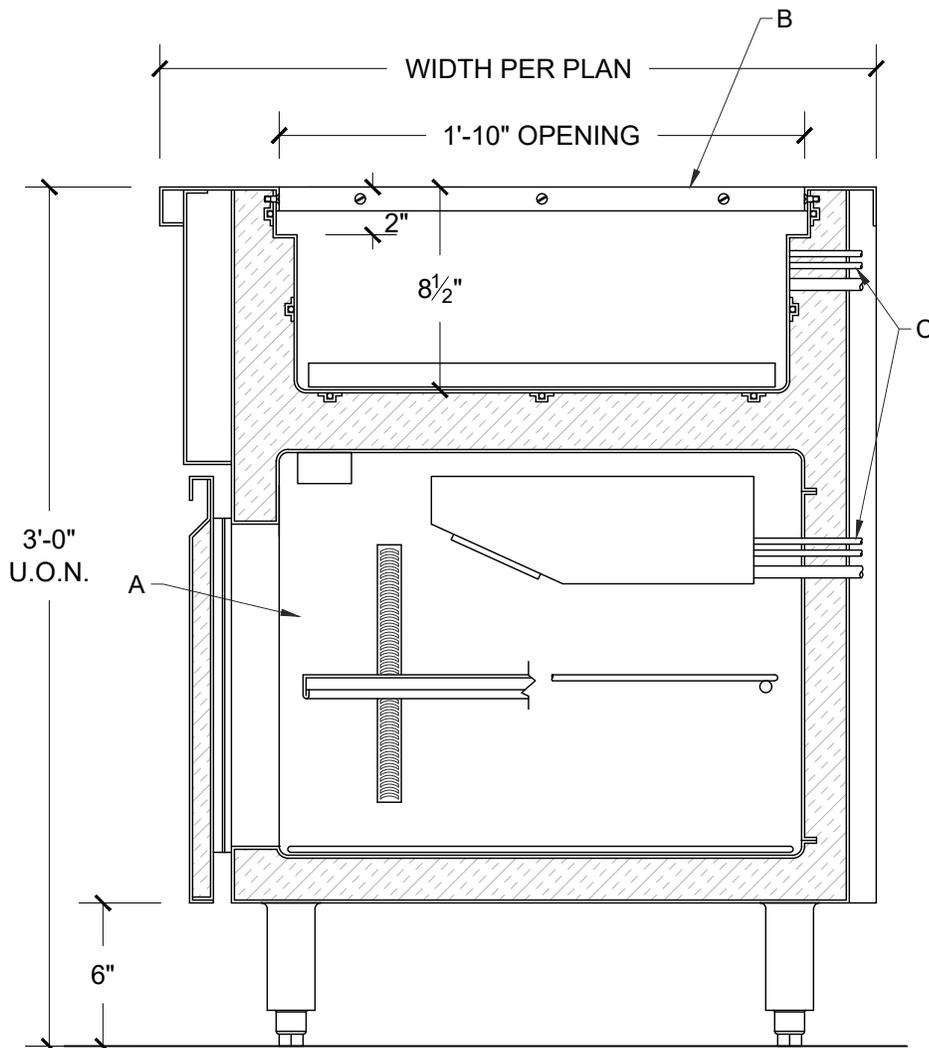
- A. LENGTH AND WIDTH PER PLANS, TO ACCOMMODATE STANDARD HOTEL PAN MODULES
- B. COUNTER PER DETAIL 5-1
- C. REMOTE UNITS TO HAVE MECHANICAL COMPARTMENT BEHIND HINGED DOOR PER DETAIL 5-3; SELF CONTAINED UNITS TO HAVE COMPRESSOR HOUSING BEHIND LOUVERED DOOR PER DETAIL 5-5



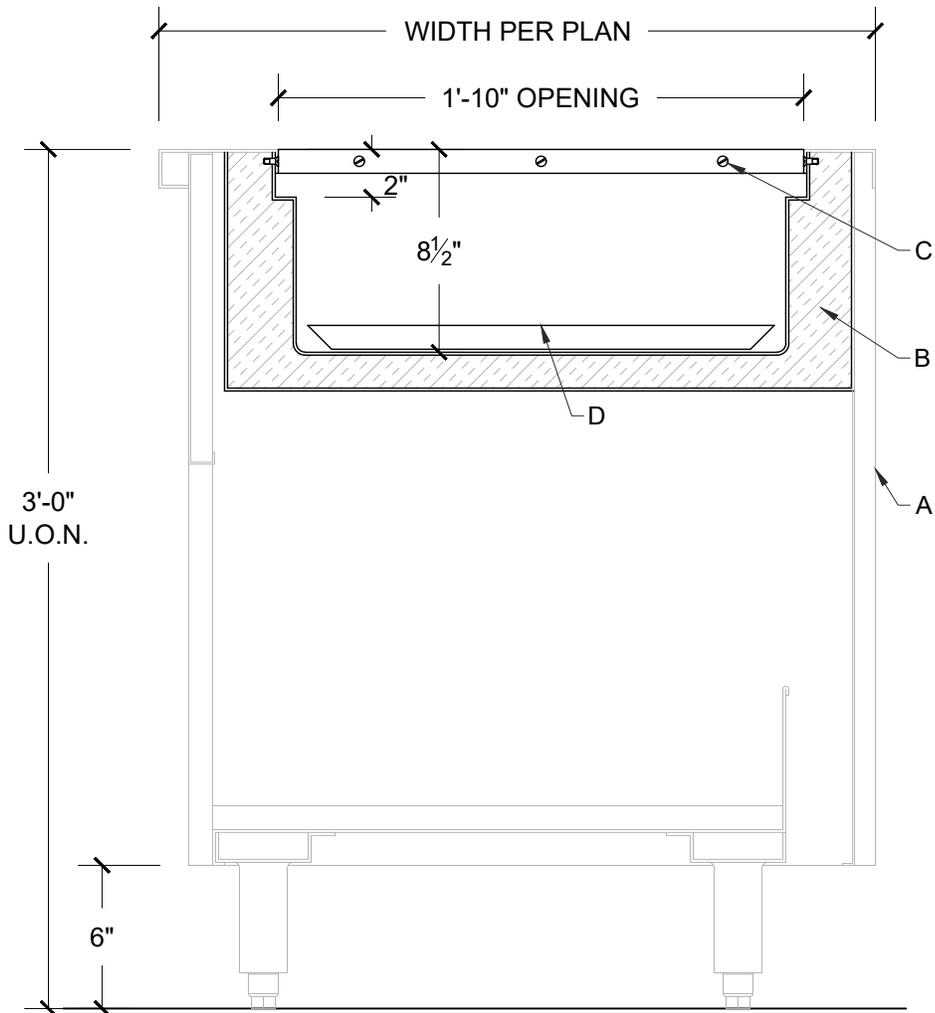
- D. 2" THICK. URETHANE RIGID BOARD INSULATION, FOAM OR FOAMED IN PLACE
- E. COUNTERSINK ALL SCREWS
- F. EXTEND REFRIGERATION, ELECTRICAL AND DRAIN LINES TO MECHANICAL COMPARTMENT
- G. LIGHTED ON/OFF SWITCH
- H. 18 GA TYPE 304 S/S PERFORATED FALSE BOTTOM
- I. DEPTH PER NSF REQUIREMENTS
- J. DRAIN FOR REFRIGERATED WELL TO BE LOCATED ABOVE UTILITY COMPARTMENT
- K. COLD WALL CONSTRUCTION
- L. 6-1/2" FOR 6" DEEP HOTEL PANS U.O.N.



- A. REFRIGERATED BASE
PER DETAIL 6-1
- B. REFRIGERATED WELL
PER DETAIL 6-3
- C. SEPARATE REFRIGERATION
FOR REFRIGERATOR AND
WELL

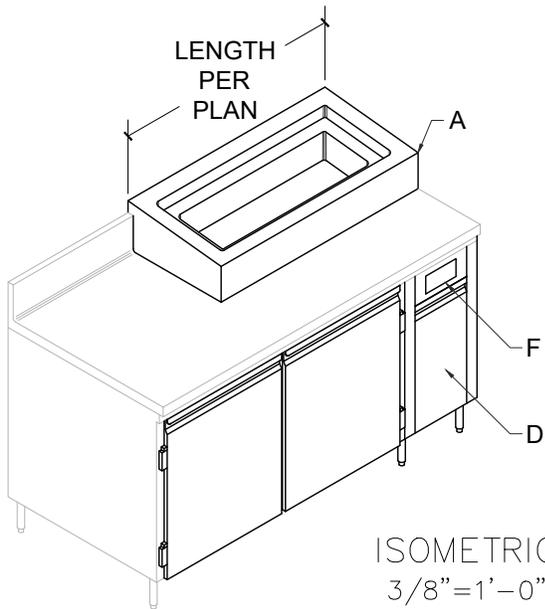


SECTION
1-1/2" = 1'-0"



SECTION
1-1/2"=1'-0"

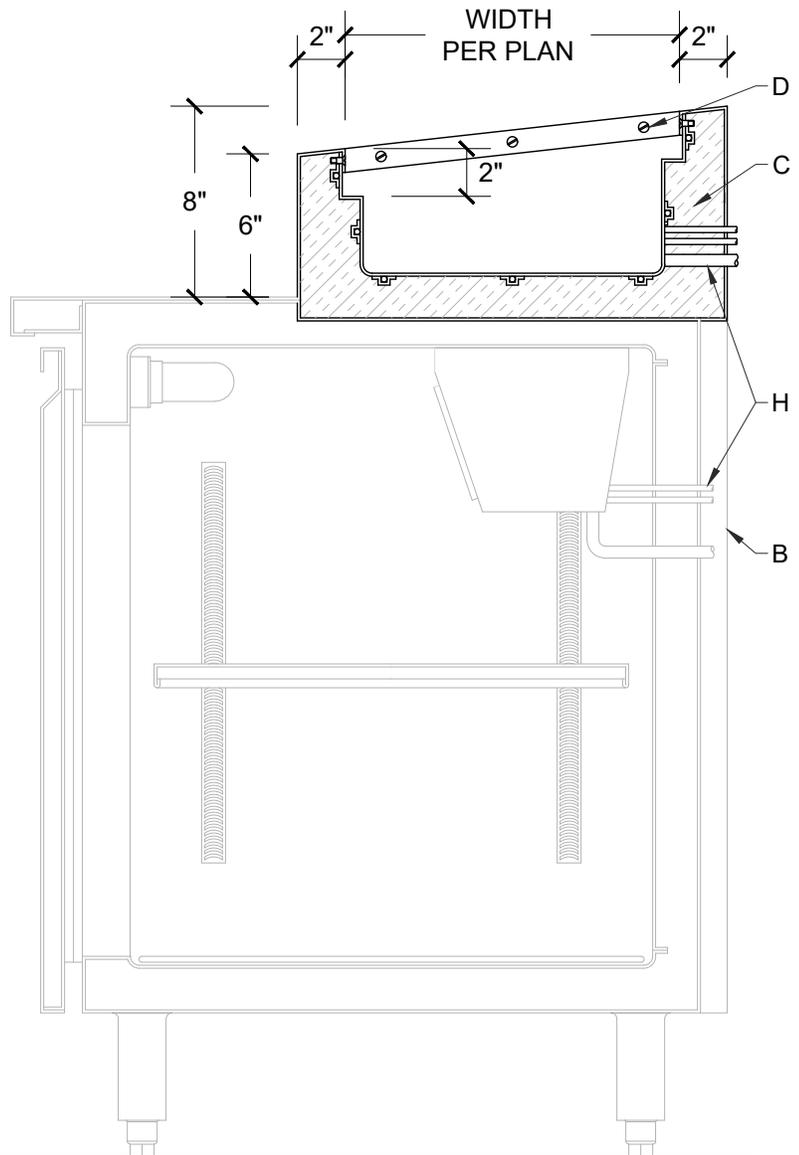
- A. COUNTER PER DETAIL 5-1
- B. 2" THICK URETHANE RIGID BOARD INSULATION, FOAM OR FOAMED-IN-PLACE
- C. COUNTERSINK ALL SCREWS
- D. 1" PERFORATED FALSE BOTTOM



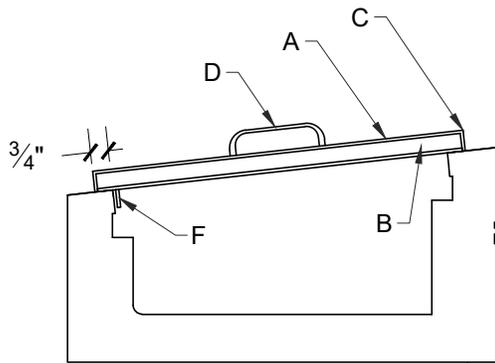
ISOMETRIC
3/8"=1'-0"

- A. LENGTH & WIDTH PER PLAN, OPENING TO ACCOMMODATE STANDARD SIZE HOTEL PANS OR STANDARD MODULES
- B. COUNTER PER DETAIL 5-1 OR REFRIGERATED BASE PER DETAIL 6-1
- C. 2" THICK. URETHANE RIGID BOARD INSULATION, FOAM OR FOAMED IN PLACE
- D. COUNTERSINK ALL SCREWS
- E. EXTEND REFRIGERATION, ELECTRICAL AND DRAIN LINES TO MECHANICAL COMPARTMENT
- F. ON/OFF SWITCH
- G. DRAIN FOR RAIL TO ALIGN OVER REFRIGERATED BASE'S UTILITY CABINET OR OPEN CABINET SECTION
- H. WHERE REFRIGERATION BELOW, PROVIDE SEPARATE REFRIGERATION FOR REFRIGERATOR AND RAIL

3'-0"
U.O.N.

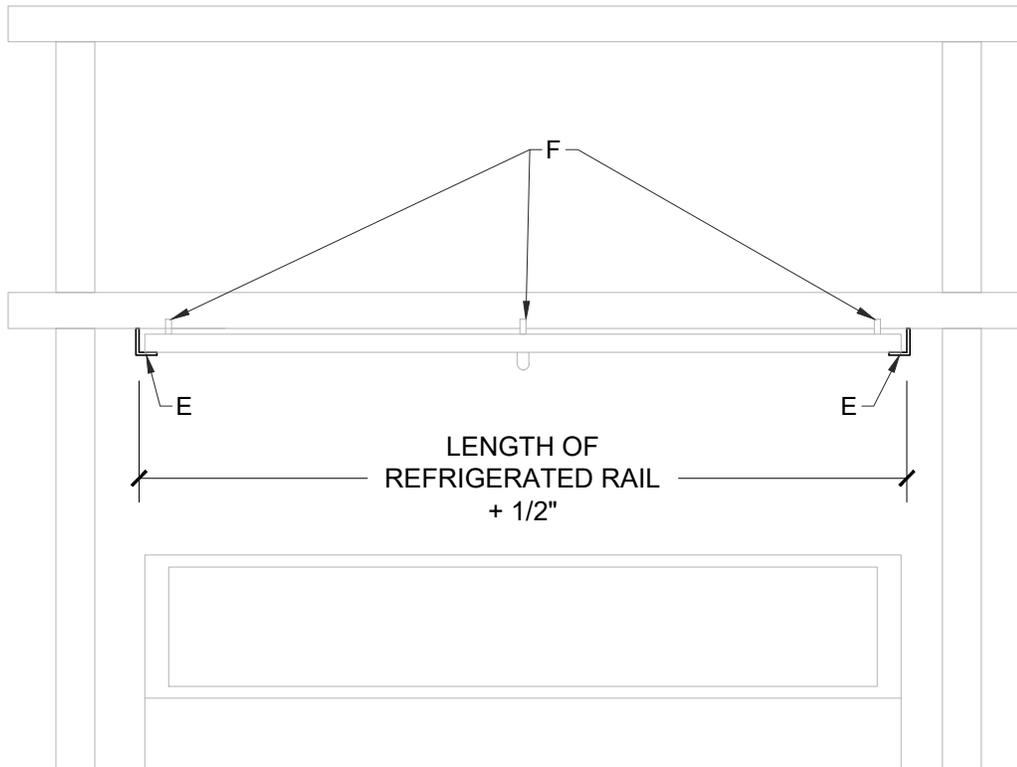


SECTION
1-1/2"=1'-0"

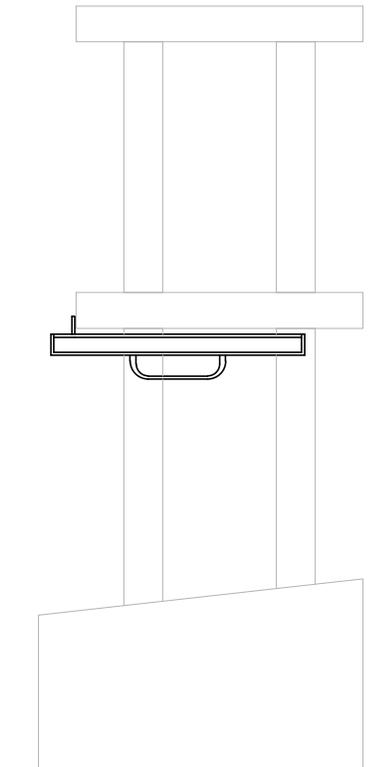


SECTION
1-1/2"=1'-0"

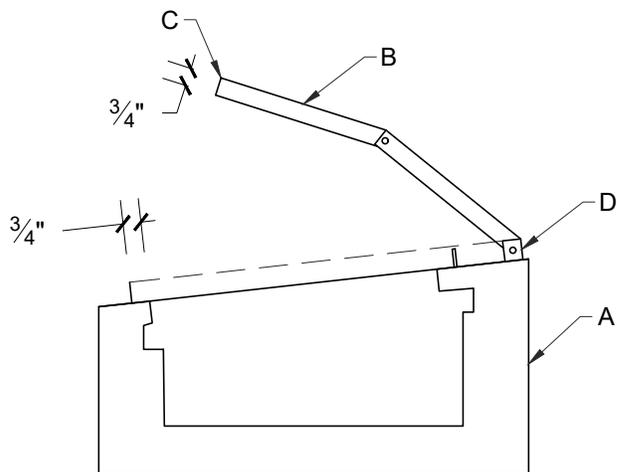
- A. RAISED RAIL PER DETAIL 6-6
- B. INSULATED LID TO BE 16 GA. S/S, 26" MAXIMUM. PROVIDE MULTIPLE LID SECTIONS FOR RAILS MORE THAN 26" LONG
- C. FULLY WELD, GRIND & POLISH CORNERS
- D. HANDLE WITH SMOOTH & ROUND EDGES TO BE COMPONENT HARDWARE GROUP P46-1012, CENTERED ON LID
- E. PROVIDE ANGLED BRACKETS FOR STORAGE
- F. PEGS TO SIT ON FRONT OF SHELF & BE FULLY WELDED TO LID. SPACED 12" APART O.C. MAX, WITH THREE MINIMUM PER SHELF



ELEVATION
1-1/2"=1'-0"

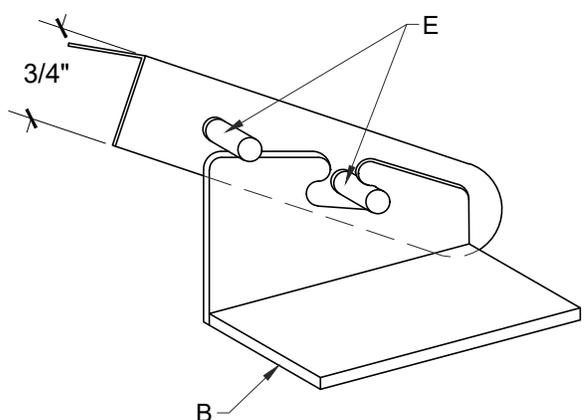


SIDE VIEW
1-1/2"=1'-0"

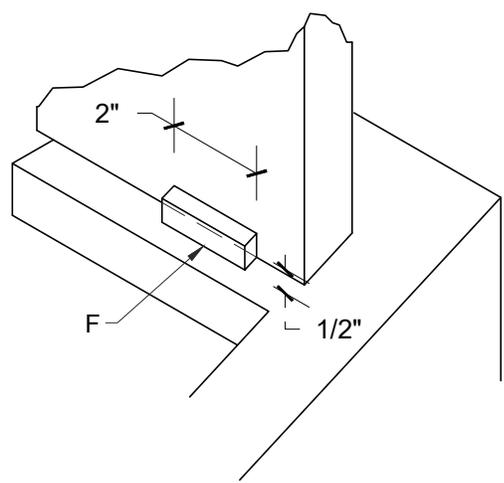


ELEVATION
1-1/2"=1'-0"

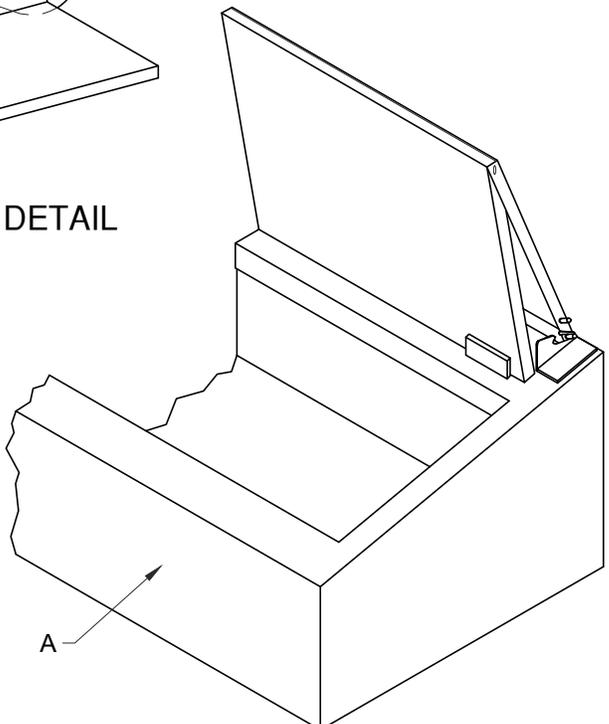
- A. RAISED RAIL PER DETAIL 6-6
- B. 16 GA. S/S
- C. FULLY WELD, GRIND & POLISH CORNERS
- D. LID REMOVABLE FOR CLEANING
- E. PIVOT PINS WITH SCREWS WELDED TO LID
- F. FULLY WELD BRACKET TO RAIL



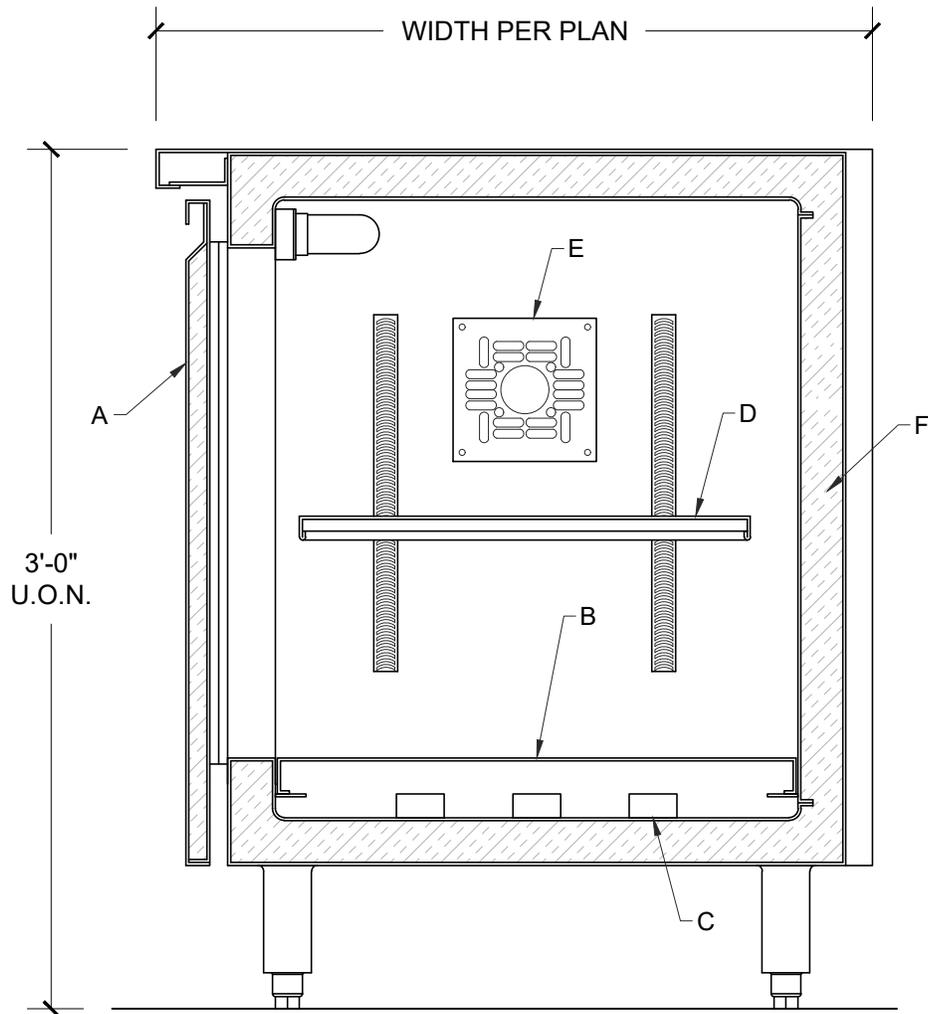
ISOMETRIC: PIVOT DETAIL
6"=1'-0"



ISOMETRIC: BRACKET
3/4"=1'-0"

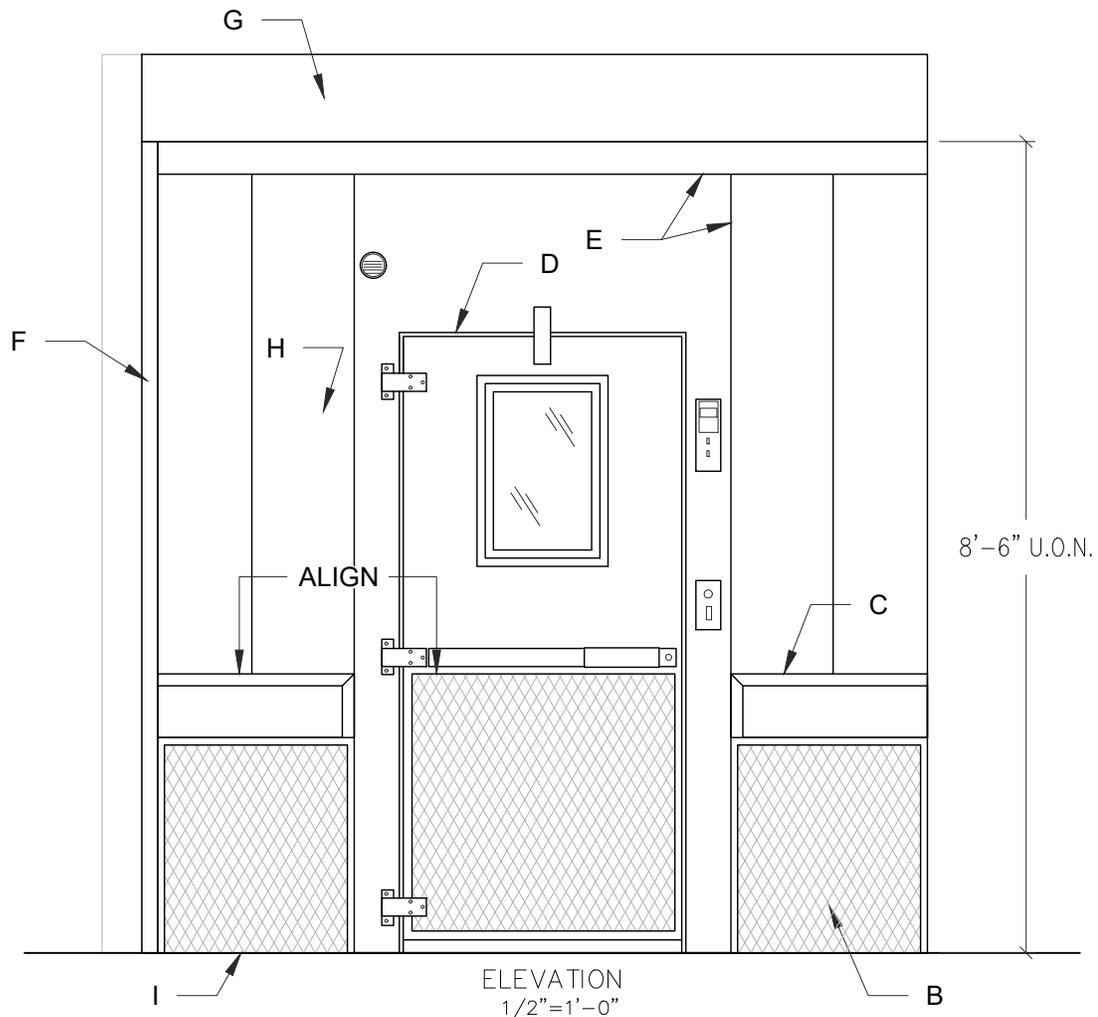


ISOMETRIC: CLOSED POSITION
1-1/2"=1'-0"

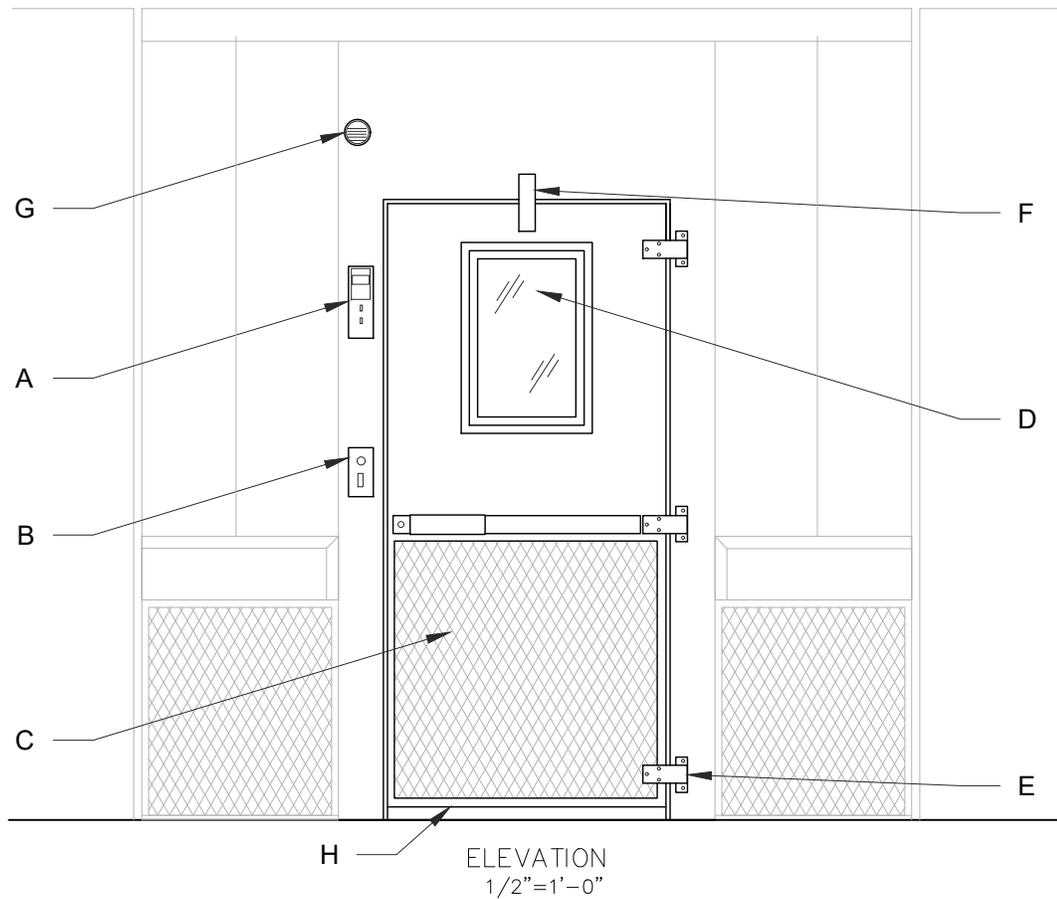


SECTION
1-1/2"=1'-0"

- A. COUNTER AND DOOR CONSTRUCTION PER DETAILS 5-3 & 6-1
- B. PERFORATED S/S BOTTOM SHELF
- C. HEATING ELEMENT
- D. PERFORATED ADJUSTABLE SHELF
- E. FAN FOR HEAT CIRCULATION
- F. 2" THICK URETHANE RIGID BOARD INSULATION, FOAM OR FOAMED IN PLACE

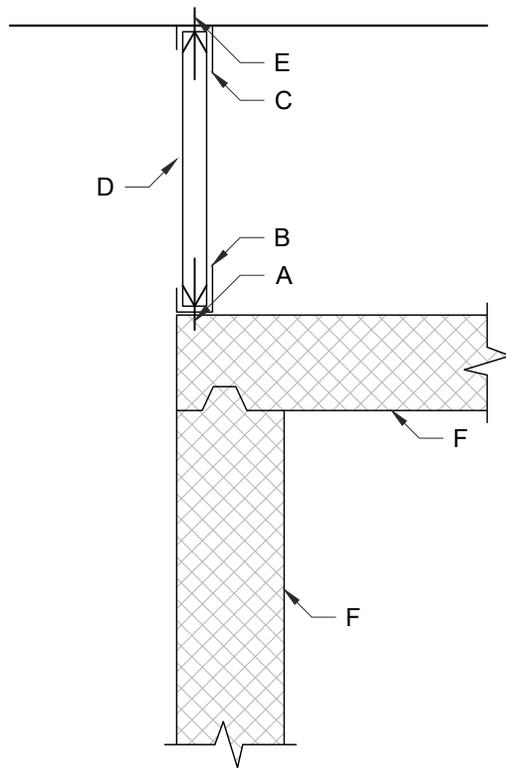


- A. PREFABRICATED MODULAR CONSTRUCTION, SIZE AND SHAPE PER PLAN. PROVIDE INSULATED RIGID PANELS WITH FOAMED-IN PLACE, URETHANE INSULATION FOR ALL PANELS. FLOOR TO UNIFORMLY WITHSTAND DISTRIBUTED STATIONARY LOADS OF 600 LBS / SF. FINISHES PER THE SPECIFICATIONS
- B. 1/8" DIAMOND PLATE ON EXTERIOR, SEALED WITH SILICONE; NO EXTERNAL FASTENERS
- C. BEVELED S/S BUMPER RAIL WITH SLOPED TOP & CAPPED ENDS ON EXPOSED EXTERIOR
- D. DOOR PER DETAIL 6-11
- E. PANEL CONNECTIONS TO FORM AIRTIGHT, VAPOR-PROOF JOINTS. ON INTERIOR OF WALK-IN, USE CAM-ACTION HOOK ARM ASSEMBLIES SET IN ONE PANEL AND A SELF-ALIGNING, SELF-CENTERING, PIN ASSEMBLY SET IN THE MATCHING PANEL. MINIMUM THREE PER VERTICAL JOINT. SEAL CAM LOCK ASSEMBLIES WITH VINYL SNAP-IN CLOSURES
- F. TRIM BETWEEN WALK-IN AND BUILDING WALLS WITH MATERIAL MATCHING THE WALK-IN'S EXTERIOR FINISH
- G. WHERE WALK-IN IS SHORTER THAN THE FINISHED CEILING, PROVIDE ENCLOSURE PANEL(S) PER DETAIL 6-12
- H. AFFIX NSF APPROVED SEAL TO THE SERIAL PLATE OF THE WALK-IN
- I. ARCHITECTURAL FLOORING TO COVE UP EXTERIOR PANELS



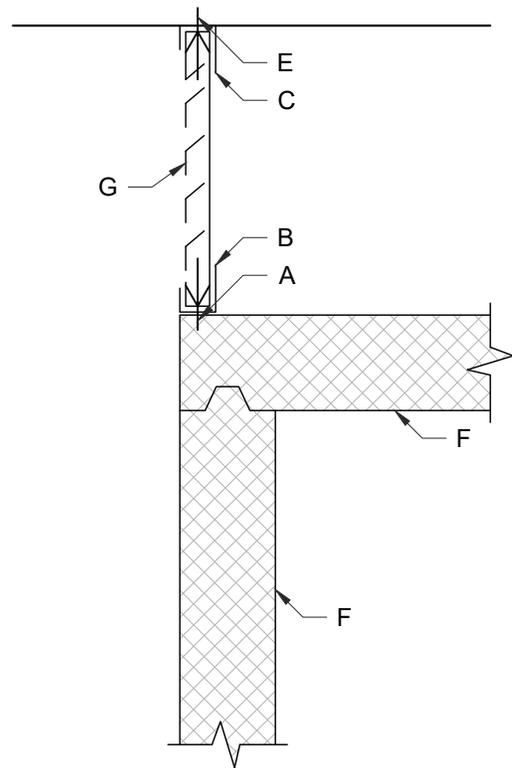
- A. TEMPERATURE ALARM DIGITAL READOUT (MULTIPLE IF INTERIOR BOX SPECIFIED). PROVIDE MODULARM MODEL 75 OR EQUAL. MOUNT REMOTE TEMPERATURE SENSOR TO THE REAR OF THE BOX
- B. LIGHT SWITCH
- C. 1/8" DIAMOND PLATE ON INTERIOR & EXTERIOR OF DOOR MOUNTED WITH ADHESIVE & SEALED WITH SILICONE; NO EXTERNAL FASTENERS
- D. 12"X22" HEATED VISION PANEL
- E. THREE DOOR HINGES
- F. AUTOMATIC DOOR CLOSURE
- G. PRESSURE PORT (FREEZERS ONLY)
- H. ADJUSTABLE WIPER GASKET MOUNTED ALONG THE BOTTOM EDGE OF THE DOOR

FINISHED CEILING



SECTION: ENCLOSURE
PANEL
1-1/2"=1'-0"

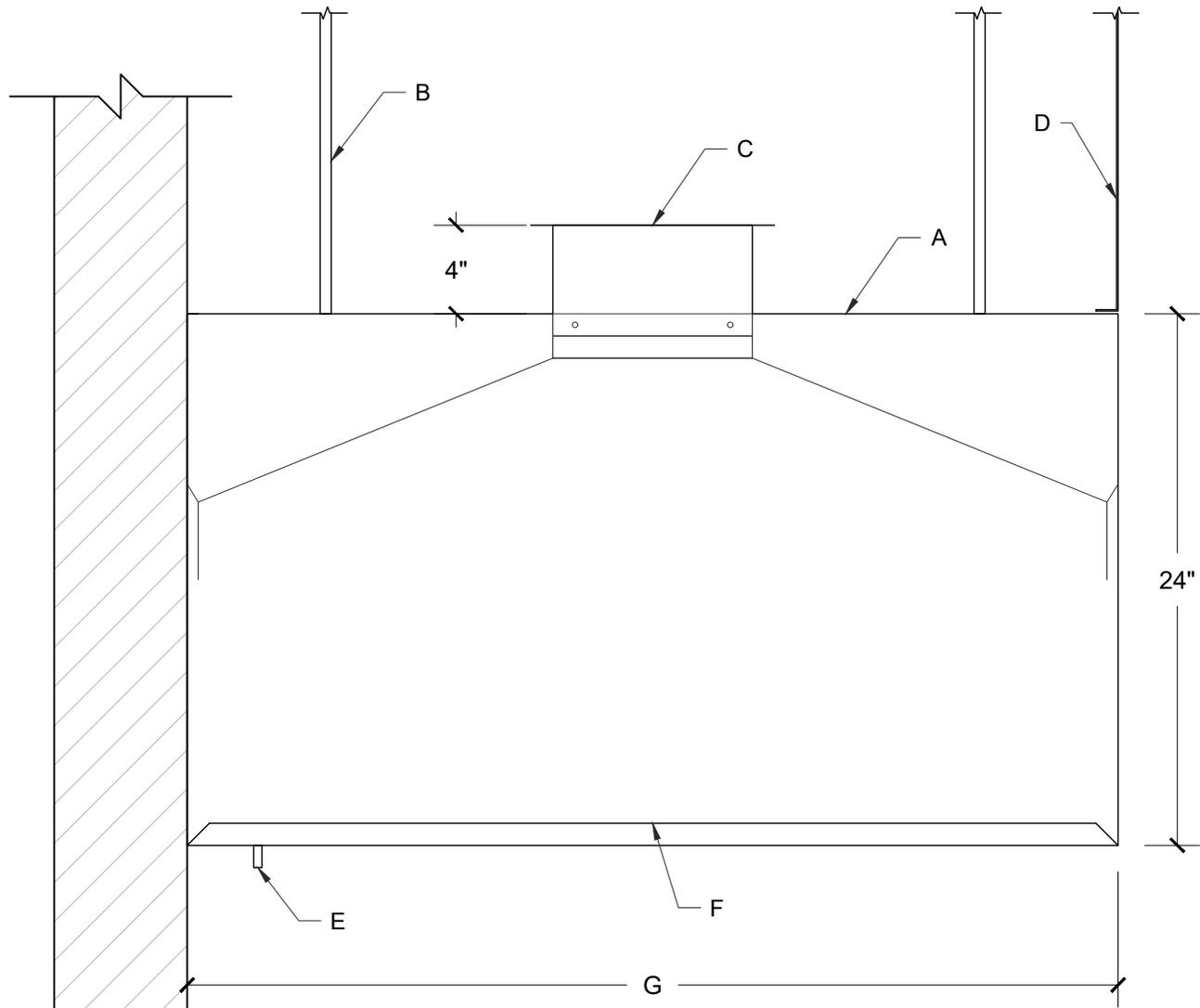
FINISHED CEILING



SECTION: LOUVERED ENCLOSURE
PANEL
1-1/2"=1'-0"

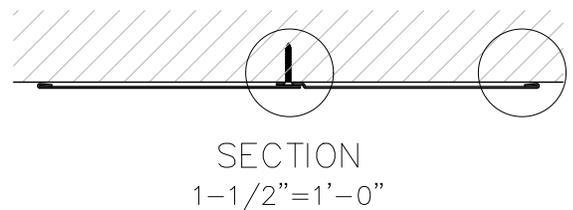
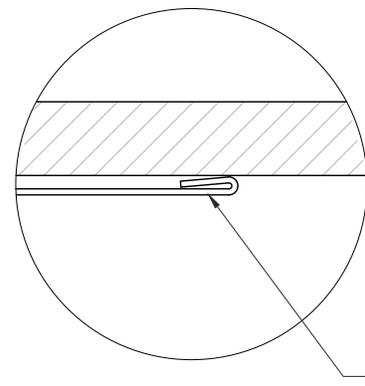
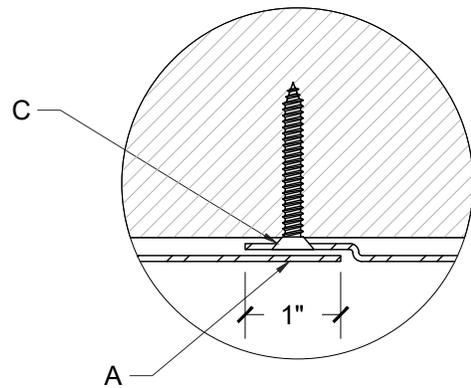
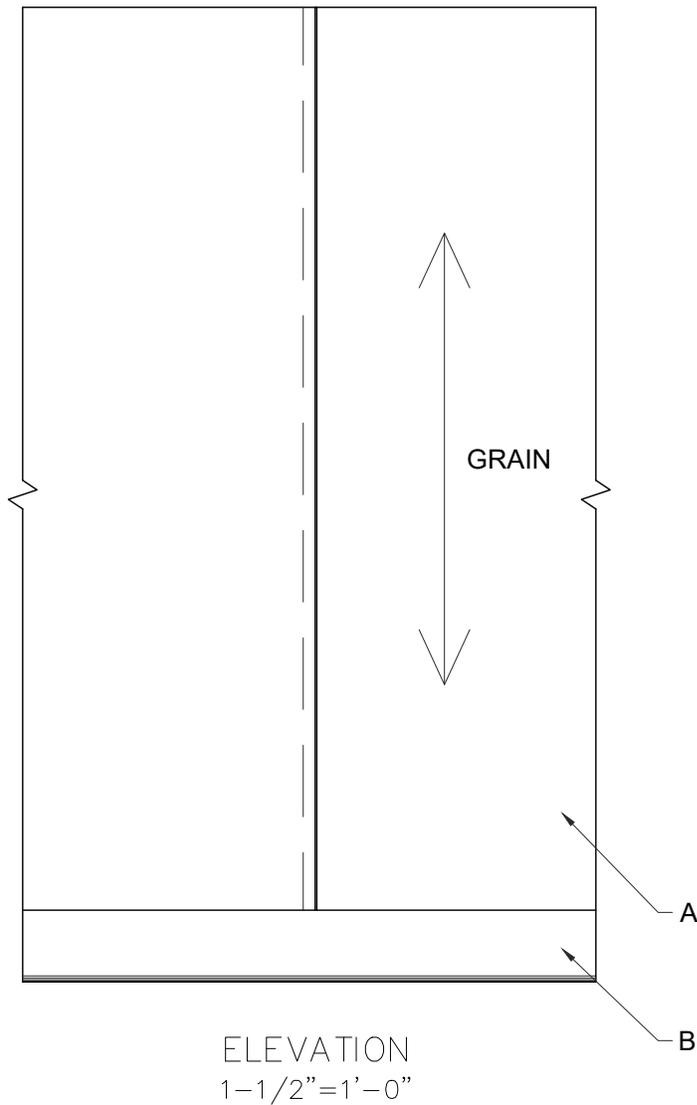
NOTE: MATERIAL TO MATCH THE EXTERIOR WALK-IN FINISH

- A. ANCHOR TO ROOF PANEL
- B. BOTTOM CHANNEL
- C. TOP CHANNEL
- D. REMOVABLE CLOSURE PANEL, HEIGHT VARIES PER FIELD CONDITIONS
- E. ANCHOR TO FINISHED CEILING
- F. WALK-IN PANEL
- G. WHERE COMPRESSOR REQUIRES VENTILATION, PROVIDE LOUVERS IN ENCLOSURE PANEL

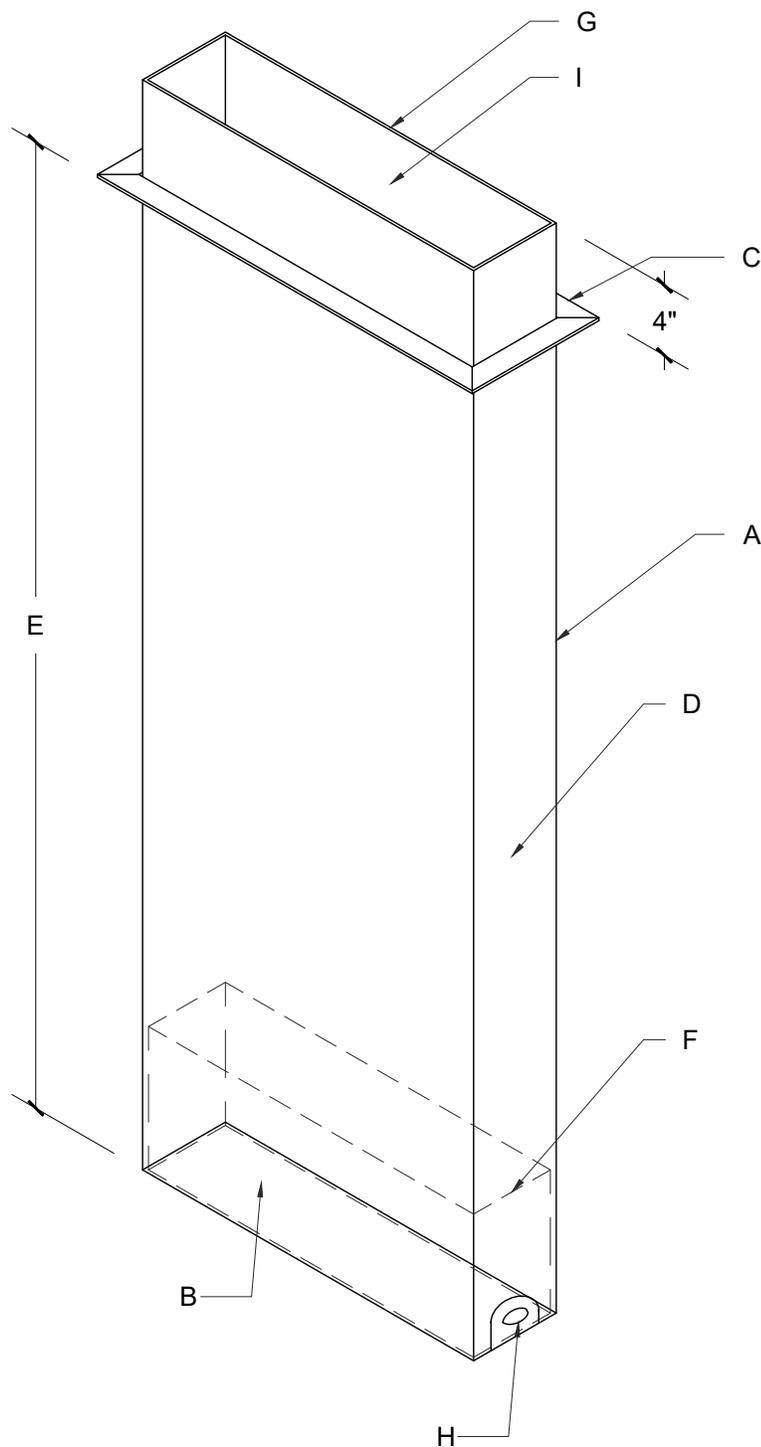


SECTION
1-1/2" = 1'-0"

- A. CONSTRUCTED ENTIRELY OF 18 GA. TYPE 304 S/S
- B. 1/2" S/S ROD HANGER TO STRUCTURE ABOVE BY KEC
- C. DUCT COLLAR FULLY WELDED TO DUCTWORK BY GC
- D. CEILING ENCLOSURE PANEL BY HOOD MANUFACTURER, INSTALLED BY KEC
- E. 3/8" DRAIN TUBE AT REAR
- F. PERIMETER GUTTER
- G. WHERE LOCATED OVER DISHWASHER, COORDINATE SIZE AND LOCATION WITH DISHWASHER MODEL

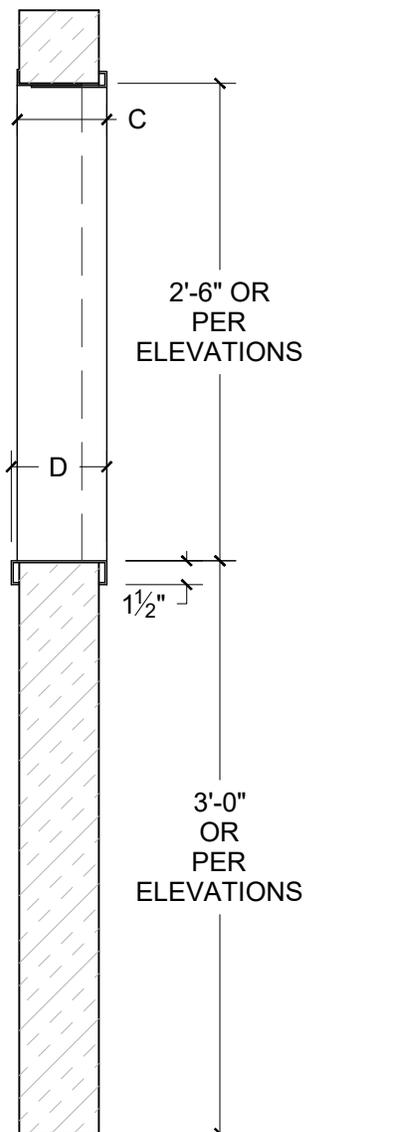


- A. 20 GA. TYPE 304 S/S SECURED TO WALL WITH SCREWS & ADHESIVE. HIDE ALL SCREW HEADS WITH OVERLAPPING PANEL
- B. FLOOR'S COVED BASE; 6" MINIMUM
- C. LAP JOINT
- D. HEM EDGE AT FINISHED ENDS

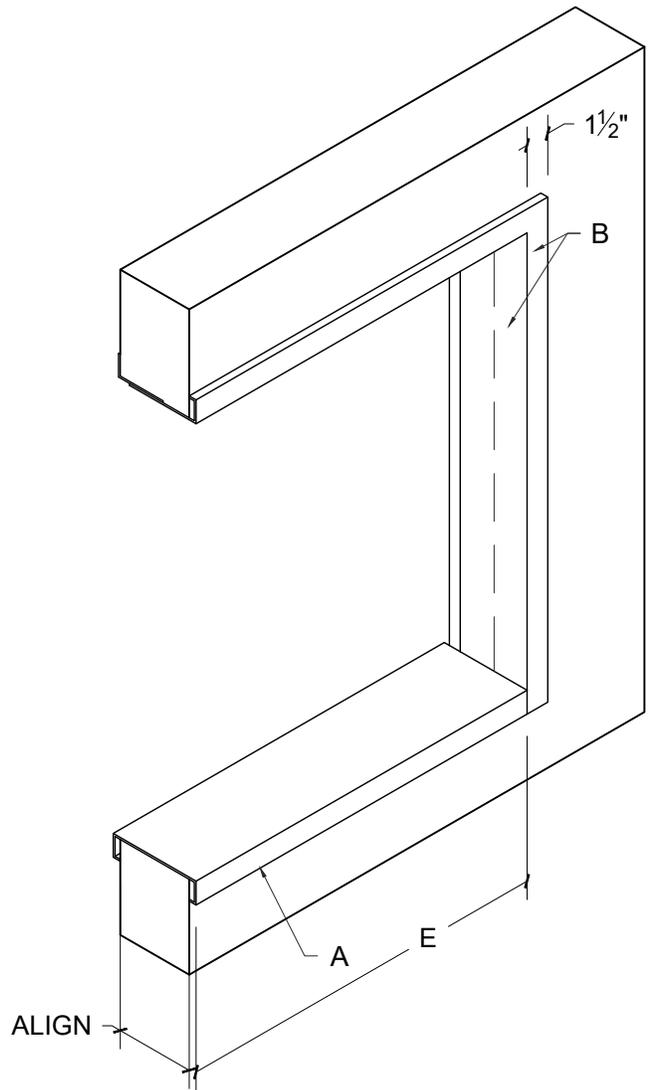


- A. 18 GA TYPE 304 S/S
- B. VAPOR TIGHT CONSTRUCTION TO FIT OVER THE DISHWASHER VENT COLLAR
- C. 1" X 2" 16 GA. S/S ANGLE COLLAR SECURED TO VENT STACK W/ S/S SCREWS. FLANGE SECURED TO CEILING IN THE FIELD
- D. DISHWASHER VENT STACK W/ MANUAL DAMPER
- E. FIELD VERIFY HEIGHT FROM DISHWASHER TO FINISHED CEILING
- F. DISHWASHER'S VENT COLLAR W/ INTEGRAL DAMPER
- G. FULLY WELDED TO DUCT BY OTHERS
- H. CUTOUT FOR ACCESS TO DAMPER CONTROLS
- I. THE TOTAL CFM CAPACITY OF THE RISER STACK TO BE 110% OF THE MANUFACTURER'S RECOMMENDATIONS

ISOMETRIC
N.T.S.

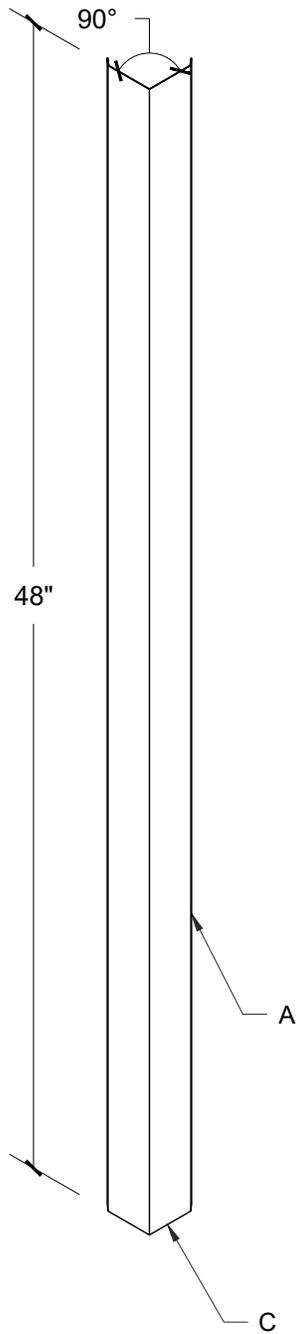


SECTION
1"=1'-0"

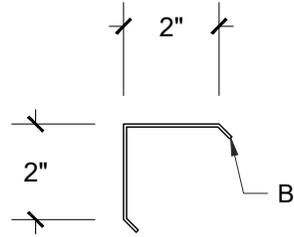


ISOMETRIC
1"=1'-0"

- A. 16 GA. TYPE 304 S/S SHELF
- B. 18 GA. TYPE 304 S/S FRAMING & FLANGE
- C. FIELD VERIFY WALL DIMENSION
- D. SHELF DEPTH PER PLAN
- E. WIDTH PER PLAN

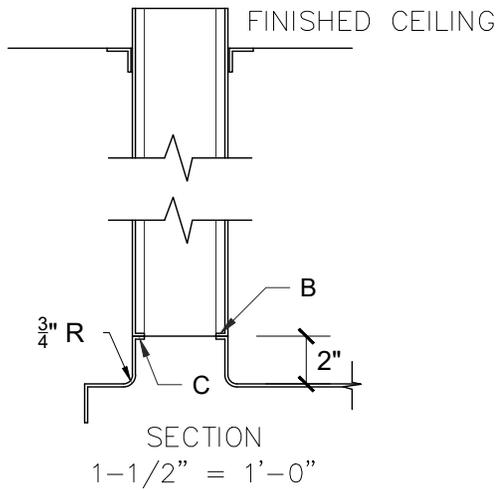


ISOMETRIC
 1-1/2" = 1'-0"

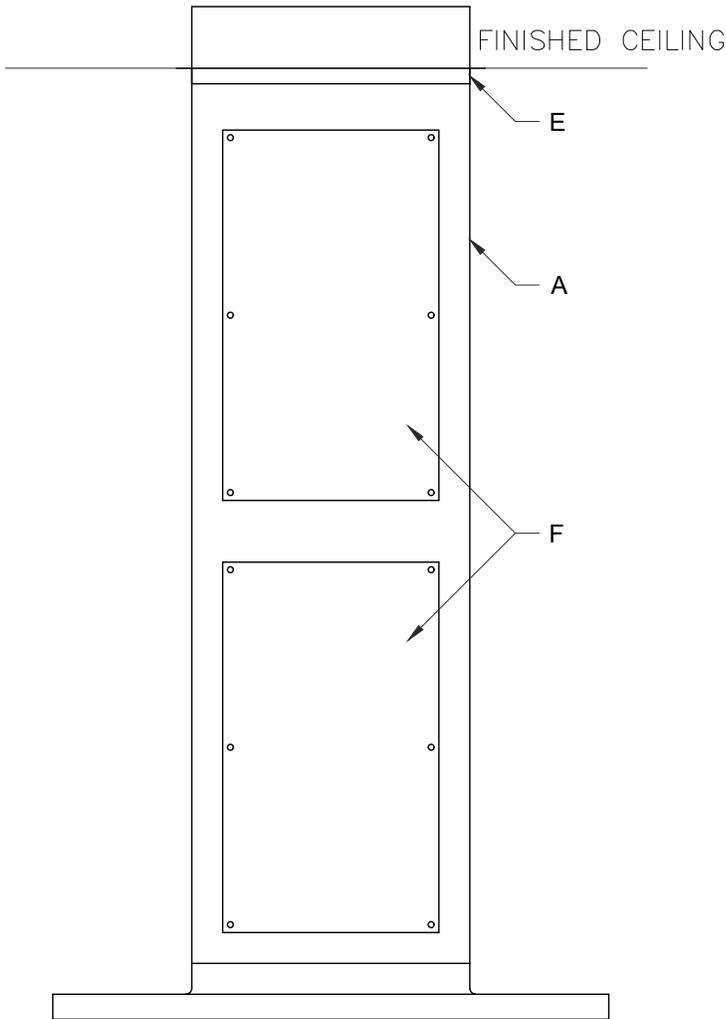


PLAN
 3" = 1'-0"

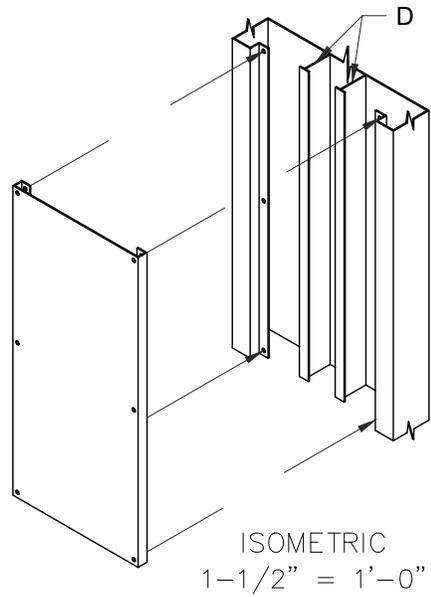
- A. 18 GAUGE TYPE 304 S/S
- B. ANGLED ENDS
- C. BOTTOM OF CORNER GUARD TO ALIGN WITH TOP OF COVED FLOOR BASE
- D. SEALED TO WALL WITH NO VISIBLE FASTENERS



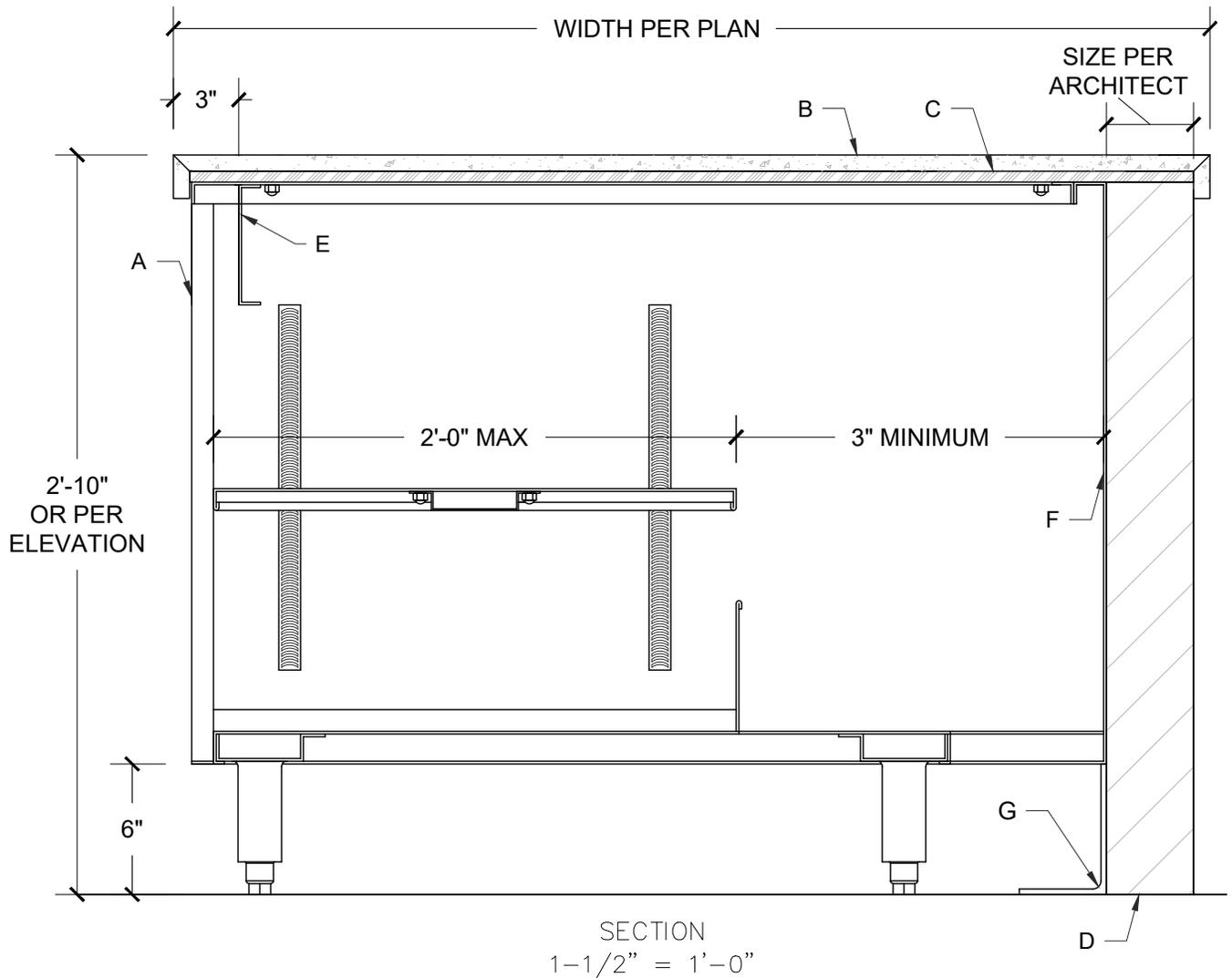
LENGTH
PER PLAN



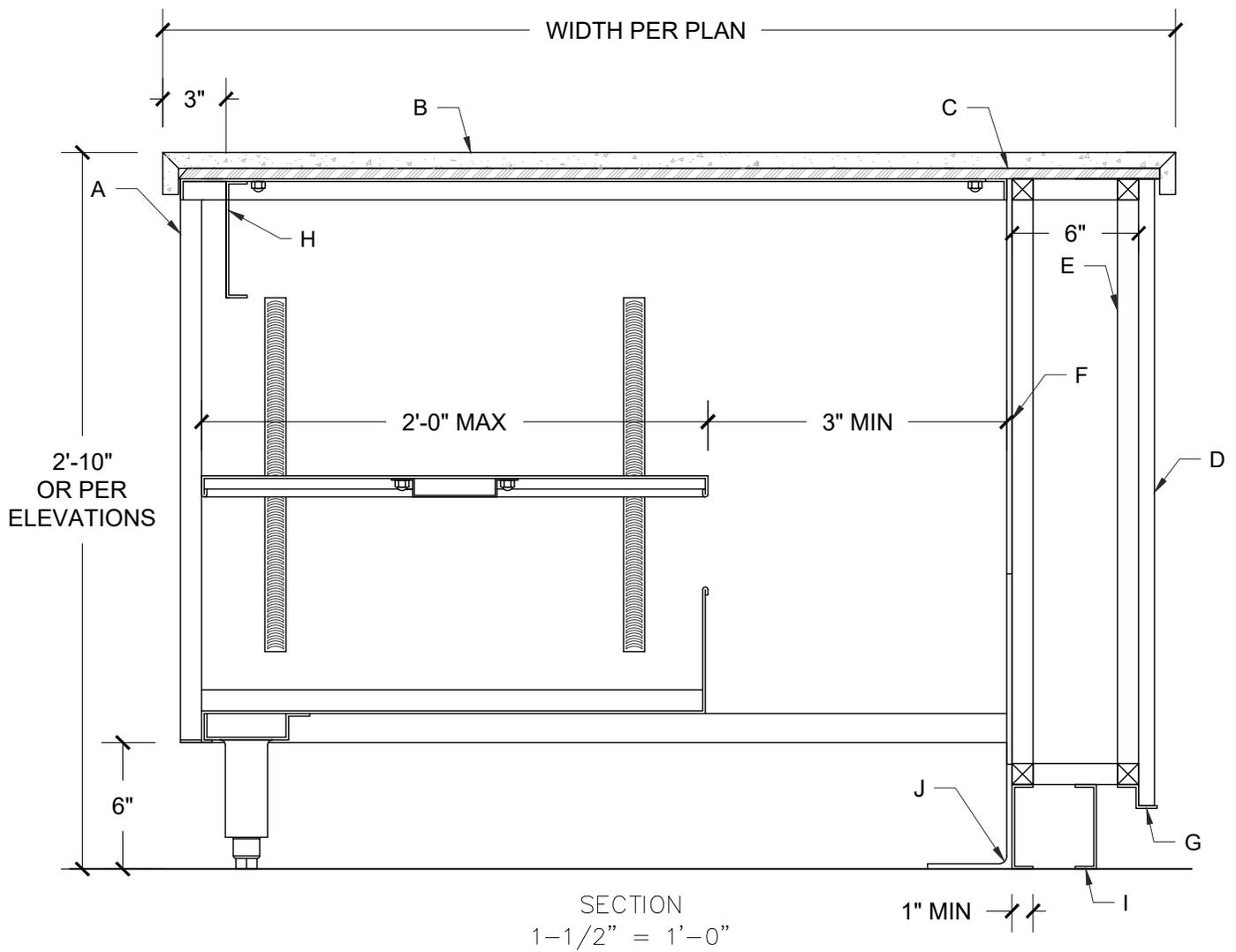
SIDE ELEVATION
1-1/2" = 1'-0"



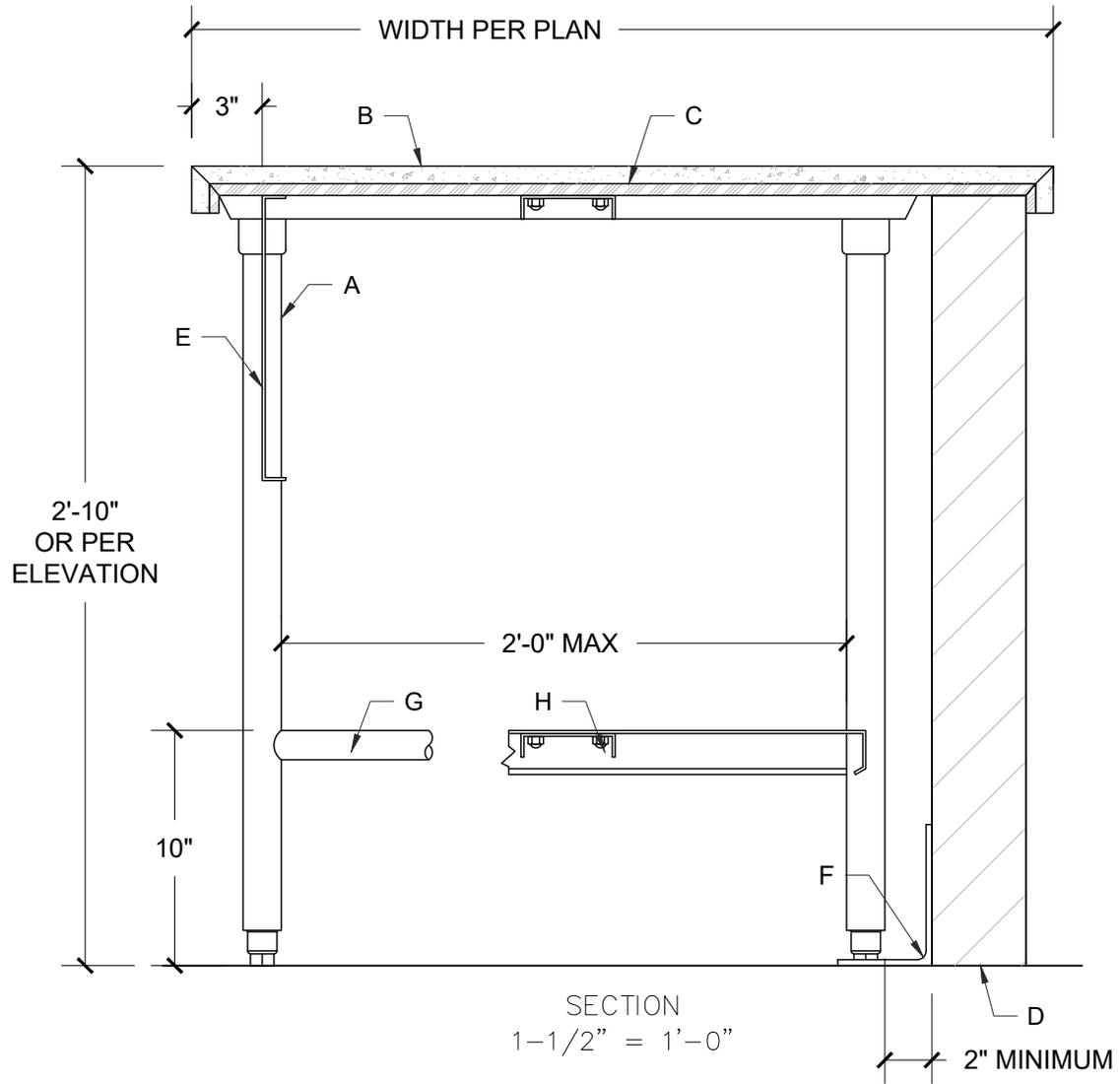
- A. 16 GA. S/S
- B. SECURE & SEAL CHASE TO SPLASH OR 2" COVERED TURN-UP ON FIXTURE TOP
- C. FLANGE BACK, WELD CORNERS & SEAL AND SECURE TO UTILITY CHASE
- D. PROVIDE DIVIDERS TO SEPARATE ELECTRICAL WIRING FROM PLUMBING/REFRIGERATION LINES IN CHASES CONTAINING MULTIPLE SERVICES
- E. 1" S/S ANGLE COLLAR AT PERIMETER
- F. PAN SHAPED, S/S REMOVABLE ACCESS PANEL. ACCESS PANEL NOT TO EXCEED 1'-6" X 4'-0" LONG.



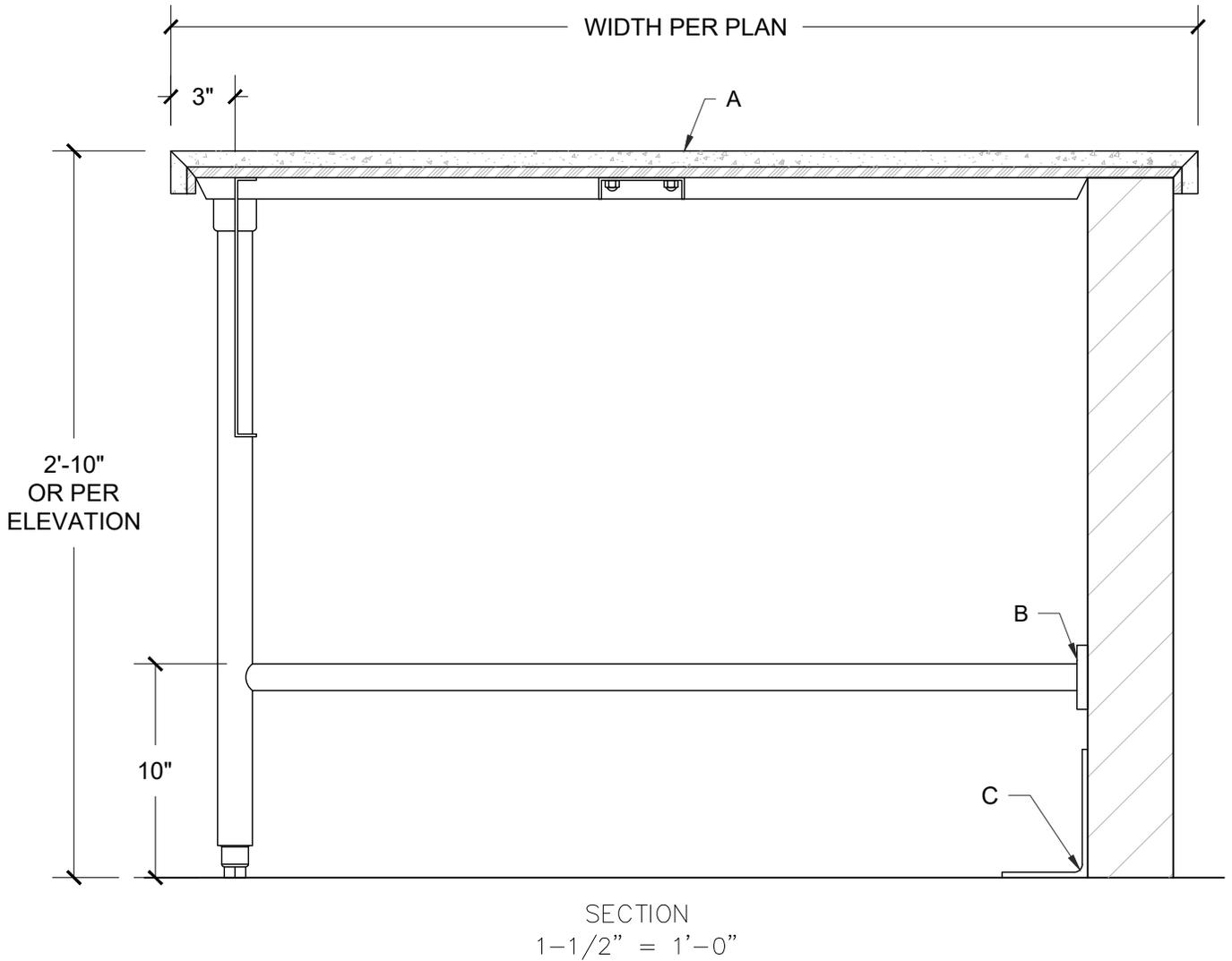
- A. S/S COUNTER BASE PER DETAIL 5-1.
- B. SOLID SURFACE TOP PER ARCHITECTURAL DRAWINGS
- C. 3/4" MARINE GRADE PLYWOOD SUBSTRATE
- D. DIE WALL FOR UTILITIES BY OTHERS. FRONT FINISH BY OTHERS
- E. WHERE APRON SPECIFIED FOR CONTROLS, RECESS 3" BACK
- F. S/S BACK WITH REMOVABLE ACCESS PANELS
- G. COVERED FLOOR TO CONTINUE UP REAR AND SIDES OF COUNTER



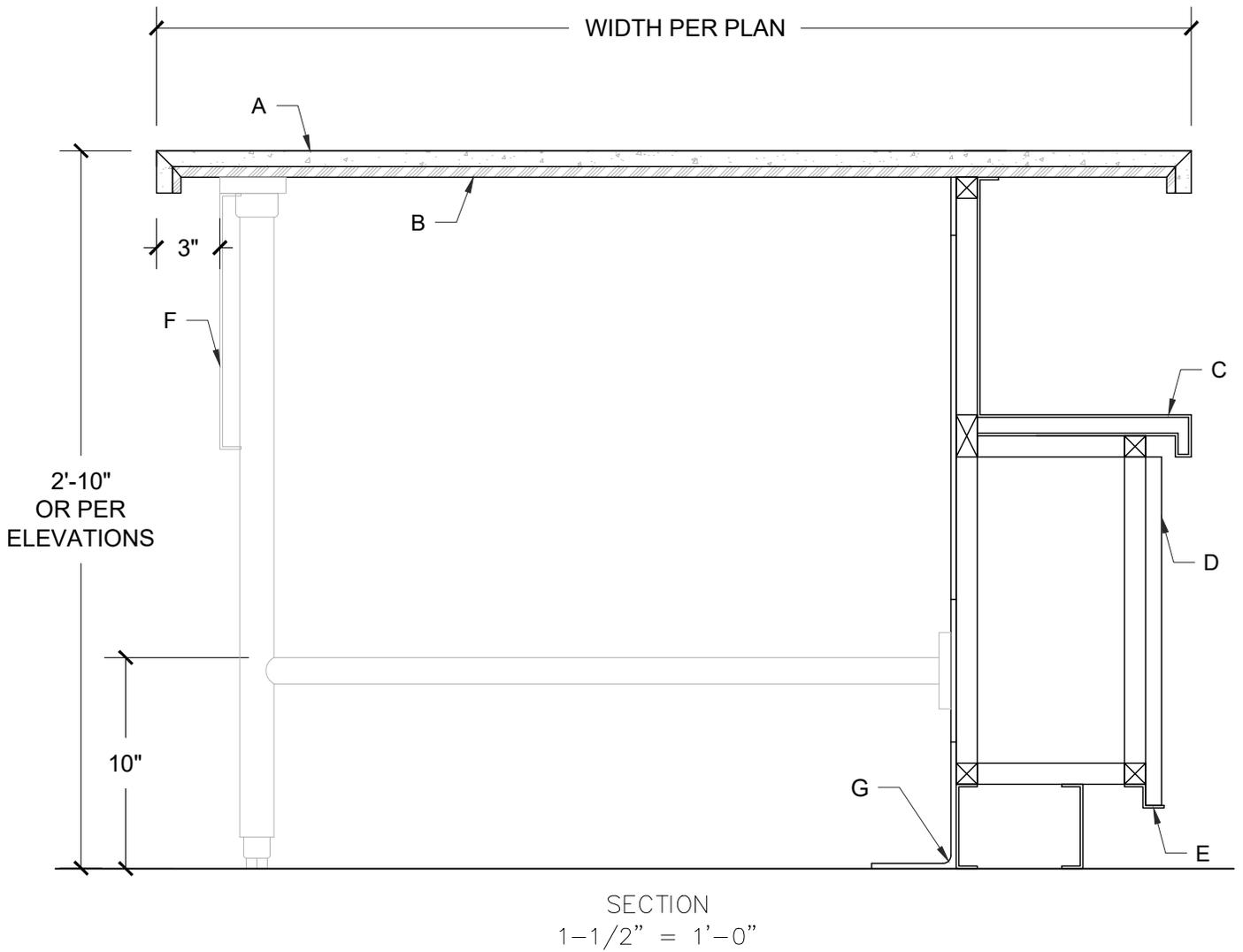
- A. S/S COUNTER BASE PER DETAIL 5-1
- B. SOLID SURFACE TOP PER ARCHITECTURAL DRAWINGS
- C. 3/4" MARINE GRADE PLYWOOD SUBSTRATE
- D. MILLWORK FINISHES AND DETAILS PER ARCHITECTURAL DRAWINGS
- E. 1" X 1" SQUARE TUBING FRAME
- F. S/S BACK WITH REMOVABLE ACCESS PANELS
- G. S/S MOP GUARD
- H. WHERE APRON SPECIFIED FOR CONTROLS, RECESS BACK 3"
- I. 14 GA S/S CHANNEL BASE
- J. COVED FLOOR TO CONTINUE UP REAR AND SIDES OF COUNTER



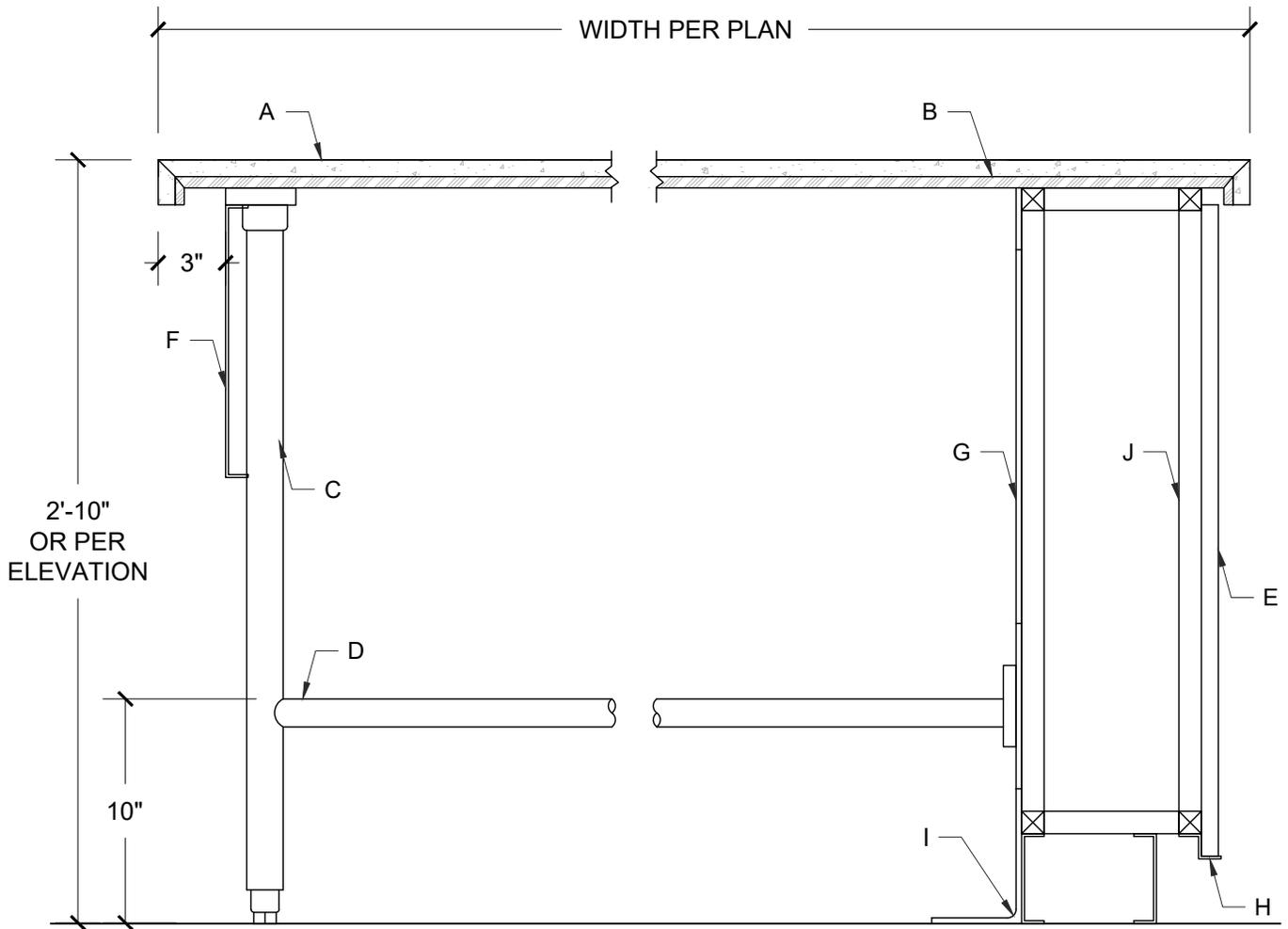
- A. S/S TABLE BASE PER DETAIL 1-3
- B. SOLID SURFACE TOP PER ARCHITECTURAL DRAWINGS
- C. 3/4" MARINE GRADE PLYWOOD SUBSTRATE
- D. DIE WALL & FRONT FINISH BY OTHERS
- E. 18 GA. S/S APRON
- F. COVERED FLOOR TO CONTINUE UP REAR AND SIDES OF COUNTER



- A. WORKTABLE, TOP, AND DIE WALL DETAIL PER DETAIL 8-3
- B. EXTEND CROSSBRACING TO DIE WALL AND ATTACH WITH A STEEL PLATE
- C. COVERED FLOOR TO CONTINUE UP REAR AND SIDES OF COUNTER

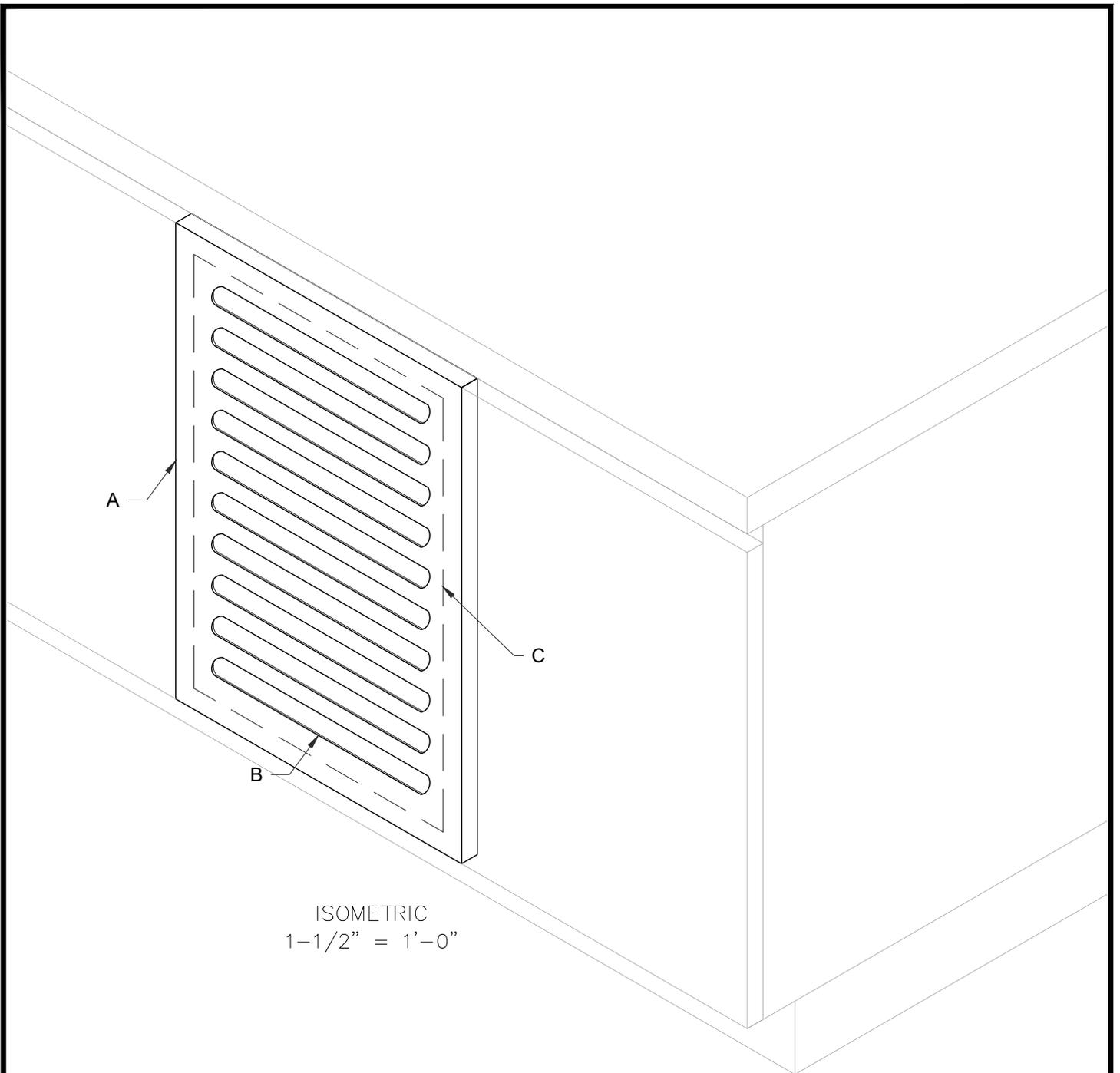


- A. VERIFY SOLID SURFACE TOP DETAILS WITH ARCHITECTURAL DRAWINGS
- B. 3/4" MARINE GRADE PLYWOOD SUBSTRATE
- C. RECESSED PLATE SHELF
- D. MILLWORK CLADDING
- E. MOP GUARD
- F. BASE AS SPECIFIED
- G. COVERED FLOOR TO CONTINUE UP REAR AND SIDES OF COUNTER



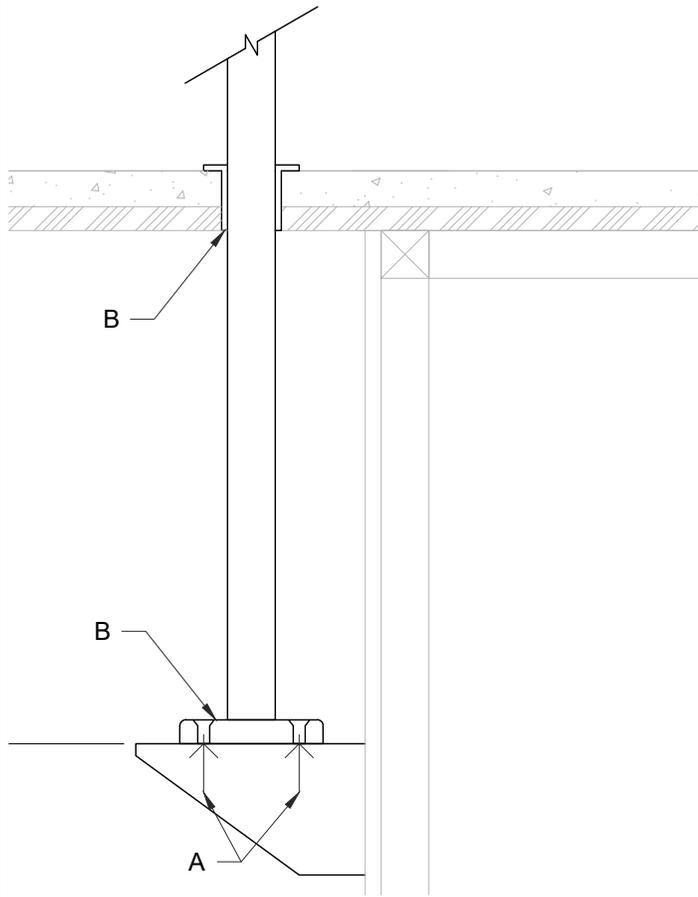
SECTION
1-1/2" = 1'-0"

- A. VERIFY SOLID SURFACE TOP DETAILS WITH ARCHITECTURAL DRAWINGS
- B. 3/4" MARINE GRADE PLYWOOD SUBSTRATE
- C. 1-5/8" O.D. 16 GA. S/S LEGS WITH ADJUSTABLE BULLET FEET FULLY WELDED TO CHANNELS
- D. 16 GA. 1-1/4" O.D. S/S CROSSRAIL FULLY WELDED, GROUND & POLISHED AT JUNCTURES
- E. MILLWORK CLADDING
- F. 18 GA. S/S APRON
- G. ACCESS PANELS
- H. MOP GUARD
- I. COVED FLOOR TO CONTINUE UP REAR AND SIDES OF COUNTER
- J. 1" X 1" SQUARE TUBING FRAME

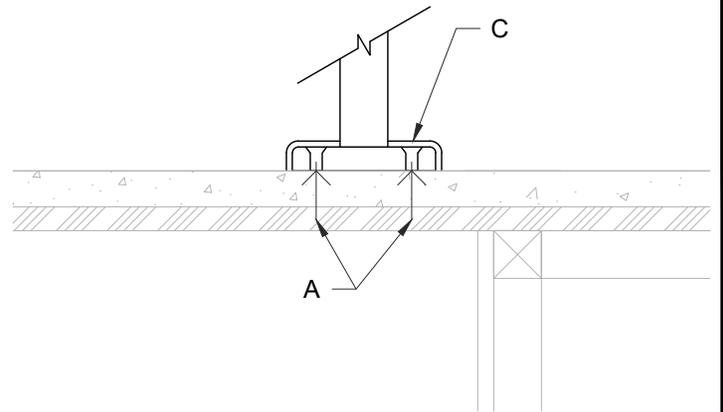


ISOMETRIC
1-1/2" = 1'-0"

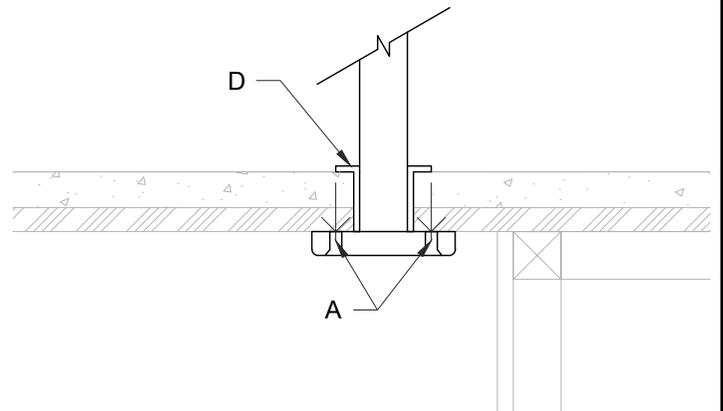
- A. DOOR FINISH, HINGING HARDWARE, HANDLE/PULL, AND LOUVER STYLE PER ARCHITECTURAL DETAILS
- B. WHERE LOUVERS ARE SPECIFIED, PROVIDE A MINIMUM 50% FREE AIR, LOCATED PER EQUIPMENT REQUIREMENTS
- C. BLACK SCREEN ON INSIDE OF DOOR TO CONCEAL EQUIPMENT



(A) DETAIL: THROUGH-COUNTER MOUNT
3" = 1'-0"

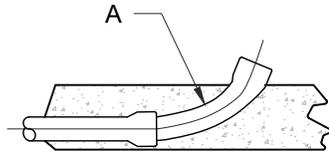


(B) DETAIL: COUNTERTOP MOUNT
3" = 1'-0"

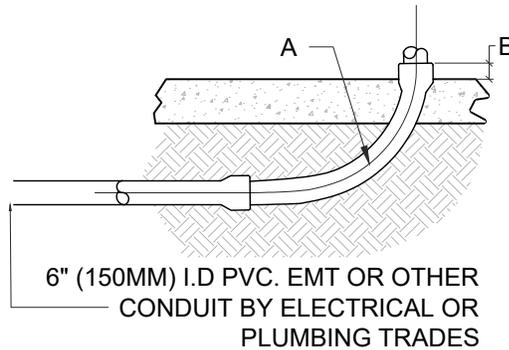


(C) DETAIL: BELOW COUNTER MOUNT
3" = 1'-0"

- A. SECURE TO COUNTERTOP / SUPPORT
- B. EXTEND FOOD GUARD POST TO COUNTER SUPPORT
- C. FLANGE COVER TO CONCEAL SCREW HOLES
- D. PLASTIC GROMMET (OR SIMILAR)



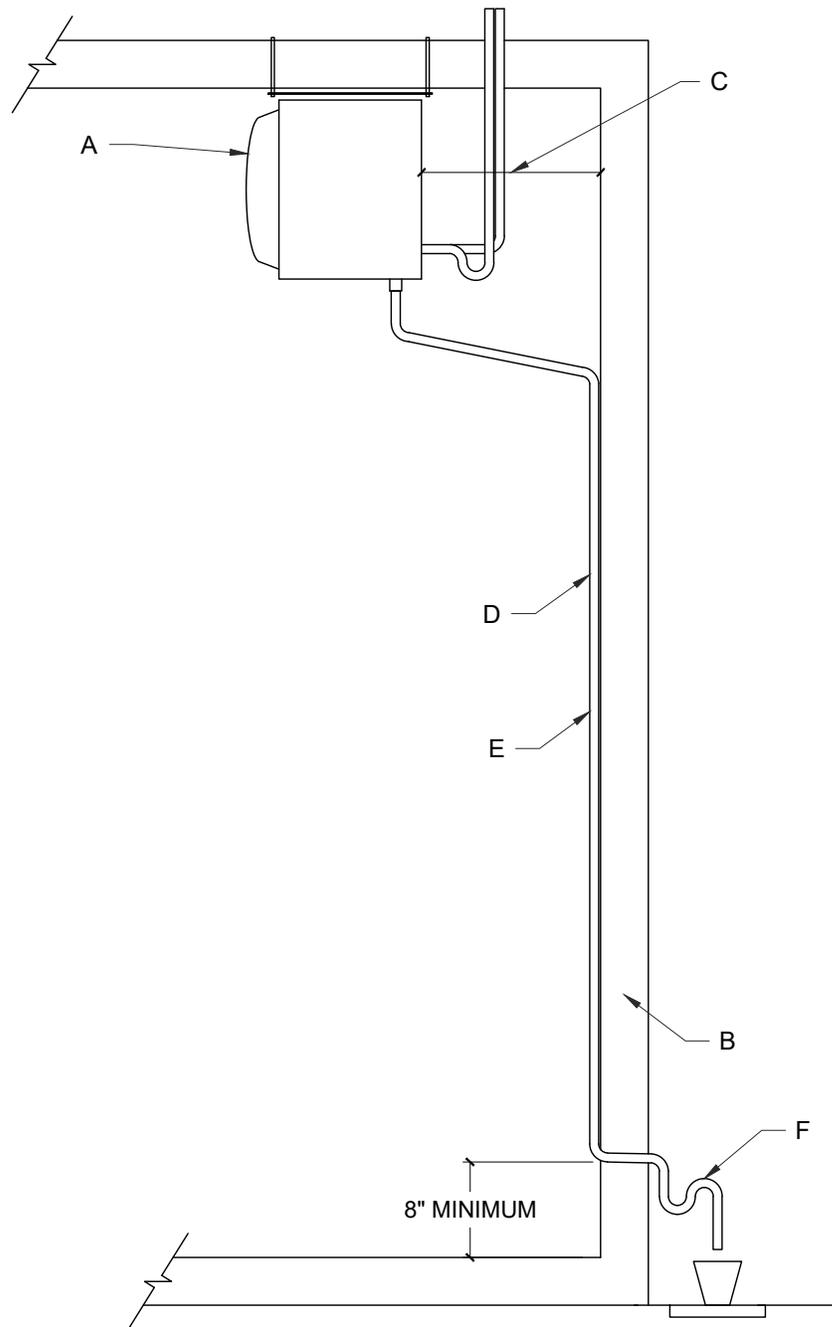
SECTION
CONDUIT IN SLAB
1/4"=1'-0"



SECTION
CONDUIT OUTSIDE OF SLAB
1/4"=1'-0"

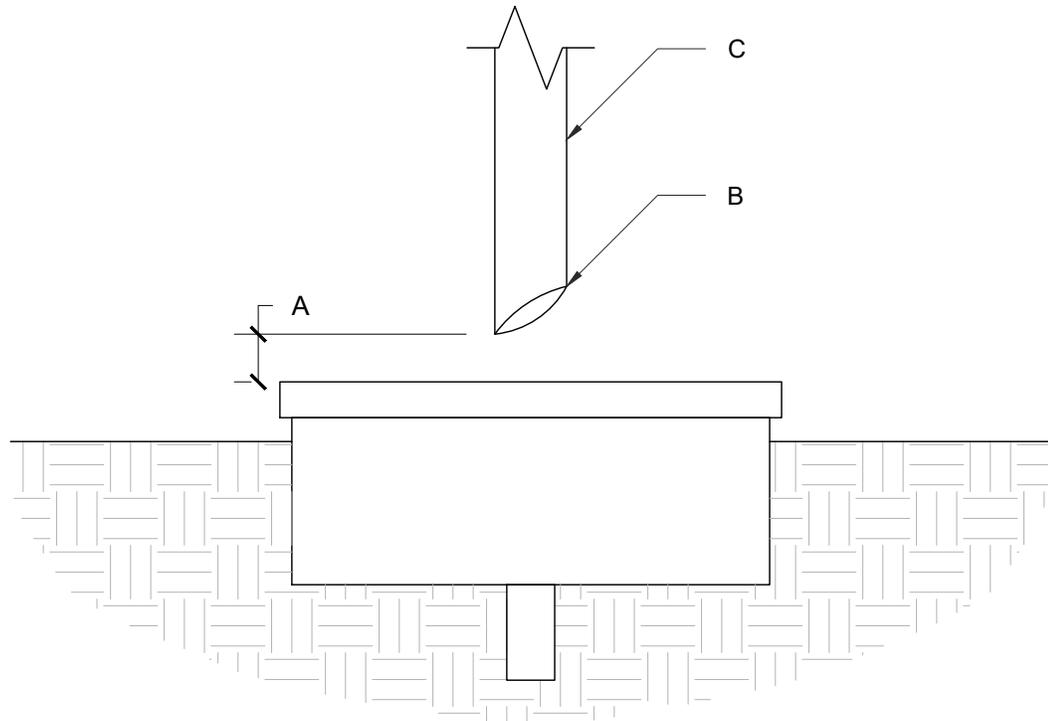
"A" (MIN. INSIDE DIA.)	MAXIMUM TRUNK HOUSING LINE QTY.
6.0"	9 LINES OR LESS
8.0"	10-12 LINES
10.0"	16, 20 & 24 LINES

- A. 24" RADIUS (18" MINIMUM) LONG SWEEP ELBOWS WITHOUT TEES OR BENDS
MAXIMUM ONE SWEEP AT EACH END OF CHASE
- B. 4" MINIMUM, 6" MAXIMUM STUB-UP ABOVE FINISH FLOOR
- C. CONDUIT TO BE WATER TIGHT AND CONSTRUCTED FROM CODE COMPLIANT MATERIALS
- D. CAP AND SEAL CONDUIT AT BOTH ENDS DURING CONSTRUCTION. AFTER PRODUCT LINES ARE INSTALLED,
CAP AND SEAL ENDS OF CONDUIT TO BE WATER-TIGHT



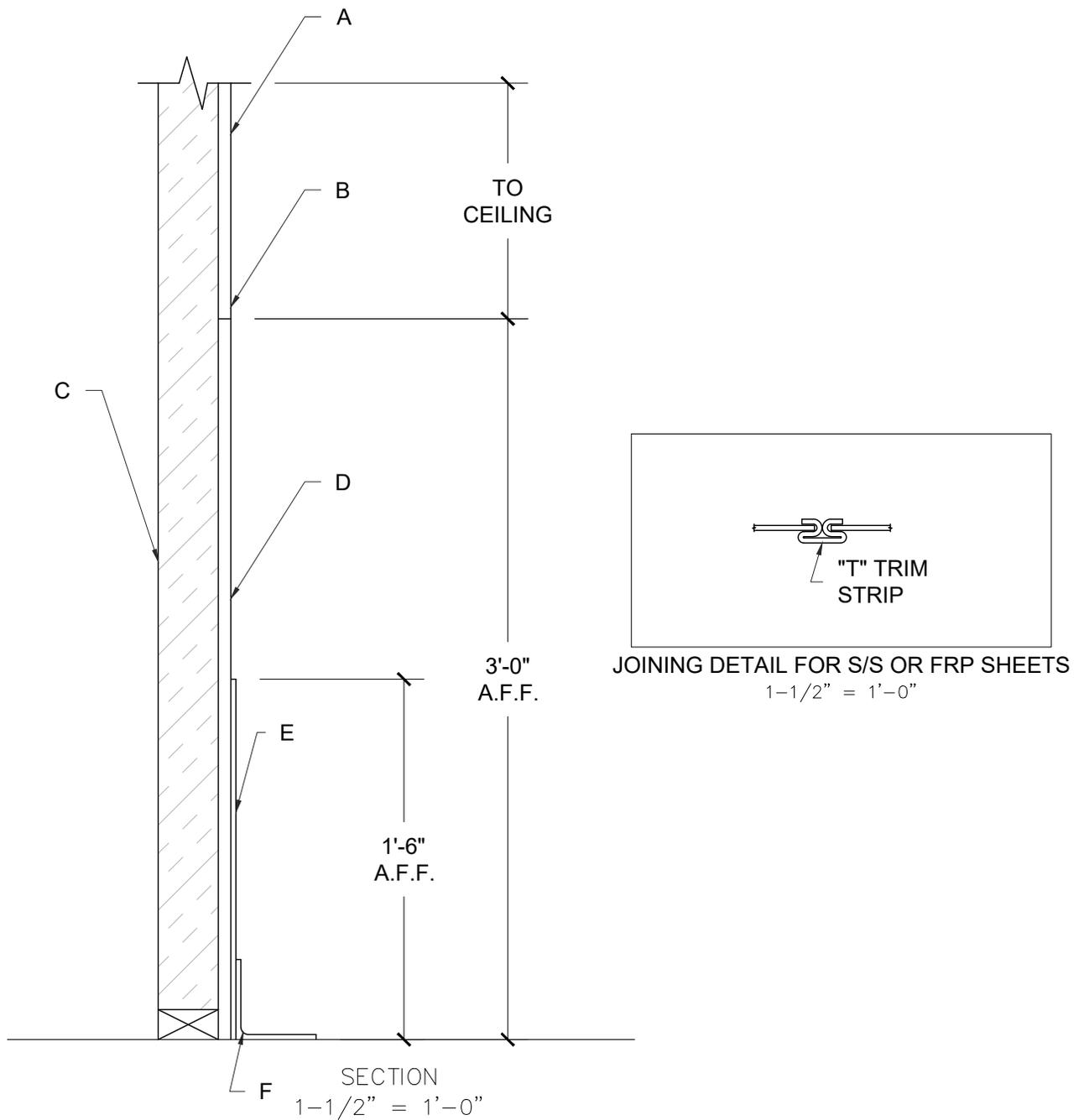
DETAIL
 $3/4" = 1'-0"$

- A. EVAPORATOR AS SPECIFIED
- B. INSULATED WALK-IN PANEL
- C. MINIMUM CLEARANCE BEHIND EVAPORATOR TO BE 15" OR PER THE MANUFACTURER'S REQUIREMENTS
- D. PROVIDE HEAT TRACE FOR LOW-TEMPERATURE EVAPORATORS FOR FREEZERS
- E. COPPER DRAIN LINE SIZED PER MANUFACTURER GUIDELINES
- F. INVERTED TRAP TERMINATED 1" ABOVE FLOOR SINK OR FUNNEL FLOOR DRAIN

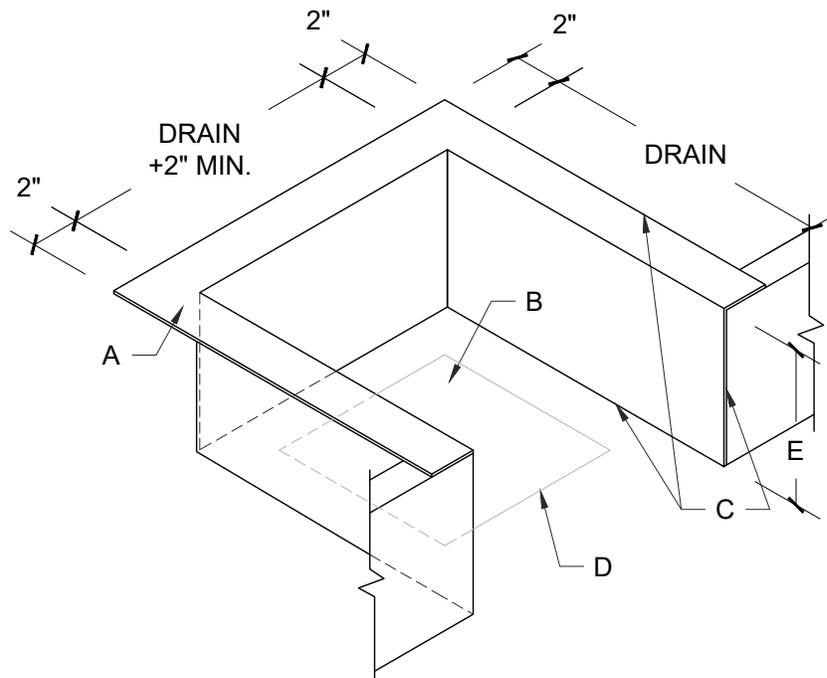


DETAIL
3" = 1'-0"

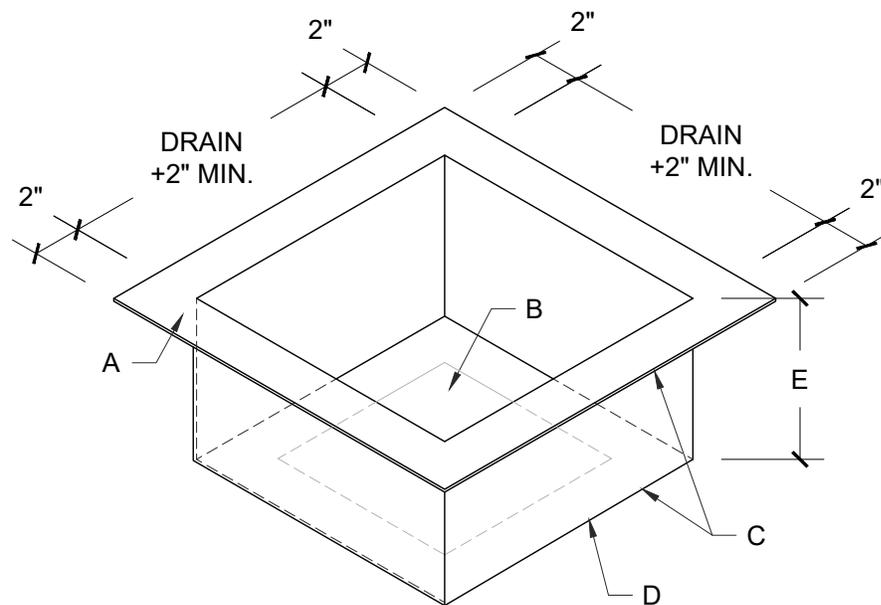
- A. SPACE BETWEEN TOP OF FLOOR SINK OR FUNNEL FLOOR DRAIN AND BOTTOM OF DRAIN TO BE $\frac{1}{2}$ OF THE DRAIN DIAMETER MINIMUM (1" TYPICAL)
- B. CUT DRAIN ON 45 DEGREE ANGLE
- C. CHROME PAINTED PIPES



- A. FINISH GREENBOARD/ DUROCK/ FLASHING WITH QUARRY TILE AND EPOXY GROUT OR 18 GA. S/S PANELS WITH "T" TRIM STRIPS OR FRP WITH "T" TRIM STRIPS
- B. 5/8" THICK GREENBOARD
- C. 3" THICK RIGID INSULATION IN STUD WALL
- D. 5/8" THICK DUROCK
- E. FLASHING
- F. SANITARY COVERED MOLDING

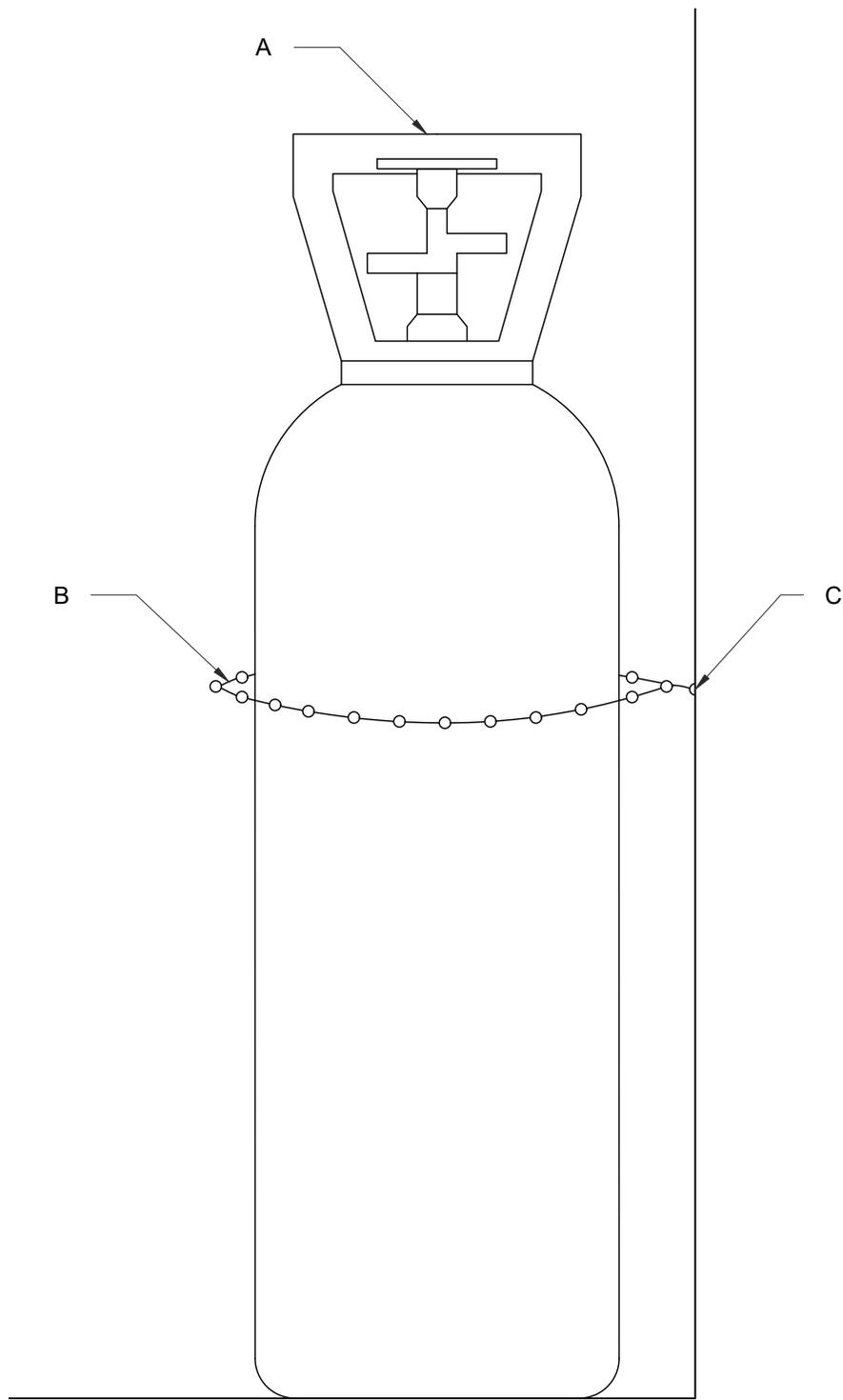


ISOMETRIC: DRAIN AT FRONT EDGE OF COUNTER
 $1-1/2" = 1'-0"$



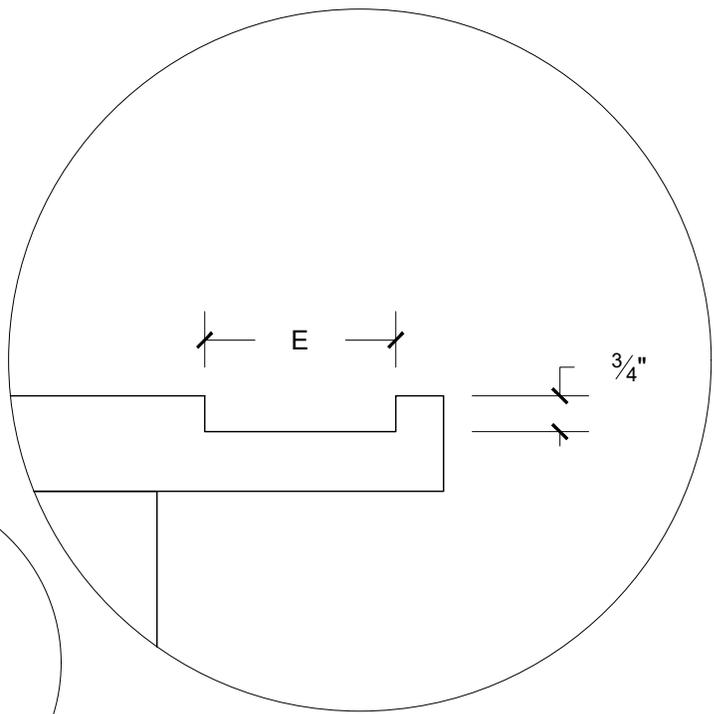
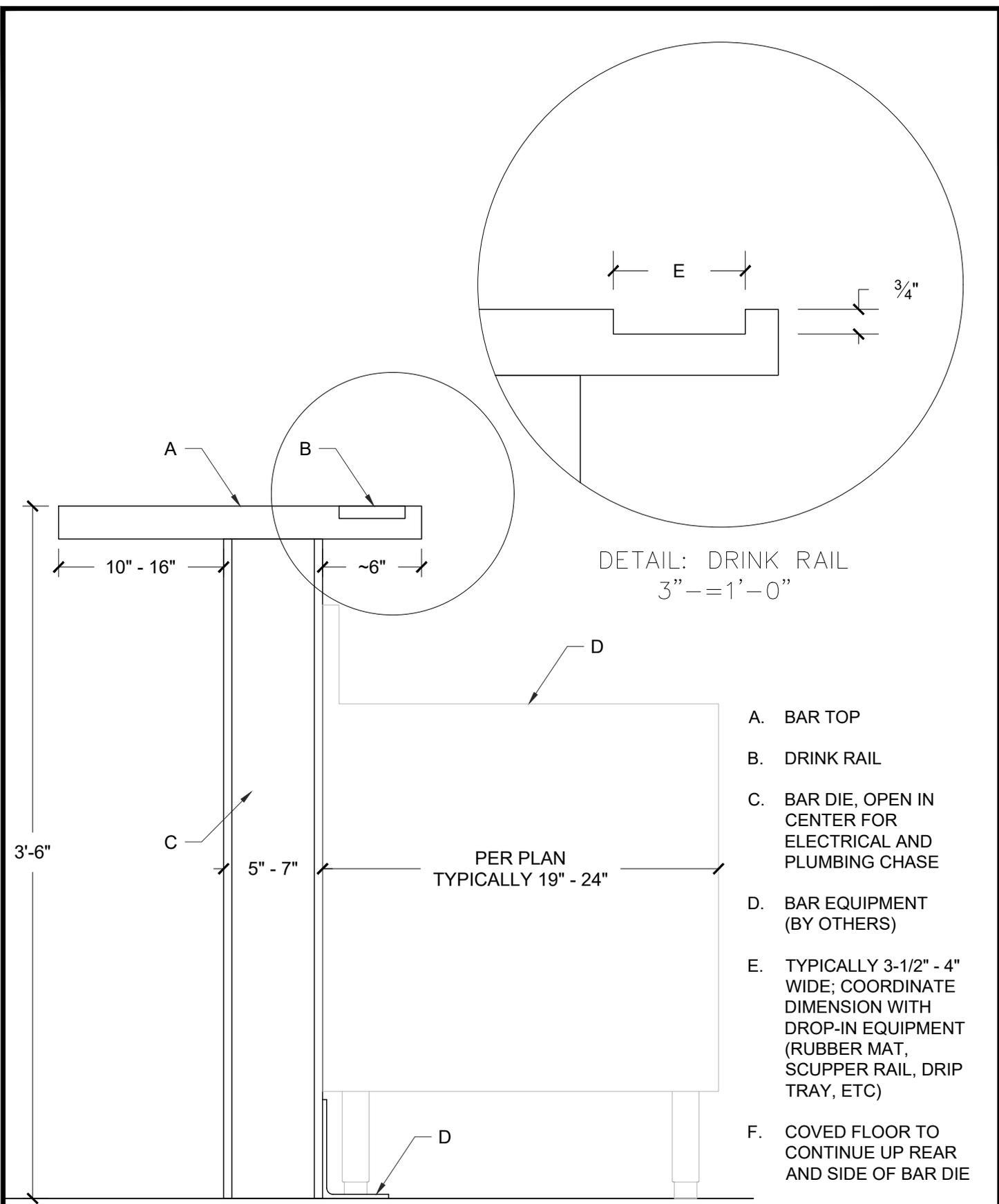
ISOMETRIC: DRAIN AT CENTER OF MILLWORK COUNTER
 $1-1/2" = 1'-0"$

- A. 16 GA FULLY WELDED S/S
- B. FLOOR SINK / FLOOR DRAIN BY OTHERS
- C. SEAL WHERE IT MEETS THE FLOOR & MILLWORK
- D. DRAIN LINER CENTERED ON DRAIN
- E. HEIGHT AS REQUIRED TO RUN FLUSH FROM FLOOR TO TOP OF MILLWORK BASE



SECTION
3" = 1'-0"

- A. GAS TANK BY VENDOR
- B. CHAIN BY GC
- C. CHAIN SECURED TO WALL OR BACK OF CABINET BY GC



DETAIL: DRINK RAIL
 3" = 1'-0"

- A. BAR TOP
- B. DRINK RAIL
- C. BAR DIE, OPEN IN CENTER FOR ELECTRICAL AND PLUMBING CHASE
- D. BAR EQUIPMENT (BY OTHERS)
- E. TYPICALLY 3-1/2" - 4" WIDE; COORDINATE DIMENSION WITH DROP-IN EQUIPMENT (RUBBER MAT, SCUPPER RAIL, DRIP TRAY, ETC)
- F. COVERED FLOOR TO CONTINUE UP REAR AND SIDE OF BAR DIE

SECTION
 1-1/2" = 1'-0"

SECTION 115213

PROJECTION SCREENS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the projection screens as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

- A. Wood backing and trim for recessed screen installation - Section 062000.
- B. Electrical wiring, connections, and installation of remote control switches for electrically operated projection screens - Division 26.

1.4 QUALITY ASSURANCE

- A. Provide each type of projection screen as a complete unit produced by a single manufacturer, including necessary mounting brackets, accessories, fittings and fastenings.

1.5 SUBMITTALS

- A. Product Data: Submit copies of manufacturer's specifications and installation instructions for each type of projection screen unit.

1.6 DELIVERY, STORAGE & HANDLING

- A. Do not deliver projection screens until building is enclosed and ready for screen installation. Protect screens from damage during delivery, handling, storage and installation.

PART 2 PRODUCTS

2.1 ELECTRICALLY OPERATED, REMOTE CONTROL SCREENS

- A. Provide units for recessed ceiling mounting completely housed in a metal-lined wood case, listed by UL and bearing re-examination markers of UL. Mount top of screen fabric to metal roller with roller supported on brackets with self-aligning bearings.
- B. Screen Case: Fabricate wood case with metal lined motor compartment, hinged or removable access panel to motor compartment, electrical outlet box, and finished with manufacturer's standard primer coat.

- C. Motor Units: Size and capacity recommended by the screen manufacturer. Use instant reversing, gear drive motor with permanently lubricated ball bearings, automatic thermal overload protection, and pre-set limit switches to automatically stop screen in "up" and "down" and "stop" in a box with cover plate for flush wall mounting. Stop action to be positive to prevent coasting.

- 1. Screen size: See Drawings

- D. Screen Fabric: Manufacturer's standard, flame and mildew-resistant fabric, glass beaded with chemical coating and 2" black masking borders.

- E. Products: Subject to compliance with requirements, provide one of the following:

- 1. Senior Electrol; Da-Lite Screen Co.
 - 2. Rolleramic; Draper Screen Co.
 - 3. Series 900; Knox Mfg. Co.

2.2 CEILING MOUNTED PROJECTOR BRACKETS:

- A. In all rooms listed to receive projection screens, provide painted steel brackets with integral cable management capability bolted to structure and integrated with acoustic ceiling tiles. (Peerless PJF2, or approved equal).

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where projection screens are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Install projection screen units and accessories at locations shown in accordance with manufacturer's instructions. Install level, plumb, secure and at proper height. Coordinate with other trades for securing projection screen units to finished surfaces. Repair or replace damaged units as directed by the Architect.
- B. Provide protections for installed units so that they will be in satisfactory operating condition, without damage at completion of project.

END OF SECTION

SECTION 122413

WINDOW SHADES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the window shades as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Manually-operated window shades.
 - 2. Field measurements of as-built conditions.
 - 3. Accessories and hardware required for complete installation and operation.
 - 4. See Architectural Drawings for the locations of shades, solar and blackout.

1.3 RELATED SECTIONS

- A. Electrical - Division 26.

1.4 QUALITY ASSURANCE

- A. Provide assemblies which are complete assemblies produced by one manufacturer, including hardware, accessory items, mounting brackets, and fastenings.
- B. Provide materials in colors as selected by the Architect from manufacturer's standard colors.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
- B. Shop Drawings: Submit floor layout and elevations, indicating location of all window treatments, mechanism details, type and size of each unit, type and location of controls. Shop drawings must also show seaming of shade fabric. Submit shop drawings showing details of installation and relation to adjoining construction and conditions.
- C. Samples: Submit full size sample of each shade type for Architect's acceptance.
- D. Mock-Up
 - 1. Install each type of shade assembly on one complete column bay for Architect's acceptance of installation details, workmanship and operation.
 - 2. Approved mock-up shall be used as the standard for installation of work under this Section, and no further installation work shall proceed before Architect's acceptance of the mock-up.

1.6 WARRANTY

- A. Manufacturer's standard non-depreciating 25-year limited warranty covering all hardware, motors, motor control system and shade cloth.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Protect shades from damage, soiling and deterioration during transit, storage and handling to, until Owner's acceptance.

PART 2 PRODUCTS

2.1 MANUALLY OPERATED SHADES

- A. Provide manually operated shade system equal to Silent Gliss Model# "SG 4910," "Mechoshade/5 System," made by the Mecho-Shade Corp. or equal made by WT Shade, Sol-R-Veil Inc., Draper, Rollease Acmeda Contract Series 1 or approved equal conforming to standards specified herein.
- B. Shade system shall be pre-engineered overrunning clutch design that disengages to 90% during the raising and lowering of the shade. The brake can stand a pull force of 40 lb. in the stop position, or sized as required for shade weight, requiring no adjustment. Self-lubricating hub on to which the brake system is mounted includes an articulated brake assembly which ensures smooth, non-jerky operation in raising and lowering the shades. System shall include the following components:
 - 1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing mounting hardware from opening and without requiring end or center supports to be removed.
 - 2. Provide shade hardware that allows for removal and remounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
 - 3. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
 - 4. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
 - 5. Provide shade hardware system that allow for operation of multiple shade bands (multi-banded shades) by a single chain operator. Connectors shall be offset to ensure alignment from the first to the last shade band.
 - 6. Provide shade hardware constructed of minimum 1/8" thick plated steel or heavier as required to support 150% of the full weight of each shade.
 - 7. Drive Bracket/ Brake Assembly:
 - a. Basis of Design: Silent Gliss drive bracket for SG 4910.
 - b. MechoShade Drive Bracket M5, WT Shade SoloMount, or equal by other manufacturers noted herein.
 - c. Rollease Acmeda chain driven clutch operating system of self-lubricating, UV-stabilized fiberglass reinforced nylon construction and tempered high carbon steel internal springs, designed for smooth, trouble-free operation, precise control, and uniform aesthetics. Galaxy geared or spring boost counterbalance system to achieve < 6 lbs. constant pull forces.

- d. Drive Chain: #10 qualified stainless-steel chain rated to 90 lb.
 - e. Minimum Breaking Strength: Nickel plate chain shall not be accepted.
8. Shades, solar and blackout, will be housed in metal shade pockets that will be recessed into a ceiling pocket adjacent to each window.
- C. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
- 1. Hem Pockets and Hem Weights: Fabric hem pocket with RF welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be the same, for all shades within one room.
 - 2. Shade Band and Shade Roller Attachment:
 - a. Provide extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without deflection. Provide for positive mechanical engagement with drive/ brake mechanism.
 - b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable/ replaceable with a snap-on/snap-off spline mounting, without having to remove shade roller from shade brackets.
 - c. Mounting spline shall not require use of adhesives, adhesive tapes, staples and/or rivets.
- D. Side Channels: Provide standard "blackout" side channels where black-out shades are required. Channels shall be extruded aluminum, with a black anodized finish, color selected by the Architect.

2.2 SHADE CLOTH

- A. Shade cloth shall have 3% openness fabric with reflective window-side finish for UV and heat rejection, color and optical properties as selected by the Architect made by MechoShade, or Ambient Screen 3% (PVC Free) by Rollease Acmeda Contract or equal by other manufacturers noted herein.
- 1. Color 1569 Silver Birch.
- B. Where black-out shades are indicated, shade cloth shall be "Chelsea Blackout" opaque acrylic black-out shade cloth made by MechoShade, or Rollease Acmeda Contract Shade Cloth Sierra Sol Mesa, or equal by other manufacturers noted herein; color selected by the Architect.
- 1. Color 0284 Steel.

2.3 FABRICATION

- A. The shade and the fabric shall hang flat without buckling or distortion. The edge, when trimmed, shall hang straight without curling or raveling. An unguided roller shade cloth shall roll true and straight, without tracking sideways more than +/- 1/8" in either direction due to warp distortion or weave design. Shades shall fill window openings from head to sill and jamb to jamb.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where window treatments are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION, GENERAL

- A. Coordinate with the work of other trades to ensure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Install the work of this Section in strict accordance with the indicated design and the installation recommendations of the manufacturer as approved by the Architect.
- C. Upon completion of the installation, put all components through at least ten (10) complete cycles of operation, adjusting as necessary to achieve optimum operation.

3.3 INSTALLATION OF MANUAL ROLLER SHADES

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions and located so shade band is not closer than 2" to interior face of glass. Allow proper clearances for window operation hardware.
- B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

3.4 PROTECTION AND CLEANING

- A. Protect installed units to ensure proper operating condition, without damage or blemishes. Repair or replace damaged units as directed by the Architect.

END OF SECTION

SECTION 123661

ENGINEERED COUNTERTOPS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the engineered quartz countertops as shown on the drawings and/or specified herein including, but not limited to, the following:
 - 1. Quartz-based fabricated stone countertops.
 - 2. Stainless steel anchoring and fastening devices.

1.3 RELATED SECTIONS

- A. Architectural Woodwork - Section 064023.
- B. Plumbing - Division 22, for lavatories.

1.4 QUALITY ASSURANCE

- A. Fire Test Response Characteristics: Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E 84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame Spread Index: 25 or less.
 - 2. Smoke Developed Index: 450 or less.

1.5 SUBMITTALS

- A. Shop Drawings for Engineered Stone: Submit complete cutting and setting drawings to the Architect for approval. Show sizes, shapes, thicknesses, jointing, anchoring, connection with other work, typical and special anchoring details, supports, dimensions, setting numbers, and color range for stone. Clearly indicate dimensions for locating cutouts in stone. Do not fabricate any stone tops (except for samples) until shop drawings have been approved by the Architect.
- B. Samples
 - 1. Stone: Submit 3 sets of 12" x 12" samples of engineered stone. Include full range of color and texture to be expected. Architect will review for color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor.
 - 2. Anchoring and Fastening Devices: Submit 3 samples of each type of anchoring and fastening device.

C. Product Data

1. Stone: Submit manufacturer's product data, fabrication, and installation instructions.
2. Accessories: Submit manufacturer's product data and installation instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect stone during storage and construction against wetting, soiling, staining and damage.
- B. Handle stone to prevent chipping, breakage, soiling or other damage. Do not use pinch or wrecking bars without protecting edges of stone with wood or other rigid materials.
- C. Store stone on wood skids or pallets, covered with non-staining, waterproof membrane. Place and stack skids and stones to distribute weight evenly and to prevent breakage or cracking of stones. Protect stored stone from weather with waterproof, non-staining covers or enclosures, but allow air to circulate around stones.

PART 2 PRODUCTS

2.1 QUARTZ STONE

- A. Provide 1-1/4" thick quartz stone surfacing "Corian Quartz" as manufactured by DuPont, or comparable product by CaesarStone Quartz Surfacing, Silestone, or approved equal.
 1. Colors and Finishes: See Color and Finish Schedule on the Architectural Drawings for additional information.
 - a. SS1.a: 5131 Calacatta Nuvo.
 - b. SS1.b: Neve/ London Sky/ Bianco Dolomite.
 - c. SS1.c: Helena/ Tundra19/ Natura18.
 - d. SS2:
 - 1). SS2.a: Durat, color D0450 Medium Red.
 - 2). SS2.b: Durasein, color DM6001 Vitality Red.
 - 3). SS2.c: Krion, color 6405 Happy Red.
- B. Exposed Edges and Corners:
 1. Countertops:
 - a. Edges: Square. Miter joint with 1/8" diameter eased edge profile at countertop fascia.
 - b. Outside Corners: Square.
 2. Backsplash:
 - a. Edges: Square, miter joint with 1/8" diameter eased edge profile.
 - b. Outside Corners: Square butt joints.

2.2 ACCESSORIES

- A. Mounting Adhesives: Provide structural-grade silicone or epoxy adhesives of type recommended by manufacturer for application and conditions of use.
 1. Acceptable Silicone Manufacturers:
 - a. Dow Corning.
 - b. GE Sealants and Adhesives.

2. Acceptable Epoxy Manufacturers:
 - a. Akemi North America.
 - b. Bonstone Material Corporation.
 - c. Tenax USA.
 3. Provide spacers, if required, of type recommended by adhesive manufacturer.
 4. Color: Adhesive or sealant which will be visible in finished work shall be tinted to match quartz surfacing.
- B. Fasteners: Type 304, stainless steel meeting ASTM A 666.
- C. Joint Sealants: Provide anti-bacterial type.
1. Acceptable Manufacturers:
 - a. Dow Corning.
 - b. GE Sealants and Adhesives.
- D. Solvent: Product recommended by adhesive manufacturer to clean surface of quartz surfacing to assure adhesion of adhesives and sealants.
- E. Cleaning Agents: Non-abrasive, soft-scrub type kitchen cleansers.
- F. Sealer: "S-32" by HMK, or equal.

2.3 FABRICATION

- A. Fabricator: Firm shall have five years' experience fabricating specified stone and shall have water-cooled cutting tools.
- B. Shop Assembly: Observe proper safety procedures and comply with manufacturer's instructions.
- C. Layout: Layout joints to minimize joints and to avoid L-shaped pieces of quartz surfacing.
- D. Inspection: Inspect material for defects prior to fabrication.
1. Color Match: Materials throughout Project shall be from the same batch and shall bear labels with same batch number. Visually inspect materials to be used for adjacent pieces to assure acceptable color match. Inspect in lighting conditions similar to those on Project.
 2. Variation in distribution of aggregates in quartz surfacing which are within manufacturer's tolerances is not a defect.
- E. Tools: Cut and polish with water-cooled power tools.
- F. Cutouts
1. Cutouts shall have 3/8" minimum inside corner radius. Inside corners shall be reinforced in an acceptable manner to prevent cracking.
 2. Exposed edges of cutout to be polished.
 3. If the remaining material outside a cutout is less than three inches wide, reinforce area by laminating it with a strip of stone.

PART 3 EXECUTION

3.1 SETTING STONE COUNTERTOPS AND COUNTER FASCIAS

- A. Cut-outs and Drilling: Provide countertops with cut-outs for sinks, faucets, etc. Cut-outs shall be carefully made in accordance with templates furnished under the Plumbing Section. Stone shall be drilled as required to receive anchoring and fastening devices.
- B. Setting: Set countertops in required pattern over steel supports using stainless steel anchors and mounting adhesive. Set countertops level, plumb and square.
- C. Stone shall be set so that adjacent sections of stone are sequence matched for veining.
- D. Joints: Maintain an even joint between units, 1/16" max. Point joints with approved elastic non-staining mastic pointing compound, color to match stone. Tool joints flush. Clean exposed surfaces carefully.

3.2 REPAIR, CLEANING, AND SEALING

- A. Remove and replace stone units which are broken, chipped, stained or otherwise damaged. Where directed, remove and replace units which do not match adjoining stonework. Patching or hiding chips or cracks in stone will not be permitted. Provide new matching units, install as specified and reseal joints to eliminate evidence of replacement. Reseal defective and unsatisfactory joints to provide a neat, uniform appearance.
- B. Clean and seal stonework after completion using cleaner and sealer specified herein and as recommended by stone manufacturer; follow manufacturer's instructions.

3.3 PROTECTION

- A. After installation and cleaning, protect stone work from damage during subsequent construction activities.
- B. Provide protection for finished work such as exposed edges, corners, and all other stone liable to physical injury or staining. Protection shall include, but is not limited to, non-staining approved coverings.

END OF SECTION

SECTION 124813

FLOOR MATS AND FRAMES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the floor mats and frames as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

- A. Concrete recess - Section 033000.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Except as otherwise indicated, provide entrance mats and accessories by a single manufacturer for entire project.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for entrance mat. Include methods of installation for each type of substrate.
- B. Samples: Submit samples for each type and color of exposed entrance mat, frames and accessories required. Provide 12" square samples of mat materials and 12" lengths of frame members.
- C. Maintenance Data: Submit manufacturer's printed instructions for cleaning, drying, maintaining and rehandling of removable entrance mat units.

1.6 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 MAT ASSEMBLY

- A. Provide entrance floor mat tiles equal to Construction Specialties "DesignStep" in pattern Powerpoint, or equal by Milliken, or approved equal. Tile carpeting to be adhered to floor surface using releasable adhesive supplied by manufacturer Framing members for recessed mats shall be angle type.
- B. Surfaces in contact with concrete shall have a shop coating of clear acrylic. All other aluminum surfaces shall have mill finish.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where floor mats and frames are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Level/fill substrate for flush installation with existing stone pavers.
- B. Install angle mat frames into prepared block out. Install mat frames in accordance with the manufacturer's installation instructions. Locate, align and level frame members accurately.
- C. Protection: Upon completion of frame installation and concrete work, provide temporary filler of plywood or fiberboard in mat recesses, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project reaches substantial completion.
- D. Delay installation of mats until work on the project reaches substantial completion.
- E. Lay mats in frames to fit properly and be centered in the recess; do not adhere.
- F. Install grating mat in frame and anchor with hidden lock downs.

END OF SECTION

SECTION 210500

BASIC FIRE SUPPRESSION REQUIREMENTS

PART 1 - GENERAL

1.1 ROUGHING

- A. The Contract Drawings have been prepared in order to convey design intent and are diagrammatic only. Drawings shall not be interpreted to be fully coordinated for construction.
- B. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, interferences, etc. Make necessary changes in contract work, equipment locations, etc., as part of a contract to accommodate work to avoid obstacles and interferences encountered. Before installing, verify exact location and elevations at work site. **DO NOT SCALE** plans. If field conditions, details, changes in equipment or shop drawing information require an important rearrangement, report same to Owner's Representative for review. Obtain written approval for all major changes before installing.
- C. Install work so that items both existing and new are operable and serviceable. Eliminate interference with removal of coils, motors, filters, belt guards and/or operation of doors. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation. Provide new materials, including new piping and insulation for relocated work.
- D. Coordinate work with other trades and determine exact route or location of each duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Obtain from Owner's Representative exact location of all equipment in finished areas, such as thermostat, fixture, and switch mounting heights, and equipment mounting heights. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers, and other items. Do not rough-in contract work without reflected ceiling location plans.
- E. Before roughing for equipment furnished by Owner or in other Divisions, obtain from Owner and other Divisions, approved roughing drawings giving exact location for each piece of equipment. Do not "rough in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment. For equipment and connections provided in this contract, prepare roughing drawing as follows:
 - 1. Existing Equipment: Measure the existing equipment and prepare for installation in new location.

2. New Equipment: Obtain equipment roughing drawings and dimensions, then prepare roughing-in-drawings. If such information is not available in time, obtain an acknowledgement in writing, then make space arrangements as required with Owner's Representative.

1.2 EQUIPMENT AND MATERIAL REQUIREMENTS

A. Provide materials that meet the following minimum requirements:

1. Materials shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, in accordance with NFPA 255.
2. All equipment and material for which there is a listing service shall bear a UL label.
3. Potable water systems and equipment shall be built according to AWWA Standards.
4. Gas-fired equipment and system shall meet AGA Regulations and shall have AGA label.
5. All electrical equipment and systems, as a whole, shall be tested and listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL) for the intended use in accordance with the applicable standards and have a physical label indicating such.

1.3 CONCEALMENT

- ### A. **Conceal all contract work** above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after their review. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

1.4 CHASES

A. New Construction:

1. Certain chases, recesses, openings, shafts, and wall pockets will be provided as part of General Construction Trade. Mechanical and Electrical trades shall provide all other openings required for their contract work.
2. Check Architectural and Structural Design and Shop Drawings to verify correct size and location for all openings, recesses and chases in general building construction work.
3. Assume responsibility for correct and final location and size of such openings.
4. Rectify improperly sized, improperly located or omitted chases or openings due to faulty or late information or failure to check final location.

5. Provide 18 gauge galvanized sleeves and inserts. Extend all sleeves 2 in. above finished floor. Set sleeves and inserts in place ahead of new construction, securely fastened during concrete pouring. Correct, by drilling, omitted or improperly located sleeves. Assume responsibility for all work and equipment damaged during course of drilling. Firestop all unused sleeves.
 6. Provide angle iron frame where openings are required for contract work, unless provided by General Construction trade.
- B. In Existing Buildings:
1. Drill holes for floor and/or roof slab openings.
 2. Multiple pipes smaller than 1 in. properly spaced and supported may pass through one 6 in. or smaller diameter opening.
 3. Seal voids in fire rated assemblies with a fire-stopping seal system to maintain the fire resistance of the assembly. Provide 18 gauge galvanized sleeves at fire rated assemblies. Extend sleeves 2 in. above floors.
 4. In wall openings, drill or cut holes to suit. Provide 18 gauge galvanized sleeves at shafts and fire rated assemblies. Provide fire-stopping seal between sleeves and wall in drywall construction. Provide fire stopping similar to that for floor openings.

1.5 PENETRATION FIRESTOPPING

- A. Fire-Stopping for Openings Through Fire and Smoke Rated Wall and Floor Assemblies:
1. Provide materials and products listed or classified by an approved independent testing laboratory for "Penetration Fire-Stop Systems". The system shall meet the requirements of "Fire Tests of Penetrations Fire-Stops" designated ASTM E814.
 2. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, ductwork and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for drywall construction.
 3. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.
 4. The methods used shall incorporate qualities which permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion, and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.

5. Plastic pipe/conduit materials shall be installed utilizing intumescent collars.
 6. Provide a submittal including products intended for use, manufacturer's installation instructions, and the UL details for all applicable types of wall and floor penetrations.
 7. Fire-stopping products shall not be used for sealing of penetrations of non-rated walls or floors.
- B. Acceptable Manufacturers:
1. Dow Corning Fire-Stop System Foams and Sealants.
 2. Nelson Electric Fire-Stop System Putty, CLK and WRP.
 3. S-100 FS500/600, Thomas & Betts.
 4. Carborundum Fyre Putty.
 5. 3-M Fire Products.
 6. Hilti Corporation.

1.6 ACCESS PANELS

- A. Provide access panels for required access to respective trade's work. Location and size shall be the responsibility of each trade. Access panels provided for equipment shall provide an opening not smaller than 22 in. by 22 in. Panels shall be capable of opening a minimum of 90 degrees. Bear cost of construction changes necessary due to improper information or failure to provide proper information in ample time. Access panels over 324 square inches shall have two cam locks. Provide proper frame and door type for various wall or ceiling finishes. Access panels shall be equal to "Milcor" as manufactured by Inland Steel Products Co., Milwaukee, Wisconsin. Provide General Construction trade with a set of architectural plans with size and locations of access panels.

1.7 CONCRETE BASES

- A. Provide concrete bases for all floor mounted equipment. Provide 3,000 lb. concrete, chamfer edges, trowel finish, and securely bond to floor by roughening slab and coating with cement grout. Bases 4 in. high (unless otherwise indicated); shape and size to accommodate equipment. Provide anchor bolts in equipment bases for all equipment provided for the project, whether mounted on new concrete bases or existing concrete bases.

1.8 HVAC EQUIPMENT CONNECTIONS

- A. Contractor is responsible for draining, filling, venting, chemically treating and restarting any systems which are affected by work shown on the Contract Documents unless specifically noted otherwise.

- B. Provide final hot water connections to all equipment as required by the equipment. Provide final connections, including domestic water piping, wiring, controls, and devices from equipment to outlets left by other trades. Provide equipment waste, drip, overflow and drain connections extended to floor drains.
- C. Provide for Owner furnished and Contractor furnished equipment all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, insulation, sheet metal work, controls, dampers, as required.
- D. Refer to manufacturer drawings and specifications for requirements of special equipment. Verify connection requirements before bidding.

1.9 PLUMBING EQUIPMENT CONNECTIONS

- A. Contractor is responsible for draining, filling, venting, chemically treating and restarting any systems which are affected by work shown on the Contract Documents unless specifically noted otherwise.
- B. Provide roughing and final water, waste, vent connections to all equipment. Provide loose key stops, sanitary "P" traps, tailpiece, adapters, gas or air cocks, and all necessary piping and fittings from roughing point to equipment. Provide installation of sinks, faucets, traps, tailpiece furnished by others. Provide cold water line with gate valve and backflow prevention device at locations called for. Provide continuation of piping and connection to equipment that is furnished by others. Provide relief valve discharge piping from equipment relief valves.
- C. Provide valved water outlet adjacent to equipment requiring same. Provide equipment type floor drains, or drain hubs, adjacent to equipment.
- D. Install controls and devices furnished by others.
- E. Refer to Contract Documents for roughing schedules, and equipment and lists indicating scope of connections required.
- F. Provide for Owner furnished and Contractor furnished equipment all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, as required.
- G. Refer to Manufacturer drawings and specifications for requirements of kitchen equipment and special equipment. Verify connection requirements before bidding.

1.10 ELECTRICAL EQUIPMENT CONNECTIONS

- A. Provide complete power connections to all electrical equipment. Provide control connections to equipment. Heavy duty NEC rated disconnect ahead of each piece of equipment. Ground all equipment in accordance with NEC.
- B. Provide for Owner furnished and Contractor furnished equipment all power wiring, electric equipment, control wiring, switches, lights, receptacles, and connections as required.

- C. Refer to Manufacturer's drawings/specifications for requirements of kitchen equipment and special equipment. Verify connection requirements before bidding.

END OF SECTION

SECTION 211010

PIPING SYSTEMS AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

- A. Provide a schedule of pipe materials, fittings and connections.
- B. Provide a detailed matrix listing the specific UL approved firestop system assembly to be used for each type of piping provided and each type of construction to be penetrated along with all associated UL assembly details.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pipe and fittings shall be new, marked with manufacturer's name and comply with applicable ASTM and ANSI Standards.

2.2 STEEL PIPING AND FITTINGS

- A. Pipe: ASTM A53, or ASTM A106 seamless, Schedule 40 or Schedule 80 weight; black or galvanized finish as called for; ends chamfered for welding or grooved for grooved mechanical connections.
- B. Fittings: Same material and pressure class as adjoining pipe.
 - 1. Welded Fittings: Factory forged, seamless construction, butt weld type chamfered ends. Where branch connections are two or more sizes smaller than main size, use of "Weldolets", "Thredolets" or "Sokolets" acceptable. Mitered elbows, "shaped" nipples, and job fabricated reductions not acceptable unless specifically called for. Socket weld type, 2000 psi wp, where called for.
 - 2. Threaded Fittings: Class 125, cast or malleable iron, black or galvanized, as called for; UL listed and FM approved for fire protection systems. Street type 45° and 90° elbows are not acceptable.
- C. Flanges, Unions, and Couplings:
 - 1. Threaded Connections:
 - a. Flanges: Cast iron companion type; for sizes 2-1/2 in. and larger.

- b. Unions: Malleable iron, bronze to iron seat, 300 lb. wwp; for sizes 2 in. and smaller.
 - c. Couplings: Malleable iron. Steel thread protectors are not acceptable as couplings.
2. Welded Connections:
- a. Flanges: Welding neck type. Slip-on type not allowed unless noted and shall not be installed in conjunction with butterfly valves.
3. Grooved Mechanical Connections:
- a. Couplings: Ductile iron, ASTM A395 and ASTM A536, with painted coating, designed for rolled grooved piping, hot dipped galvanized finish complying with ASTM A153 where called for.
 - b. Gaskets: Grade "E" EPDM synthetic rubber, -30°F to 230°F temperature range, suitable for water service.
 - c. Bolts and Nuts: Heat treated, hex head carbon steel, ASTM A183, cadmium plated or zinc electroplated.
 - d. Fittings: Elbows, tees, laterals, reducers, adapters as required shall be ductile iron conforming to ASTM A395 and A536. Fittings shall have grooves designed to accept grooved end couplings of the same manufacturer.
 - e. Victaulic, rigid system, Style 005 couplings cast with offsetting angle pattern bolt pads to provide system rigidity and support in accordance with ANSI B31.1 and B 31.9. UL listed and FM approved; 300 psi wwp; follow all terms of listings/approvals.
 - f. Acceptable Manufacturers: Grinnell, Gruvlok by Anvil, Victaulic or approved equal.
- D. Gauge and Instrument Connections: Nipples and plugs for adapting gauges and instruments to piping system shall be IPS brass.

2.3 DIELECTRIC PIPE FITTINGS

- A. Description: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.
- B. Nipples: Factory fabricated, threaded, insulating material suitable for system fluid, pressure and temperature.
- C. Flanges: Factory fabricated, companion flange assembly, for 150 or 300 psig minimum pressure to suit system fluid pressures and temperatures with flange insulation kits and bolt sleeves.

- D. Acceptable Manufacturers: EPCO, Capitol Manufacturing, Victaulic, Watts or approved equal.

2.4 HANGERS, INSERTS AND SUPPORTS

- A. Hangers, Inserts, Clamps: B-Line, Grinnell, Michigan Hanger, PHD Manufacturing.

- B. Hangers:

1. Adjustable, wrought malleable iron or steel with electroplated zinc or cadmium finish. Copper plated or PVC coated where in contact with copper piping. Hot-dipped galvanized finish for exterior locations.
2. Adjustable ring type where piping is installed directly on hanger for piping 3 in. and smaller.
3. Adjustable steel clevis type for piping 4 in. and larger.
4. Nuts, washers and rods with electroplated zinc or cadmium finish. Hot-dipped galvanized finish for exterior locations.

- C. Spacing Schedule (Maximum Distance between Hangers (ft.-in.):

NOMINAL PIPE SIZE (IN.)	3/4	1	1-1/4	1-1/2	2	2-1/2	3	3-1/2	4	5	6	8
Steel Pipe	N/A	12-0	12-0	15-0	15-0	15-0	15-0	15-0	15-0	15-0	15-0	15-0
Copper Tube	8-0	8-0	10-0	10-0	12-0	12-0	12-0	12-0	15-0	15-0	15-0	15-0
Rod Size (in.)	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	1/2	1/2	1/2

- D. Beam Attachments:

1. C-Clamp style, locknut, restraining strap, electroplated finish, UL listed, FM approved for pipe sizes 2 in. and smaller, complying with NFPA 13.
2. Center loaded style with clamp attachments that engage both edges of beam, electroplated finish, UL listed, FM approved, for pipe sizes larger than 2 in., refer to "Supports" for additional requirements, complying with NFPA 13 .

- E. Inserts: Carbon steel body and square insert nut, galvanized finish, maximum loading 1300 lbs., for 3/8 in. to 3/4 in. rod sizes, reinforcing rods on both sides, MSS-SP-69 Type 19 or approved equal, complying with NFPA 13.

- F. Supports:

1. For all piping larger than 2 in., provide intermediate structural steel members for hanger attachment. Members shall span across the bar joists at panel points of joists. Secure member to structure. Select size of members based on a minimum factor of safety of four.

2. For weights under 1,000 lbs.: "Drill-In" inserts, "U" shaped Channel, beam clamps or other structurally reviewed support. The factor of safety shall be at least four. Follow manufacturer's recommendations.
 3. For Metal Decks: Drill hole through for hanger rods and imbed a welded plate in concrete or use devices designed for this application, with a safety factor of four.
 4. Acceptable Manufacturers: Hilti, ITW Ramset, Phillips "Red Head" or approved equal.
- G. Hangers for fire protection piping as specified and in accordance with NFPA 13. Hangers and building attachments shall be UL listed and FM approved for fire protection service. Adjustable swivel ring type hangers are permitted for 3 in. and smaller piping.

2.5 PIPING ACCESSORIES

- A. Escutcheon Plates: Steel or cast brass, split hinge type with setscrew, high plates where required for extended sleeves. Chrome plated in finished areas.
- B. All bushings and nipples required for instruments and gauges shall be brass.

2.6 SLEEVES

- A. Standard Type:
 1. Schedule 40 black steel pipe sleeves for structural surfaces, two (2) pipe sizes larger than the pipe, and as recommended by the sealing element manufacturer. Provide full circle water stop collar for sleeves located within below grade walls, wet wells and waterproofed surfaces. The collar shall be fabricated from steel plate and welded to the sleeve around its entire circumference.

2.7 FIRESTOP SYSTEM FOR OPENINGS THROUGH FIRE RATED WALL AND FLOOR ASSEMBLIES

- A. Materials for firestopping seals shall be listed by an approved independent testing laboratory for "Through-Penetration Firestop Systems". The system shall meet the standard fire test for Through-Penetration Firestop Systems designated ASTM E814. Firestop system seals shall be provided at locations where piping pass through fire rated wall, floor/ceiling, or ceiling/roof assembly. Minimum required fire resistant ratings of the assembly shall be maintained by the Firestop System. Installation shall conform to the manufacturer's recommendations and other requirements necessary to meet the testing laboratory's listing for the specific installation.

2.8 PIPING MATERIALS AND SCHEDULE

- A. See Exhibit "A" - Piping Materials at end of this Section for Fire Protection piping.
- B. See Exhibit "B" - Testing at end of this Section for Fire Protection piping.

PART 3 - EXECUTION

3.1 EQUIPMENT AND SYSTEMS

- A. Install equipment and systems in accordance with provisions of each applicable section of these Specifications, and Local/State Codes/Regulations having jurisdiction. Accurately establish grade and elevation of piping before setting sleeves. Install piping without springing or forcing, except where specifically called for, making proper allowance for expansion and anchoring. Changes in size shall be made with reducing fittings. Reducing couplings are not acceptable. Arrange piping at equipment with necessary offsets, unions, flanges, and valves, to allow for easy part removal and maintenance. Offset piping and change elevation as required, to coordinate with other work. Avoid contact with other mechanical or electrical systems. Provide adequate means of draining and venting systems. Conceal piping unless otherwise called for.
- B. Copper tubing shall be cut with a wheeled tubing cutter or other approved copper tubing cutter tool. The tubing must be cut square to permit proper joining with the fittings. Ream pipes after cutting and clean before installing.
- C. Cap or plug equipment and pipe openings during construction. Install piping parallel with lines of building, properly spaced to provide clearance for insulation. Make changes in direction and branch connections with fittings. Do not install valves, unions and flanges in inaccessible locations. Materials within a system and between systems shall be consistent. If this is not possible, install dielectric fittings.

3.2 PIPING OVER ELECTRICAL EQUIPMENT

- A. Contractor shall route piping to avoid installation directly over electric equipment, including, but not limited to panels, transformers, disconnects, starters, motor control center, adjustable speed drives and fused switches.
- B. Piping shall not be installed in the dedicated electric and working space as defined by NEC 110. Dedicated electrical space is generally equal to the depth and width of electrical equipment, and extends 6 ft. above the electrical equipment, or to a structural ceiling. Dedicated working space is a minimum of 30 in. wide or the width of equipment (whichever is larger) a minimum of 6 ft.-6 in. tall, with a depth of 3ft. to 9 ft. depending on the voltage.

3.3 HANGERS, INSERTS AND SUPPORTS

- A. Piping shall not be supported by wires, band iron, chains, from other piping, or by vertical expansion bolts. Support piping with individual hangers from concrete inserts, wood construction, welded supports, or beam clamps of proper configuration and loading design requirements for each location; replace if not suitable. Follow manufacturer's safe loading recommendations. Suspend with rods of sufficient length for swing and of size called for, using four (4) nuts per rod. Provide additional structural steel members, having one coat rustproof paint, where required for proper support. Provide oversized hangers on diesel engine exhaust piping where insulation/supports must pass between pipe and hanger. Hangers, when attached to joists, shall only be placed at the top or bottom chord panel point.

Only concentric type hangers are permissible on piping larger than 2-1/2 in.; "C" types are permitted for piping 2 in. and smaller on joists. Provide riser clamps for each riser at each floor.

3.4 PIPE CONNECTIONS

- A. Threaded Connections: Clean out tapering threads, made up with pipe dope; screwed until tight connection. Pipe dope must be specifically selected for each application.
- B. Grooved Mechanical Joints: Pipes joined with grooved fittings shall be joined by a listed combination of fittings, couplings, gaskets and grooves of a single manufacturer. Lubricate and install gasket and couplings. Follow manufacturer's recommendations. Grooved ends shall be clean and free of indentations, projections and roll marks in the area from pipe end to groove.
- C. Dielectric Pipe Fittings: Protect fittings from excessive heat.

3.5 WELDING

- A. Welding shall be performed in compliance with the welding procedure specifications prepared by the National Certified Pipe Welding Bureau. Welded piping fabricated by qualified welder. Use certified welder where specifically required by code or insurance company. If indicated and permitted for fire protection systems, all provisions for welded pipe shall additionally be in accordance with NFPA Standard 13. Use full length pipe where possible; minimum distance between welds, 18 in. on straight runs. Welds must be at least full thickness of pipe with inside smooth and remove cutting beads, slag and excess material at joints; chamfer ends. Minimum gap 1/8 in., maximum 1/4 in., for butt welds. Overlaps on position and bench welds to be not less than 3/4 in. One internal pass and one external pass minimum required on slip-on flanges. Do not apply heat to rectify distorted pipe due to concentrated welding; replace distorted pipe.
- B. When welding galvanized pipe, apply cold galvanizing on joint following welding.

3.6 SLEEVES

- A. Provide for pipes passing through floors, walls or ceilings. Not required for floors that are core-drilled, except where floor is waterproofed. Extend 1/8 in. above finished floor in finished areas. In above grade Mechanical Rooms and other areas with floor drains use steel pipe sleeves 2 in. above floor. Use steel pipe sleeves in bearing wall, structural slabs, beams and other structural surfaces, and where called for. Sleeves shall be as small as practical, consistent with insulation, so as to preserve fire rating. Fill abandoned sleeves with concrete. Provide rubber grommet seals for pipes passing through ducts or air chambers or built-up housings.

3.7 SLEEVE PACKING

- A. Seal void space at sleeves as follows:
 - 1. Interior locations: Firmly pack with fiberglass and caulk.

2. Cored holes: Use sealing element.
3. Fire rated, partitions and floor slabs: Use fire rated sealing elements, materials and methods. Provide per manufacturer's instructions to maintain firestop.
4. Waterproofed walls/floors: Use waterproof sealing element, device or compound.

3.8 ESCUTCHEON PLATES

- A. Provide polished chrome setscrew type escutcheon plates for all exposed piping passing through floors, walls or ceilings, in all rooms except in Boiler, Fan and Mechanical Rooms.

3.9 PIPE LINE SIZING

- A. Pipe sizes called for are to be maintained. Pipe size changes made only as reviewed by Owner's Representative and shall be justified by hydraulic calculations. Where discrepancy in size occurs, the larger size shall be provided.

EXHIBIT "A" - PIPING MATERIALS

<u>SERVICE</u>	<u>PIPE MATERIALS</u>	<u>FITTINGS</u>	<u>CONNECTIONS</u>
Sprinkler (wet)	Schedule 40, black steel, 2 in. and smaller	Cast or malleable iron	Threaded
	Schedule 40, black steel, 2 1/2 in and larger	Ductile Iron	Roll grooved mechanical type coupling

EXHIBIT "B" - TESTING

<u>SERVICE</u>	<u>TEST REQUIREMENTS</u>
Sprinklers	Hydrostatic Tests: Tested at 215 PSI and in accordance with NFPA 13 for two (2) hours. Test to be witnessed by EH&S and Ithaca Fire Department.

END OF SECTION

SECTION 211300

FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 QUALITY ASSURANCE

- A. Comply with the 2020 Building Code of New York State referenced edition of the following National Fire Protection Association (NFPA) Standards:
 - 1. NFPA 13: Standard for the Installation of Sprinkler Systems.
 - 2. NFPA 25: Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.
 - 3. NFPA 72: National Fire Alarm Code.
 - 4. NFPA 241: Standard for Safeguarding Construction, Alteration and Demolition Operations.
- B. Follow all requirements, recommendations and appendices to comply with the latest edition of the following publications, codes, standards, and listings/approvals:
 - 1. Factory Mutual Engineering Corporation (FM) Approval Guide.
 - 2. Underwriters Laboratories, Inc. (UL) Fire Protection Equipment Directory.
 - 3. 2020 Building Code of New York State.
 - 4. OSHA Rules and Regulations.
 - 5. Requirements of Insurance Underwriter and other Authorities Having Jurisdiction.
- C. Equipment, devices, hangers and components shall be UL listed and FM approved and labeled for the intended fire protection service.
- D. The fire protection work shall be performed by an experienced firm regularly engaged in the installation of fire protection sprinkler systems.
- E. Preparation of working plans, calculations and site observation of systems shall be completed by a NICET Level III technician under the direction of a qualified New York State Registered Professional Engineer.

1.3 SYSTEM DESCRIPTION

- A. The fire protection system shall be a wet pipe automatic sprinkler system arranged to properly protect spaces as indicated.
- B. Water is supplied from the existing system and fire pump.
- C. The system shall be hydraulically calculated in accordance with all provisions of the Contract Documents and any Authority Having Jurisdiction.
- D. Calculations shall be based upon the specific hazard for the areas being protected. Refer to drawings for minimum requirements.
- E. Maximum coverage for any sprinkler head shall not exceed NFPA requirements and the listing for the sprinklers provided.
- F. A minimum 10 psi safety factor shall be provided between the available municipal water supply curve and the total system demand point. The total system demand point shall be at the municipal water main and include the calculated sprinkler and interior hose stream demands plus the exterior hose stream demand at the residual pressure required for proper system operation.
- G. The maximum flow velocity shall not exceed 20 ft. per second in the piping system and 15 ft. per second in mains with paddle type waterflow indicators.
- H. Water supply control valves shall be electrically supervised and mechanically locked for proper position. Waterflow and supervisory circuits shall be in accordance with the requirements of electrical specifications. Electric connections to sprinkler system shall be by Division 26. Furnish wiring diagrams for all equipment.
- I. Chains and locks provided by Cornell EH & S.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Submit manufacturer's catalog cut, specifications and installation instructions for each item or component of fire protection system. Clearly indicate pertinent information such as, but not limited to:
 - a. Manufacturer's model number.
 - b. Materials, size, finish and type of connection.
 - c. Pressure ratings of components.
 - d. FM approval/UL listing.
- B. Certification: Submit Contractor's NICET certification and number.

C. Drawings and Calculations:

1. All drawings and calculations shall be signed and sealed by a New York State Registered Professional Engineer.
2. Submit complete NFPA 13 drawings and hydraulic calculations with cross reference to applicable drawings, water supply data, and equipment schedule with ratings for the system to the Owner's Representative, Insurance Underwriter, and other Authorities Having Jurisdiction.
3. Submit hydraulic calculations for each design density/remote area with items in NFPA 13 incorporated including sketches to indicate flow quantities, sprinklers operating and direction of flow for pipes in looped and gridded systems.
4. Drawing shall be fabrication drawings provided to indicate actual sprinkler, standpipe and equipment layouts. Drawings shall be 1/4" = 1'-0" scale on reproducible sheets of uniform size. Drawings shall show all data required by NFPA 13.
5. Submit drawings in one (1) complete package.
6. Include Cornell EH & S and FP Engineer on submittal process.

D. Record Drawings and Documents:

1. Submit Record Drawings, hydraulic calculations, test reports, and NFPA Above and Below Ground Material and Test Certificates to the Owner's Representative, Insurance Underwriter and other Authorities Having Jurisdiction.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Mixing of manufacturers or models of the same or similar component will not be acceptable.

2.2 SPRINKLERS AND ACCESSORIES

- A. Brass or bronze, 1/2 in. orifice, 1/2 in. NPT. 165°F ordinary temperature classification for light and ordinary hazards. Use 286°F sprinklers in Mechanical, Electrical and Elevator Rooms; in vicinity of heat equipment/sources; and in accordance with NFPA 13.

1. Finished Ceiling Areas: Semi-recessed pendent sprinklers.
2. Unfinished Ceiling Areas: Natural brass/bronze finish pendent or upright sprinklers as required.

B. Sprinkler Types and Design Equipment:

1. Quick Response Pendent and Upright: Reliable Model F1FR.

2. Quick Response Horizontal Sidewall: Reliable Model F1FR-HSW1.
 3. Quick Response Dry Pendent and Horizontal Sidewall: Reliable Model F3QR.
- C. Flexible Sprinkler Drops:
1. FM Approved braided Type 304 stainless steel tube with union joints, factory tested to 400 psi and listed for up to three (3) 90° bends including bracket for mounting to ceiling or building structure.
 - a. Design Equipment: Victaulic "VicFlex".
- D. Sprinkler Guards:
1. Steel wire cage with base plate and retaining clamps. Same manufacturer as sprinkler.
 2. Design Equipment: Reliable Model C-1.
- E. Sprinkler Cabinets and Spare Sprinklers:
1. Steel or aluminum construction with shelves and shell holes to accommodate the number of spare sprinklers required by NFPA 13.
 2. Bright red finish with hinged front door and label.
 3. Sprinkler wrenches compatible for each type used.
 4. Spare sprinklers for each system of the type and proportion of those used in each system.
 5. Design Equipment: Reliable Model A-4.
- F. Acceptable Manufacturers: Reliable, Tyco, Victaulic, Viking or approved equal.

2.3 SYSTEM COMPONENT IDENTIFICATION

- A. At control, test and drain valves, provide permanently marked identification signs constructed of 18 gauge steel with baked enameled finish. The signs shall be permanently mounted on the piping or wall at the valve, or on the valve, but shall not be hung on the valve with wires or chains which permits easy removal of the sign. The sign shall clearly indicate the valve's purpose and what portion of the structure it serves. Additional signs, shall be provided at each alarm check and dry pipe valve to clearly indicate hydraulic calculation data.

2.4 ADDITIONAL SPRINKLERS AND SPRINKLER GUARDS

- A. Include allowance for providing 5 additional sprinklers with related piping, fittings, hangers installed at locations where job conditions or equipment selections may be required. Provide a credit for sprinklers and guards not installed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The nature of the work requires coordination with other trades. Shop fabrication shall be done at the Contractor's risk. Relocation of piping and components to avoid obstructions may be necessary. Relocation, if required, shall be done at the Contractor's expense. The installation shall be performed in a workmanlike manner as determined by the Owner's Representative and in accordance with the Contract Documents, manufacturer's printed installation instructions, and submitted and Owner's Representative reviewed drawings.
- B. Piping shall not pass directly over electric panelboards, switchboards, motor control centers, and similar electric and telephone equipment. However, protection for these spaces shall be provided.
- C. Piping shall be installed concealed above finish ceiling area with sprinklers located in the center of ceiling tiles where ceiling tiles are used.
- D. Provide a readily removable flushing connection consisting of a cap at each end of cross mains.
- E. Provide sprinkler guards for sprinklers in mechanical and storage spaces, less than 8 ft. above finished floor subject to mechanical damage.
- F. Upright sprinklers directly on branch lines shall be installed with their frame parallel to the piping.
- G. Provide sprinkler protection under ductwork, groups of ductwork and other obstructions to water spray and distribution. Use intermediate level sprinklers if subject to waterspray from above.
- H. Exposed pipe shall be left clean for painting.
- I. Coordinate and activate the systems or portions of the system to operational status as soon as possible.
- J. Temporary heat detectors need to be installed and tested before removal of any sprinklers that will last more than one work shift.

3.2 PIPING, VALVES AND HANGERS

- A. Refer to other applicable sections.
- B. All piping shall be installed to permit drainage of the system through a main drain valve. Where a change in piping direction prevents drainage of the system, auxiliary drains shall be provided. The auxiliary drain assembly shall consist of a lockable ball valve, nipple and cap or plug and shall be located 7 ft. or less above the finished floor. Pipe drain to an accessible location.

3.3 TESTS

A. General:

1. Pipe installation shall be inspected by Owner's Representative prior to being covered by building construction or backfill.
2. Perform tests in a safe manner. Provide written certification that tests have been successfully completed. Use NFPA Above and Below Ground Material and Test Certificate Forms.
3. Correct system leaks prior to final test. Do not utilize water additives, caulking, etc. to correct leaks. Provide appliances, equipment, instruments, devices and personnel.
4. Flushing: Follow Contract Documents and utilize open end pipe sections if possible.
5. Coordinate testing with CU EHS. All new joints to be exposed and pressure gauge to be located within work area.

B. Pressure Tests:

1. Hydrostatic Tests: Tested at 215 PSI and in accordance with NFPA 13 for two (2) hours. Per 25.2.1.1 and 25.2.1.4.2.
 - a. Air test not accepted as final test.
2. Do not subject existing systems to excess pressures.

3.4 SYSTEM TURNOVER

- A. Prior to final acceptance, instruct the Owner's Representative in the proper operation, maintenance, testing, inspection and emergency procedures for all systems furnished, for a period of time as needed. Provide one (1) new original pamphlet of NFPA 25. Indicate in writing to the Owner's Representative the provisions for proper maintenance, testing, and inspection of the systems as required by local fire codes.

END OF SECTION

SECTION 220500

BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 ROUGHING

- A. The Contract Drawings have been prepared in order to convey design intent and are diagrammatic only. Drawings shall not be interpreted to be fully coordinated for construction.
- B. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, interferences, etc. Make necessary changes in contract work, equipment locations, etc., as part of a contract to accommodate work to avoid obstacles and interferences encountered. Before installing, verify exact location and elevations at work site. **DO NOT SCALE** plans. If field conditions, details, changes in equipment or shop drawing information require an important rearrangement, report same to Owner's Representative for review. Obtain written approval for all major changes before installing.
- C. Install work so that items both existing and new are operable and serviceable. Eliminate interference with removal of coils, motors, filters, belt guards and/or operation of doors. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation. Provide new materials, including new piping and insulation for relocated work.
- D. Coordinate work with other trades and determine exact route or location of each duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Obtain from Owner's Representative exact location of all equipment in finished areas, such as thermostat, fixture, and switch mounting heights, and equipment mounting heights. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers, and other items. Do not rough-in contract work without reflected ceiling location plans.
- E. Before roughing for equipment furnished by Owner or in other Divisions, obtain from Owner and other Divisions, approved roughing drawings giving exact location for each piece of equipment. Do not "rough in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment. For equipment and connections provided in this contract, prepare roughing drawing as follows:
 - 1. Existing Equipment: Measure the existing equipment and prepare for installation in new location.

2. New Equipment: Obtain equipment roughing drawings and dimensions, then prepare roughing-in-drawings. If such information is not available in time, obtain an acknowledgement in writing, then make space arrangements as required with Owner's Representative.

1.2 EQUIPMENT AND MATERIAL REQUIREMENTS

- A. Provide materials that meet the following minimum requirements:
 1. Materials shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, in accordance with NFPA 255.
 2. All equipment and material for which there is a listing service shall bear a UL label.
 3. Potable water systems and equipment shall be built according to AWWA Standards.
 4. Gas-fired equipment and system shall meet AGA Regulations and shall have AGA label.
 5. All electrical equipment and systems, as a whole, shall be tested and listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL) for the intended use in accordance with the applicable standards and have a physical label indicating such.

1.3 CONCEALMENT

- A. **Conceal all contract work** above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after their review. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

1.4 CHASES

- A. New Construction:
 1. Certain chases, recesses, openings, shafts, and wall pockets will be provided as part of General Construction Trade. Mechanical and Electrical trades shall provide all other openings required for their contract work.
 2. Check Architectural and Structural Design and Shop Drawings to verify correct size and location for all openings, recesses and chases in general building construction work.
 3. Assume responsibility for correct and final location and size of such openings.
 4. Rectify improperly sized, improperly located or omitted chases or openings due to faulty or late information or failure to check final location.

5. Provide 18 gauge galvanized sleeves and inserts. Extend all sleeves 2 in. above finished floor. Set sleeves and inserts in place ahead of new construction, securely fastened during concrete pouring. Correct, by drilling, omitted or improperly located sleeves. Assume responsibility for all work and equipment damaged during course of drilling. Firestop all unused sleeves.
 6. Provide angle iron frame where openings are required for contract work, unless provided by General Construction trade.
- B. In Existing Buildings:
1. Drill holes for floor and/or roof slab openings.
 2. Multiple pipes smaller than 1 in. properly spaced and supported may pass through one 6 in. or smaller diameter opening.
 3. Seal voids in fire rated assemblies with a fire-stopping seal system to maintain the fire resistance of the assembly. Provide 18 gauge galvanized sleeves at fire rated assemblies. Extend sleeves 2 in. above floors.
 4. In wall openings, drill or cut holes to suit. Provide 18 gauge galvanized sleeves at shafts and fire rated assemblies. Provide fire-stopping seal between sleeves and wall in drywall construction. Provide fire stopping similar to that for floor openings.

1.5 PENETRATION FIRESTOPPING

- A. Fire-Stopping for Openings Through Fire and Smoke Rated Wall and Floor Assemblies:
1. Provide materials and products listed or classified by an approved independent testing laboratory for "Penetration Fire-Stop Systems". The system shall meet the requirements of "Fire Tests of Penetrations Fire-Stops" designated ASTM E814.
 2. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, ductwork and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for drywall construction.
 3. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.
 4. The methods used shall incorporate qualities which permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion, and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.

5. Plastic pipe/conduit materials shall be installed utilizing intumescent collars.
 6. Provide a submittal including products intended for use, manufacturer's installation instructions, and the UL details for all applicable types of wall and floor penetrations.
 7. Fire-stopping products shall not be used for sealing of penetrations of non-rated walls or floors.
- B. Acceptable Manufacturers:
1. Dow Corning Fire-Stop System Foams and Sealants.
 2. Nelson Electric Fire-Stop System Putty, CLK and WRP.
 3. S-100 FS500/600, Thomas & Betts.
 4. Carborundum Fyre Putty.
 5. 3-M Fire Products.
 6. Hilti Corporation.

1.6 ACCESS PANELS

- A. Provide access panels for required access to respective trade's work. Location and size shall be the responsibility of each trade. Access panels provided for equipment shall provide an opening not smaller than 22 in. by 22 in. Panels shall be capable of opening a minimum of 90 degrees. Bear cost of construction changes necessary due to improper information or failure to provide proper information in ample time. Access panels over 324 square inches shall have two cam locks. Provide proper frame and door type for various wall or ceiling finishes. Access panels shall be equal to "Milcor" as manufactured by Inland Steel Products Co., Milwaukee, Wisconsin. Provide General Construction trade with a set of architectural plans with size and locations of access panels.

1.7 CONCRETE BASES

- A. Provide concrete bases for all floor mounted equipment. Provide 3,000 lb. concrete, chamfer edges, trowel finish, and securely bond to floor by roughening slab and coating with cement grout. Bases 4 in. high (unless otherwise indicated); shape and size to accommodate equipment. Provide anchor bolts in equipment bases for all equipment provided for the project, whether mounted on new concrete bases or existing concrete bases.

1.8 HVAC EQUIPMENT CONNECTIONS

- A. Contractor is responsible for draining, filling, venting, chemically treating and restarting any systems which are affected by work shown on the Contract Documents unless specifically noted otherwise.

- B. Provide final hot water connections to all equipment as required by the equipment. Provide final connections, including domestic water piping, wiring, controls, and devices from equipment to outlets left by other trades. Provide equipment waste, drip, overflow and drain connections extended to floor drains.
- C. Provide for Owner furnished and Contractor furnished equipment all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, insulation, sheet metal work, controls, dampers, as required.
- D. Refer to manufacturer drawings and specifications for requirements of special equipment. Verify connection requirements before bidding.

1.9 PLUMBING EQUIPMENT CONNECTIONS

- A. Contractor is responsible for draining, filling, venting, chemically treating and restarting any systems which are affected by work shown on the Contract Documents unless specifically noted otherwise.
- B. Provide roughing and final water, waste, vent connections to all equipment. Provide loose key stops, sanitary "P" traps, tailpiece, adapters, gas or air cocks, and all necessary piping and fittings from roughing point to equipment. Provide installation of sinks, faucets, traps, tailpiece furnished by others. Provide cold water line with gate valve and backflow prevention device at locations called for. Provide continuation of piping and connection to equipment that is furnished by others. Provide relief valve discharge piping from equipment relief valves.
- C. Provide valved water outlet adjacent to equipment requiring same. Provide equipment type floor drains, or drain hubs, adjacent to equipment.
- D. Install controls and devices furnished by others.
- E. Refer to Contract Documents for roughing schedules, and equipment and lists indicating scope of connections required.
- F. Provide for Owner furnished and Contractor furnished equipment all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, as required.
- G. Refer to Manufacturer drawings and specifications for requirements of kitchen equipment and special equipment. Verify connection requirements before bidding.

1.10 ELECTRICAL EQUIPMENT CONNECTIONS

- A. Provide complete power connections to all electrical equipment. Provide control connections to equipment. Heavy duty NEC rated disconnect ahead of each piece of equipment. Ground all equipment in accordance with NEC.
- B. Provide for Owner furnished and Contractor furnished equipment all power wiring, electric equipment, control wiring, switches, lights, receptacles, and connections as required.

- C. Refer to Manufacturer's drawings/specifications for requirements of kitchen equipment and special equipment. Verify connection requirements before bidding.

END OF SECTION

SECTION 220523

VALVES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Document.

1.2 SUBMITTALS

- A. Submit manufacturer's data in accordance with Basic Mechanical and Electrical Requirements. Obtain approval prior to ordering material.
- B. Provide submittals for all items specified under Part 2 of this section.

PART 2 - PRODUCTS

2.1 VALVES - GENERAL

- A. Valves shall have following requirements:
 - 1. Working pressure stamped or cast on bodies.
 - 2. Stem packing serviceable without removing valve from line.
 - 3. All items here-in used to convey water for potable use shall be lead free in accordance with NSF Standard, Standard 61, Section 9 - Standard for Drinking Water and Lavatory Faucets and NSF Standard 372 - Maximum Lead Requirements. Compliance shall be via third party testing and certification.
 - 4. These valves and fittings shall not be used on campus.
 - a. Dielectric Fittings
 - b. Automatic control valves
 - c. Combinations devises such a manual balance/control/ball isolation valves, Y-strainer/ball valves, balancing/shutoff valves, ball/drain valves.
 - d. Triple duty valves
- B. Acceptable Manufacturers:
 - 1. Balance Valves: Armstrong and Bell & Gossett
 - 2. Ball Valves: Apollo, Nibco, Watts.
 - 3. Gate and Check Valves: Nibco, Watts.

4. To establish a standard of quality and identify features, certain manufacturer's numbers are given in the following paragraphs.

2.2 DOMESTIC WATER VALVES

A. Check Valves:

1. 2 in. and Smaller: Lead-free swing check with silicone bronze body, bonnet and trim, PTFE disc seat and stainless steel seat disc washer, 200 psi working pressure, Nibco T-413-Y-LF (threaded) or Nibco's S-413-Y-LF (solder).

B. Ball Valves:

1. For all water services, ball valves shall be:
 - a. Body Lead Free Bronze
 - b. Body Style Full Port, 2 piece
 - c. Connection Threaded
 - d. Trim 316 Stainless Steel Ball and Stem, with stem extension to raise handle out of insulation
 - e. Seat Reinforced Teflon (RTFE), 15% glass filled double seal
 - f. Seat Working P/T Rating 300 psig @ 250°F Minimum
 - g. Body Working P/T Rating 300 psig @ 300°F Minimum
 - h. WOG Rating 300 psig Minimum
 - i. Lead free
 - j. Lever Handle
 - k. Design Basis Apollo 77CLF-1401, Nibco T-585-66LF, Watts LFB6080-G2-SS

C. Balance Valves:

1. 2 in. and Smaller: Lead-free, brass body, chrome plated brass ball, glass and carbon filled PTFE seat rings, Viton packing, threaded or solder ends, differential readout ports, calibrated nameplate and memory stop indicator rated for 125 psi; and pre-formed insulation to permit access for balancing and readout; Watt Series LFCSM-61-S.
 - a. Balance valve sizes shall be based upon gpm range rather than pipe size.

Balance Valve Size	GPM Range
1/2 in.	Up to 2.5
3/4 in.	2.5 - 4.5
1 in.	4.5 - 10
1-1/4 in.	10 - 15
1-1/2 in.	15 - 30
2 in.	30 - 60

D. Pressure Reducing Valves:

1. Direct Operated for Cold Water Service:

- a. Bronze body construction, renewable stainless steel seat, reinforced Buna-N diaphragm and valve disc integral strainer, adjustable reduced pressure range, for dead end service.
- b. Acceptable Manufacturers: Watts Series #223, Cash, Spence or approved equal.

2. Direct Operated for Hot Water Service:

- a. Water Wash Hoods: Same as cold water except with built-in by-pass option; outlet set at 40 psi, rated at 160°F.
- b. Dishwashers: Same as cold water except with low pressure range and built-in by-pass option; outlet set at 22 psi, rated at 200°F.
- c. Acceptable Manufacturers: Watts Series #223, Cash, Spence or approved equal.

E. Valves for Gauges and Instruments:

1. Use ball valve

F. Hose Thread Drain Valves:

1. Ball valve, lead free bronze body, full port, two-piece, threaded connections, 316 SS stem and ball; Apollo: 70LF-140-HC, Nibco: T-585-66-LF-HC.

2.3 SANITARY DRAINAGE VALVE

A. Gate Valves:

1. 2 in. and Smaller: Bronze, solid wedge disc, rising stem, 125 SWP; Milwaukee 1152 (threaded ends, union bonnet) or Milwaukee 149 (sweat ends, threaded bonnet.)

- B. Check Valves:
 - 1. 2-1/2 in. and Smaller: Cast iron body, epoxy coated, sinking ball type check, two bolt access cover for cleanout, replaceable Buna-N valve seat; Flomatic Model 508, or GA Industries.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide all shutoff, check, balancing and other type valves as indicated, as required by Code and as required for proper system maintenance, isolation and safety. Provide at major building and systems sections. Provide shutoff valves on all branch lines serving two fixtures or more, at all equipment, fixtures, before and after automatic control valves, and at future connections.
- B. Locate valves for easy access and provide separate support where necessary. Install valves with stems at or above the horizontal position. Install swing check valves in horizontal position with hinge pin level.
- C. Provide drain valves with hose thread connections on all equipment. Provide hose thread drain valves at all low points to enable complete drainage of all piping systems including, water mains, branches, at base of vertical risers and at strainers.
- D. Provide shutoff valve and wye-strainer before all automatic control valves and pressure reducing valves.
- E. Inspect valves for proper operation before installation. Install underground valve boxes vertically over each valve. Adjust top of box to proper grade. Immediately backfill with crushed stone and carefully tamp into place. Unless otherwise noted, leave in the open position.

3.2 DOMESTIC WATER SYSTEM

- A. Install balance valves in each hot water circulation branch and where noted.

END OF SECTION

SECTION 220553

PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 QUALIFICATIONS

- A. All identification devices shall comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles.

1.3 SUBMITTALS

- A. Submit manufacturer's technical product data and installation instructions for each identification material and device. Submit valve schedule for each piping system typewritten on an 8-1/2 in. x 11 in. paper (minimum), indicating valve number, location and valve function. Submit schedule of pipe, equipment and name identification for review before stenciling or labeling.

1.4 MAKES

- A. Allen Systems, Inc., Brady (W.H.) Co.; Signmark Div., Industrial Safety Supply Co., Inc., Seton Name Plate Corp.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide manufacturer's standard products of categories and types required for each application. In cases where there is more than one type specified for an application, selection is installer's option, but provide single selection for each product category.
- B. All adhesives used for labels in the interior of the building shall comply with the maximum Volatile Organic Compound (VOC) limits as called for in the current version of U.S. Green Building Council LEED Credits EQ 4.1 and EQ 4.2.
- C. For work within an existing building, the mechanical identification shall meet the intent of this section, but match the Owner's existing identification symbology.

2.2 PIPING IDENTIFICATION

A. Identification Types:

1. Pressure Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color coded, pressure sensitive vinyl pipe markers complying with ANSI A13.1. Provide a 360° wrap of flow arrow tape at each end of pipe label.
2. Snap-On Type: Provide manufacturer's standard pre-printed, semi rigid snap-on, color coded pipe markers, complying with ANSI-A13.1.
3. Stencil Paint: Apply black or yellow stencil paint directly to covering or bare pipe; color to contrast with background. Stencil as follows:

O.D. PIPE OR COVERING	SIZE STENCIL LETTER
3/4 in., 1 in., 1-1/4 in.	1/2 in.
1-1/2 in., 2 in.	3/4 in.
2-1/2 in. and over	1-1/4 in.

B. Lettering:

1. Piping labeling shall conform to the following list: **[Edit list as required.]**

PIPE FUNCTION	IDENTIFICATION
Cold Water	DOMESTIC COLD WATER
Hot Water	DOMESTIC HOT WATER
Hot Water Recirculating	DOMESTIC HOT WATER RECIRCULATING
Sanitary Waste	SANITARY WASTE
Indirect Waste	INDIRECT WASTE
Storm	STORM
Vent	VENT
Pump Discharge	PUMP DISCHARGE

2.3 VALVE IDENTIFICATION

A. Valve Tags:

1. Standard brass valve tags, 2 in. diameter with 1/2 in. high black-filled numerals. Attach to valve with brass jack chain and "S" hook. Identify between heating and plumbing services with 1/4 in. letters above the valve number.
2. Acceptable Manufacturers: Seton Style No. M4507, or approved equal.

B. Valve Chart:

1. Provide valve chart for all valves provided as a part of this project. Frame and place under clear glass. Mount in Mechanical Room.

2.4 EQUIPMENT IDENTIFICATION

A. General:

1. Provide engraved vinyl nameplates for each major piece of mechanical equipment provided, 2-1/2 in. x 3/4 in. size.
2. Acceptable Manufacturers: Seton Style No. M4562, or approved equal.

2.5 ABOVE CEILING EQUIPMENT LOCATOR

- A. 3/4 in. diameter adhesive stickers placed on ceiling grid and color-coded.
- B. The color for all plumbing valves shall be BLUE.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide valve tags for all valves provided on project.
- B. Provide equipment tags for all equipment provided on project.
- C. Provide piping identification with directional flow arrows for all piping on project, maximum intervals of 20'-0". For piping installed through rooms, provide at least one (1) pipe label in each room, for each pipe function.

END OF SECTION

SECTION 220700

INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTAL

- A. Shall include product description, manufacturer's installation instructions, types and recommended thicknesses for each application, and location of materials.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Insulation, jackets, adhesive, and coatings shall comply with the following:
 - 1. Treatment of jackets or facing for flame and smoke safety must be permanent. Water-soluble treatments not permitted.
 - 2. Insulation, including finishes and adhesives on the exterior surfaces of pipes and equipment, shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less.
 - 3. Asbestos or asbestos bearing materials are prohibited.
 - 4. Comply with 2015 International Energy Conservation Code as amended by Part 1 of the 2016 Supplement to the New York State Energy Conservation Code.
 - 5. All adhesives and sealants used for insulation in the interior of the building shall comply with the maximum Volatile Organic Compound (VOC) limits as called for in the current version of U.S. Green Building Council LEED Credits EQ E4.1 and EQ E4.2.
 - 6. Provide materials which are the standard products of manufacturers regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least two (2) years prior to bid opening. Provide insulation systems in accordance with the approved MICA or NAIMA Insulation Standards.
 - 7. Insulation shall be clearly marked with manufacturer's name, identification of installed thermal resistance (R) value, out-of-package R value, flame spread and smoke developed indexes in accordance with Energy Code requirements.

2.2 ACCEPTABLE MANUFACTURERS

- A. Fiberglass: Knauf, Johns Manville, Owen-Corning, Certainteed
- B. Adhesives: Childers Products, Foster.

2.3 PIPE INSULATION (RIGID FIBERGLASS TYPE)

- A. Product meeting ASTM C 547, ASTM C 585, and ASTM C 795; rigid, molded, noncombustible.
- B. 'K' Value: ASTM C 335, 0.23 at 75°F mean temperature. Maximum Service Temperature: 1000°F.
- C. Vapor Retarder Jacket: ASJ/SSL conforming to ASTM C 1136 Type I, secured with self-sealing longitudinal laps and butt strips.
- D. Field-Applied PVC Fitting Covers with Flexible Fiberglass Insulation: Proto Corporation 25/50 or Indoor/Outdoor, UV-resistant fittings, jacketing and accessories, white or colored. Fitting cover system shall consist of pre-molded, high-impact PVC materials with blanket type fiberglass wrap inserts. Blanket fiberglass wrap inserts shall have a thermal conductivity ('K') of 0.26 at 75°F mean temperature. Closures shall be stainless steel tacks, matching PVC tape, or PVC adhesive per manufacturer's recommendations.
- E. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in pre-forming insulation to cover valves, elbows, tees, and flanges.

2.4 FIELD-APPLIED JACKETS

- A. Piping:
 - 1. PVC Pipe Jacket: High-impact, ultraviolet-resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming. Adhesive: As recommended by insulation material manufacturer. PVC Jacket Color: White.

2.5 COATINGS, MASTICS, ADHESIVES AND SEALANTS

- A. Lagging Adhesives: Used in conjunction with canvas or glass lagging cloth to protect equipment/piping indoors. Foster 30-36 Sealfas; Childers CP-50AMV1 Chil Seal, or approved equal.
- B. Fiberglass Adhesive: Used bond low density fibrous insulation to metal surfaces. Shall meet ASTM C916 Type II. Foster 85-60; Childers CP-127, or approved equal.
- C. Insulation Joint Sealant: Used as a vapor sealant on below ambient piping with polyisocyanurate and cellular glass insulation. Foster 95-50; Childers CP-76, or approved equal.

2.6 PIPE SUPPORT INSULATION INSERTS

- A. 20 lbs./cu. ft. molded fiberglass, for -120°F to +450°F service temperature, non-combustible, 0.30 thermal conductivity (k), same thickness as pipe insulation.
- B. Acceptable Manufacturers: Hamfab "H" Block, or approved equal.

2.7 MATERIALS AND SCHEDULES

- A. See Exhibits at the end of this section.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. All materials shall be installed by skilled labor regularly engaged in this type of work. All materials shall be installed in strict accordance with manufacturer's recommendations, building codes, and industry standards.
- B. Locate insulation and cover seams in the least visible location. All surface finishes shall be extended in such a manner as to protect all raw edges, ends and surfaces of insulation. No glass fibers shall be exposed to the air.
- C. All pipe insulation shall be continuous through hangers, sleeves, walls, ceiling, floor, or roof openings, unless not allowed by fire stop system. Refer to Sections 220500, "Basic Plumbing Requirements" and 221010, "Piping Systems and Accessories" for firestop systems.
- D. Provide thermal insulation on clean, dry surfaces and after piping and equipment (as applicable) have been tested. Do not cover pipe joints with insulation until required tests are completed.
- E. All cold surfaces that may "sweat" must be insulated. Vapor barrier must be maintained; insulation shall be applied with a continuous, unbroken moisture and vapor seal. All hangers, supports, anchors, or other projections that are secured to cold surfaces shall be insulated and vapor sealed to prevent condensation. Cover valves, fittings and similar items in each piping system with insulation as applied to adjoining pipe run. Extra care must be taken on piping appurtenances to insure a tight fit to the piping system. For piping systems with fluid temperatures below ambient, all vapor retarder jacket (ASJ) seams must be coated with vapor barrier coating. All associated elbows, fittings, valves, etc. must be coated with vapor barrier coating and reinforcing mesh to prevent moisture ingress. Valve extension stems require Elastomeric insulation that is tight fitting to the adjoining fiberglass system insulation. Pumps, strainers, drain valves, etc. must be totally encapsulated with Elastomeric insulation.
- F. Items such as manholes, handholds, clean-outs, plugged connections, pet cocks, air vents, ASME stamp, and manufacturers' nameplates, may be left un-insulated unless omitting insulation would cause a condensation problem. When such is the case, appropriate tagging shall be provided to identify the presence of these items. Provide neatly beveled edges at interruptions of insulation.

- G. Provide protective insulation as required to prevent personal injury.
- H. All pipes shall be individually insulated.
- I. If any insulation material becomes wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site.
- J. All exposed surfaces shall be white, unless noted otherwise.

3.2 PIPE INSULATION

- A. Insulate piping systems including fittings, valves, flanges, unions, strainers, and other attachments installed in piping system, whether exposed or concealed.
- B. Insulation installed on piping operating below ambient temperatures must have a continuous vapor retarder. All joints, seams and fittings must be sealed. Insulation shall be continuous through hangers on all water piping and storm water piping.
- C. Hanger Shields: Refer to Section 221010 "Piping Systems and Accessories".
- D. Hanger shields shall be installed between hangers or supports and the piping insulation. Rigid insulation inserts shall be installed as required between the pipe and the insulation shields. Inserts shall be of equal thickness to the adjacent insulation and shall be vapor sealed as required.
 - 1. Pre-Insulated Type: Butt insulation to hanger shields and apply a wet coat of vapor barrier cement to the joints and seal with 3 in. wide vapor barrier tape.
 - 2. Field Insulated Type: Provide Hamfab Co. "H" blocks per manufacturers recommended spacing between pipe and shield.
 - 3. Tape shields to insulation.
- E. Joints in section pipe covering made as follows:
 - 1. All ends must be firmly butted and secured with appropriate butt-strip material. On high-temperature piping, double layering with staggered joints may be appropriate. When double layering, the inner layer should not be jacketed.
 - 2. Standard: Longitudinal laps and butt joint sealing strips cemented with white vapor barrier coating, or factory supplied pressure sensitive adhesive lap seal.
 - 3. Vapor Barrier: For cold services, Longitudinal laps and 4 in. vapor barrier strip at butt joints shall be sealed with white vapor barrier coating. Seal ends of pipe insulation at valves, flanges, and fittings with white vapor barrier coating.

- F. Fittings, Valves and Flanges:
 - 1. Domestic Hot and Cold Water: Premolded fitting insulation of the same material and thickness as the adjacent pipe insulation.
 - 2. White PVC jacketing, with continuous solvent weld of all seams. Tape all fittings.
- G. Apply PVC jacket where indicated, with 1 in. overlap at longitudinal seams and end joints. Seal with manufacturers recommended adhesive.
- H. Apply PVC jacketing to exposed insulated pipe, valves, fittings, and specialties, at an elevation of 8 feet or less above finished floor in mechanical/electrical rooms, penthouses, and services aisles/pipe chases. Fittings of aluminum-jacketed piping may be either aluminum or standard PVC fitting covers. Jacketing for piping in existing areas shall match existing jacketing.
- I. Piping in exterior walls, spaces, overhangs, attics, or where subject to freezing: Insulate pipe with double the thickness called for. Piping in wall chases: In addition to the above, pack chase with loose glass fiber insulation.
- J. Provide insulation on exposed hot and cold plumbing piping to within 18 in. of fixture or equipment connection.
- K. Insulate exposed domestic water and waste piping for plumbing fixtures designated for use by the handicapped.

3.3 EXISTING INSULATION

- A. Patch existing insulation damaged during the course of the work.
- B. Insulate existing piping and equipment as called for.
- C. Jacketing for piping in existing areas shall match existing jacketing.
- D. Reinsulate piping that was abated.

EXHIBIT "I" - PIPE INSULATION MATERIALS

<u>SERVICE</u>	<u>INSULATION MATERIAL</u>	<u>THICKNESS</u>	<u>REMARKS</u>
Domestic cold water	Glass fiber	1-1/2 in. and larger: 1 in. 1-1/4 in. and smaller: 1 in.	
Domestic hot, tempered and circulation water (105°F - 140°F)	Glass fiber	1-1/2 in. and larger: 1-1/2 in. 1-1/4 in. and smaller: 1 in.	
AC unit drains, overflows and indirect waste piping associated with any HVAC equipment	Glass fiber	All sizes: 1/2 in.	

END OF SECTION

SECTION 221010

PIPING SYSTEMS AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

- A. Provide a schedule of pipe materials, fittings and connections.
- B. Provide a detailed matrix listing the specific UL approved firestop system assembly to be used for each type of piping provided and each type of construction to be penetrated along with all associated UL assembly details.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pipe and fittings shall be new, marked with manufacturer's name and comply with applicable ASTM and ANSI Standards.
- B. All items here-in used to convey water for potable use shall be lead free in accordance with NSF, Standard 61, Section 9 - Standard for Drinking Water and Lavatory Faucets and NSF Standard 372 - Maximum Lead Requirements. Compliance shall be via third party testing and certification.

2.2 STEEL PIPING AND FITTINGS

- A. Pipe: ASTM A53, or ASTM A106 seamless, Schedule 40 or Schedule 80 weight; black or galvanized finish as called for; ends chamfered for welding or grooved for grooved mechanical connections.
- B. Fittings: Same material and pressure class as adjoining pipe.
 - 1. Welded fittings: Factory forged, seamless construction, butt weld type chamfered ends. Where branch connections are two or more sizes smaller than main size, use of "Weldolets", "Thredolets" or "Sokolets" acceptable. Mitered elbows, "shaped" nipples, and job fabricated reductions not acceptable unless specifically called for. Socket weld type, 2000 psi wp, where called for.
 - 2. Threaded fittings: Cast or malleable iron, black or galvanized, as called for; drainage type where called for; UL listed and FM approved for fire protection systems. Street type 45° and 90° elbows are not acceptable.

- C. Flanges, Unions, and Couplings:
 - 1. Threaded Connections:
 - a. Flanges: Cast iron companion type; for sizes 2-1/2 in. and larger.
 - b. Unions: Malleable iron, bronze to iron seat, 300 lb. wwp; for sizes 2 in. and smaller.
 - c. Couplings: Malleable iron. Steel thread protectors are not acceptable as couplings.
 - 2. Welded Connections:
 - a. Flanges: Welding neck type. Slip-on type not allowed unless noted and shall not be installed in conjunction with butterfly valves.
- D. Gauge and Instrument Connections: Nipples and plugs for adapting gauges and instruments to piping system shall be IPS brass.

2.3 COPPER TUBE AND FITTINGS

- A. Pipe: ASTM B88; Type K or L, hard temper. Soft temper only as called for. Plans show copper tube sizes.
- B. Fittings: Wrought copper and copper alloy, ASME B16.22 or cast copper alloy, ASME B16.18; solder end connections.
- C. Joints: Comply with the requirements of ASTM B828.
- D. Unions and Flanges: 2 in. and smaller use unions, solder type, cast bronze, ground joint, 150 lb. swp; 2-1/2 in. and over use flanges, cast bronze, companion type, ASME drilled, solder connection, 150 lb. swp.
- E. Flux Materials: Flux shall comply with ASTM B813 and the provisions of the New York State Plumbing Code.
- F. Solder Materials: No-lead solder, using alloys made from tin, copper, silver and nickel. Harris, Inc., "Stay-Safe 50" and "Bright", Engelhard "Silvabright 100", Canfield "Watersafe" or approved equal.
- G. Brazing Materials: Class BcuP-5 for brazing copper to brass, bronze to copper. Harris, Inc. "Stay-Silv 15" or approved equal.

2.4 COPPER DRAINAGE TUBE AND FITTINGS

- A. Pipe: ASTM B306, Type DWV, hard temper.
 - 1. Copper not allowed for urinal waste.

- B. Fittings: Wrought copper, ANSI B16.29 or cast bronze, ANSI B16.23; solder end connections.
- C. Flux Materials: Flux shall comply with ASTM B813 and the provisions of the New York State Plumbing Code.
- D. Solder Materials: No lead solder, using alloys made from tin, copper, silver and nickel.
- E. Acceptable Manufacturers: Harris, Inc., "Stay-Safe 50" and "Bright", Engelhard "Silvabright 100", Canfield "Watersafe", or approved equal.

2.5 NO-HUB CAST IRON SOIL PIPE AND FITTINGS

- A. Pipe: ASTM A888, CISPI Standard 301, no-hub cast iron, bitumen coated.
 - 1. For above grade only.
- B. Fittings: Cast iron, no-hub drainage pattern, bitumen coated.
- C. Couplings:
 - 1. 1-1/2 in. to 2 in.: CISPI standard 310 with 300 series stainless steel corrugated shield and clamp assembly with ASTM C564 neoprene sealing sleeve (or) same as specified for 3 in. and larger.
 - 2. 3 in. and Larger: 24 gauge, Type 304 stainless steel housing clamp assembly with ASTM C564 neoprene sealing sleeve, 60 in. lbs. minimum torque rating, shall meet requirements of pipe manufacturer and shall be compatible with specified pipe. Acceptable Manufacturers: Clamp-All Coupling System, Tyler "Wide Body", Husky "Series 2000", Mission "Heavy Weight" or approved equal.
- D. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

2.6 SPECIAL FITTINGS

- A. Cast Iron to Lead Pipe: Red brass ferrules and wiped joints. Caulk ferrule into cast iron hub.
- B. Copper to Cast Iron: Cast bronze, cast iron to sweat adapter.
- C. Copper to Steel Piping:
 - 1. Cast bronze copper to iron male or female adapter with shoulder for drainage piping only.
 - 2. Dielectric pipefittings.
- D. Steel to Cast Iron: Cast iron soil pipe connector with spigot and IPS male thread end (Manhoff fittings).

- E. No-Hub, Cast Iron, Glass, Polypropylene or High Silicon Cast Iron: Proper adapter to piping being connected.
- F. Cast Iron and PVC Solvent: Aerators and deaerators as manufactured by Conine Manufacturing Co., Inc.

2.7 DIELECTRIC PIPE FITTINGS

- A. Description: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.
- B. Nipples: Factory fabricated, for 250 psi minimum working pressure at 180°F, threaded ends, insulating material suitable for system fluid, pressure and temperature.
- C. Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300 psig minimum pressure to suit system fluid pressures and temperatures with flange insulation kits and bolt sleeves.
- D. Acceptable Manufacturers: EPCO, Capitol Manufacturing, Watts or approved equal.

2.8 HANGERS, INSERTS AND SUPPORTS

- A. Hangers, Inserts, Clamps: B-Line, Grinnell, Michigan Hanger, PHD Manufacturing.
- B. Hangers:
 - 1. Adjustable, wrought malleable iron or steel with electroplated zinc or cadmium finish. PVC coated where in contact with copper piping.
 - 2. Adjustable ring type where piping is installed directly on hanger for piping 3 in. and smaller.
 - 3. Adjustable steel clevis type for piping 4 in. and larger.
 - 4. Nuts, washers and rods with electroplated zinc or cadmium finish.
 - 5. Provide hot dipped galvanized finish for hangers and accessories installed in exterior locations and interior areas with moist environment conditions such as pools, pool filter rooms, areaways, garages and similar areas.
- C. Spacing Schedule:

Pipe Size	Steel	Copper	Plastic	Cast Iron	Rod Size
3/4 in. to 1 in.	8 ft.	6 ft.	3 ft.	Each Horizontal Joint 5 ft. Maximum O.C.	3/8 in.
1-1/4 in. to 2 in.	10 ft.	6 ft.	3 ft.		3/8 in.
2-1/2 in. to 4 in.	12 ft.	10 ft.	4 ft.		1/2 in.
5 in. and over	12 ft.	10 ft.	4 ft.		5/8 in.
8 in.	12 ft.	10 ft.	4 ft.		3/4 in.
Over 8 in.	To suit loading conditions.				

D. Cast Iron No-Hub Supports:

1. In accordance with manufacturer's recommendations.
2. Vertical piping supported at each stack base, at each floor and 15 ft. on center, maximum. Freestanding vertical pipe should be adequately staked or braced during construction to maintain alignment. Bases of stacks shall be supported on concrete, brick laid in cement mortar, metal brackets attached to the building construction or by other methods approved by the Owner's Representative.
3. Horizontal piping supported within 24 in. each side of the coupling joint at 10 ft. intervals for 10 ft. pipe lengths and at 5 ft. intervals for 5 ft. pipe lengths. Supports or hangers placed to maintain alignment and grade with provision made to prevent shear. Greater than 3 in. diameter pipe braced at changes of direction to prevent horizontal movement.

E. Beam Attachments:

1. C-Clamp style, locknut, restraining strap, electroplated finish, UL listed, FM approved for pipe sizes 2 in. and smaller.
2. Center loaded style with clamp attachments that engage both edges of beam, electroplated finish, UL listed, FM approved, for pipe sizes larger than 2 in., refer to "Supports" for additional requirements.
3. Inserts: Carbon steel body and square insert nut, galvanized finish, maximum loading 1300 lbs., for 3/8 in. to 3/4 in. rod sizes, reinforcing rods on both sides, MSS-SP-69 Type 19 or approved equal.

F. Supports:

1. Provide intermediate structural steel members where required for hanger attachment. Members shall span across the bar joists at panel points of joists. Secure member to structure. Select size of members based on a minimum factor of safety of four.
2. For Weights Under 1000 lbs.: "Drill-In" inserts, "U" shaped Channel, beam clamps or other structurally reviewed support. The factor of safety shall be at least four. Follow manufacturer's recommendations.
3. For Metal Decks: Drill hole through for hanger rods and imbed a welded plate in concrete or use devices designed for this application, with a safety factor of four.
4. Acceptable Manufacturers: Hilti, ITW Ramset, Phillips "Red Head" or approved equal.

G. Trapeze Hangers:

1. For plumbing systems only.

2. Hangers shall be supported with rod sized with a safety factor of four.
3. May be manufactured type "U" shaped channel, or suitable angle iron or channel. Round off all sharp edges.
4. Securely fasten piping to trapeze with "U" bolt or pipe clamps, dissimilar metals shall not touch, use isolation gaskets, similar to HoldRite strut-mounted cushion clamps. Fasten piping to trapeze at every third support, except uninsulated piping which shall be fastened at every support using strut-mounted cushion clamps.
5. Acceptable Manufacturers: B-Line, HoldRite, Kindorf, Unistrut or approved equal.

H. Cabinet Pipe Space Supports:

1. Piping below casework countertops within space behind cabinet shall be supported using continuous slot metal channels with pipe clamps.
2. Acceptable Manufacturers: B-Line, Kindorf, Unistrut or approved equal.

I. Hanger Insulation Shields:

1. Hanger insulation shields shall be provided for all water and storm water piping. Hangers shall attach directly to pipe for all remaining services.
2. Piping 2 in. and Smaller: Pipe insulated with glass fiber insulation shall be protected at point of support by a sheet metal shield. Shield shall be #18 gauge, galvanized steel, minimum 120 degree arc, formed to fit insulation thickness and 12 in. long. Tape shields to pipe insulation.
3. Piping 3 in. and Larger: Pipe insulated with glass fiber insulation shall be protected at point of support by a sheet metal shield and pipe support insulation insert(s) between pipe and hanger. Shield shall be #18 gauge, galvanized steel, minimum 120 degree arc, formed to fit insulation thickness and 12 in. long. Tape shields to pipe insulation. Provide temporary blocking to maintain proper spacing for insulation.

J. Provide continuous support for unpigmented polypropylene piping.

K. Piping systems with material not listed above shall be supported and protected in accordance with manufacturer's recommendations.

2.9 PIPING ACCESSORIES

- A. Escutcheon Plates: Steel or cast brass, split hinge type with setscrew, high plates where required for extended sleeves. Chrome plated in finished areas and at plumbing fixtures.
- B. All cleanout plugs, bushings and nipples, required for instruments and gauges shall be brass.

2.10 SLEEVES

A. Standard Type:

1. Schedule 40 black steel pipe sleeves for structural surfaces, two pipe sizes larger than the pipe, and as recommended by the sealing element manufacturer. Provide full circle water stop collar for sleeves located within below grade walls, wet wells and waterproofed surfaces. The collar shall be fabricated from steel plate and welded to the sleeve around its entire circumference.

2.11 SEALING ELEMENTS

A. Expanding neoprene link type, watertight seal consisting of interlocking links with zinc plated bolts.

1. Acceptable Manufacturers: Thunderline "Link-Seal" Series 200, 300 or 400, Pyropac, Calipco.

2.12 FIRESTOP SYSTEM FOR OPENINGS THROUGH FIRE RATED WALL AND FLOOR ASSEMBLIES

- ### A.
- Materials for firestopping seals shall be listed by an approved independent testing laboratory for "Through-Penetration Firestop Systems". The system shall meet the standard fire test for Through-Penetration Firestop Systems designated ASTM E814. Firestop system seals shall be provided at locations where piping pass through fire rated wall, floor/ceiling, or ceiling/roof assembly. Minimum required fire resistant ratings of the assembly shall be maintained by the Firestop System. Installation shall conform with the manufacturer's recommendations and other requirements necessary to meet the testing laboratory's listing for the specific installation.

2.13 STACK SLEEVE

- ### A.
- Cast iron body with caulking recess, flashing clamp and under deck clamp.
- ### B.
- Acceptable Manufacturers: Jay R. Smith Series 1720, Zurn, Wade.

2.14 PIPING MATERIALS AND SCHEDULE

- ### A.
- See Exhibit "A", "Schedule of Piping Materials" at end of this Section for (Plumbing) piping.
- ### B.
- See Exhibit "B", "Testing" at end of this Section.

PART 3 - EXECUTION

3.1 EQUIPMENT AND SYSTEMS

- ### A.
- Install equipment and systems in accordance with provisions of each applicable Section of these Specifications, and Local/State Codes/Regulations having jurisdiction. Accurately establish grade and elevation of piping before setting sleeves.

Install piping without springing or forcing, except where specifically called for, making proper allowance for expansion and anchoring. Changes in sizes shall be made with reducing fittings. Reducing couplings are not acceptable. Arrange piping at equipment with necessary offsets, unions, flanges, and valves, to allow for easy part removal and maintenance. Offset piping and change elevation as required to coordinate with other work. Avoid contact with other mechanical or electrical systems. Provide adequate means of draining and venting units, risers, circuits and systems. Conceal piping unless otherwise called for. Copper tubing shall be cut with a wheeled tubing cutter or other approved copper tubing cutter tool. The tubing must be cut square to permit proper joining with the fittings. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction. Install piping parallel with lines of building, properly spaced to provide clearance for insulation. Make changes in direction and branch connections with fittings. Do not install valves, unions and flanges in inaccessible locations. Materials within a system and between systems shall be consistent. If this is not possible, install dielectric fittings.

3.2 PIPING OVER ELECTRICAL EQUIPMENT

- A. Contractor shall route piping to avoid installation directly over electric equipment, including, but not limited to panels, transformers, disconnects, starters, motor control center, adjustable speed drives and fused switches.
- B. Piping shall not be installed in the dedicated electric and working space as defined by NEC 110. Dedicated electrical space is generally equal to the depth and width of electrical equipment, and extends 6 ft. above the electrical equipment, or to a structural ceiling. Dedicated working space is a minimum of 30 in. wide or the width of equipment (whichever is larger) a minimum of 6 ft.-6 in. tall, with a depth of 3ft. to 9 ft. depending on the voltage.

3.3 HANGERS, INSERTS AND SUPPORTS

- A. Piping shall not be supported by wires, band iron, chains, from other piping, or by vertical expansion bolts. Support piping with individual hangers from concrete inserts, wood construction, welded supports, or beams clamps of proper configuration and loading design requirements for each location; replace if not suitable. Follow manufacturer's safe loading recommendations. Suspend with rods of sufficient length for swing and of size called for, using four (4) nuts per rod. Provide additional structural steel members, having one coat rustproof paint, where required for proper support. Provide oversized hangers where insulation/supports must pass between pipe and hanger. Provide continuous support or extra supports for plastic piping per manufacturer's requirements. Hangers, when attached to joists, shall only be placed at the top or bottom chord panel point. Only concentric type hangers are permissible on piping larger than 2-1/2 in.; "C" types are permitted for piping 2 in. and smaller on joists. Provide riser clamps for each riser at each floor. Use trapeze hangers where a group of piping can be installed.
- B. Provide a pipe hanger within 12 inches of pipe unions and piping connections to equipment, in order to facilitate disconnections of piping without pipe sagging.

3.4 PIPE CONNECTIONS

- A. No-Lead Solder Connections: Nonacid flux and clean off excess flux and solder.
- B. Brazed Connections: Make joints with silver brazing alloy in accordance with manufacturer's instructions. Remove working parts of valves before applying heat.
- C. Threaded Connections: Clean out tapering threads, made up with pipe dope; screwed until tight connection. Pipe dope must be specifically selected for each application.
- D. Flanged Joints: Select appropriate gasket material, size, type and thickness for service applications. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- E. Dielectric Pipe Fittings: Provide dielectric nipples at ALL equipment connections where dissimilar metals meet. In addition, provide dielectric unions in all open type piping systems (condensing water, domestic water, etc.) where dissimilar metals are to be joined.
 - 1. Dielectric Unions are not be to used.

3.5 SLEEVES

- A. Provide for pipes passing through floors, walls or ceilings. Not required for floors that are core-drilled, except where floor is waterproofed.
- B. Extend 1/8 in. above finished floor in finished areas. In above grade Mechanical Rooms and other areas with floor drains, use steel pipe sleeves 2 in. above floor.
- C. Use steel pipe sleeves in bearing wall, structural slabs, beams and other structural surfaces, and where called for.
- D. Sleeves shall be as small as practical, consistent with insulation, so as to preserve fire rating.
- E. Fill abandoned sleeves with concrete.
- F. Provide rubber grommet seals for pipes passing through ducts or air chambers or built-up housings.

3.6 SLEEVE PACKING

- A. Seal void space at sleeves as follows:
 - 1. Interior Locations: Firmly pack with fiberglass and caulk.
 - 2. Exterior Walls and Below Grade Cored Holes: Use sealing element.
 - 3. Cored Holes: Use sealing element.
 - 4. Fire Rated, Partitions and Floor Slabs: Use fire rated sealing elements, materials and methods. Provide per manufacturer's instructions to maintain firestop.

5. Waterproofed Walls/Floors: Use waterproof sealing element, device or compound.

3.7 ESCUTCHEON PLATES

- A. Provide polished chrome setscrew type escutcheon plates for all exposed piping passing through floors, walls or ceilings, in all rooms except in Boiler, Fan and Mechanical Rooms.

3.8 TESTS

- A. Refer to Exhibit "B" at the end of this section for testing of Plumbing Systems.
- B. Provide all necessary items to complete proper testing of work. Perform all testing in accordance with governing Codes, local utilities and other agencies having jurisdiction and as specified. Pay all costs to perform tests. Perform all testing in a safe manner. Isolate existing systems.
- C. Domestic Water:
 1. Do not cover joints with insulation until required tests are completed and the Owner's Representative accepts the system.
 2. Make leaks tight; no caulking permitted. Replace defective fittings, pipe or connections. Piping shall be tight and show no loss of pressure.
 3. Air test not acceptable as final test.
 4. Confirm in writing that tests and flushing have been conducted and successfully completed. Submit copy of the test report to Owner's Representative.
- D. Sanitary and Storm:
 1. There shall be no loss of water when testing interior piping.
 2. Air test not acceptable as final test.
 3. Should any leaks, defective joints or defective construction be detected in sewers and/or floors or walls of appurtenant structures, they shall be permanently stopped. Should any defective pipes, fittings or accessories be discovered they shall be removed and replaced at the Contractor's expense.
 4. Confirm in writing that tests have been conducted and successfully completed. Submit copy of the test report to Owner's Representative.

3.9 DOMESTIC WATER PIPING CLEANING AND DISINFECTION

- A. Cleaning and disinfecting shall be in accordance with requirements of New York State Department of Health and authority having jurisdiction. Prior to disinfecting, flush piping to remove any sediment and debris.

- B. Clean and disinfect water distribution piping systems and parts of existing potable water systems that have been altered, extended or repaired.
- C. After disinfection procedures, submit water samples in sterile bottles to an approved Department of Health Laboratory. Samples shall be proven equal to the water quality served to the public from the existing water supply system and acceptable to the Department of Health. Flush and disinfect all sections of pipe that fail the laboratory tests. Submit test results indicating water is potable.

3.10 CONNECTIONS TO SPECIAL EQUIPMENT

- A. Kitchen Equipment:
 - 1. Kitchen Equipment shall be furnished by others and set in place by others.
 - 2. Provide all piping, stops, valves, traps and fittings.
 - 3. Where exposed, provide chrome plated brass piping, valves, hangers, brackets and accessories.
 - 4. Pipe relief valves to floor. Size and arrangement of pipe, traps, valves and fittings, as recommended by manufacturer of equipment.

3.11 PIPE LINE SIZING

- A. Pipe sizes called for are to be maintained. Pipe size changes made only as reviewed by Owner's Representative. Where discrepancy in size occurs, the larger size shall be provided.

EXHIBIT "A" - PIPING MATERIALS (PLUMBING)
(Notes at end of Exhibit "A")

<u>SERVICE</u>	<u>PIPE MATERIALS</u>	<u>FITTINGS</u>	<u>CONNECTIONS</u>
Domestic water interior/hot, cold and circulating 3 in. and smaller	Type L copper	Wrought or cast copper	No-lead solder
Sanitary, sanitary vent, grease waste and storm (buried)	SEE "UNDERGROUND PIPING AND ACCESSORIES" SECTION 221020		
Sanitary, sanitary vent and grease waste	Service weight cast iron soil pipe	No hub	No hub neoprene gasket and stainless steel clamp assembly
	Type DWV copper	Wrought copper	No-lead solder (SEE NOTE 3)
Storm	Service weight cast iron soil pipe	Cast iron hub and spigot	Neoprene compression type gasket
	Service weight cast iron soil pipe	No hub	No hub neoprene gasket and stainless steel clamp assembly
	Schedule 40 galvanized steel	Galvanized ductile iron	Roll grooved mechanical type couplings
	Type DWV copper	Wrought copper	No-lead solder
Indirect waste 1" and Smaller	Type M copper	Wrought copper	No-lead solder
Indirect waste 1 1/4" and larger	Type DWV copper	Wrought copper	No-lead solder
Pump discharge	Schedule 40 galvanized steel	Galvanized cast iron drainage	Threaded
	Type L Copper	Wrought copper	No-lead solder

NOTES FOR EXHIBIT A:

NOTE 1: All uninsulated piping supported by trapeze hangers shall be securely fastened to each hanger using strut-mounted cushion clamps.

EXHIBIT "B" - TESTING

SERVICE

TEST REQUIREMENTS

Domestic water	Test hydrostatically at 150 PSI for two (2) hours or at 1.5 times the working pressure when working pressure exceeds 100 PSI
Sanitary, sanitary vent, storm	Maintain 10 ft. head of water for two (2) hours.
Indirect waste	Maintain 10 ft. head of water for two (2) hours.
Pump discharge	Hydrostatically test at 5 PSI greater than the pump rating for two (2) hours.

END OF SECTION

SECTION 221020

UNDERGROUND PIPING AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents

1.2 SUBMITTALS

- A. Provide a schedule of pipe materials, fittings and connections.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pipe and fittings new and marked with manufacturer's name, complying with applicable ASTM and ANSI Standards.

2.2 CAST IRON SOIL PIPE AND FITTINGS

- A. Pipe: ASTM A74 service weight cast iron, bitumen coated, hub and spigot.
- B. Fittings: Service weight cast iron, bitumen coated, hub and spigot, ASTM C564 service weight neoprene gasket of same manufacturer as piping.
- C. All cast iron pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

2.3 DETECTABLE TAPE

- A. Detectable underground warning tape, 5 mil. polyethylene, 6 in. wide, aluminum backing, APWA approved background colors within permanent black lettering identifying service below.
- B. Schedule:
 - 1. Sanitary: Green color, "Caution Buried Sewer Line Below".
 - 2. Storm: Green color, "Caution Buried Sewer Line Below".
 - 3. Water: Blue color, "Caution Buried Water Line Below".
 - 4. Gas: Yellow color, "Caution Buried Gas Line Below".
 - 5. Electric: Red color, "Caution Buried Electric Line Below".

C. Acceptable Manufacturers: Seton, Terra Tape, Pro-Line Safety Products, Inc.

2.4 SCHEDULE OF PIPING MATERIALS

A. See Exhibit "A", Schedule of Piping Materials at end of this section for piping.

PART 3 - EXECUTION

3.1 TESTING

A. Sanitary and Storm:

1. Do not backfill over piping until required tests are completed and the Owner's Representative accepts the system.
2. There shall be no loss of water when testing interior piping inside the building foundation.
3. Air test not acceptable as final test.
4. Should any leaks, defective joints or defective construction be detected in sewers, floors or walls of appurtenant structures, they shall be permanently stopped. Should any defective pipes, fittings or accessories be discovered they shall be removed and replaced at the Contractor's expense.
5. Test exterior piping outside the building foundation in 100 ft. sections. The allowable rate of leakage per 24 hours per in. of diameter per 1,000 ft. of sewer tested shall not exceed 25 gallons. Piping shall be inspected and tested prior to backfill.
6. Confirm in writing that tests have been conducted and successfully completed. Submit copy of the test reports to Owner's Representative.

3.2 DETECTABLE TAPE

A. Provide detectable tape directly over the buried pipe lines at a depth of 1 ft. - 0 in. below finished grade. Install tape over the continuous length of the pipe.

EXHIBIT "A" - PIPING MATERIALS (PLUMBING)

(Notes are at end of Exhibit "A")

<u>SERVICE</u>	<u>PIPE MATERIALS</u>	<u>FITTINGS</u>	<u>CONNECTIONS</u>
Sanitary and Vent	Service weight cast iron soil pipe	Cast iron, hub and spigot	Neoprene gasket compression type

EXHIBIT "B" - TESTING

<u>SERVICE</u>	<u>TEST REQUIREMENTS</u>
Sanitary, sanitary vent, storm	Maintain 10 ft. head of water for two (2) hours.

END OF SECTION

SECTION 223010

EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Document.

1.2 SUBMITTALS

- A. Provide submittals for all items specified under Part 2 of this section.

PART 2 - PRODUCTS

2.1 FLOOR DRAINS

- A. Drain Description: All Floor Drains Type A unless otherwise noted.
 - 1. Type A: Cast iron body, flashing collar with weepholes, nickel bronze, 7 in. diameter adjustable strainer; Jay R. Smith Figure #2010-A.
 - 2. Type B: Cast iron body, flashing collar with weepholes, nickel bronze 7 in. diameter adjustable strainer with separate oval funnel; Jay R. Smith Figure #2010-A with #3590 funnel.
- B. Where floor drains are not installed in slabs on grade, provide flashing collar and flash with 24 in. square four (4) pound lead flashing or equal.
- C. Make: Josam, Jay R. Smith, Mifab, Watts or Zurn.

2.2 FLOOR SINKS

- A. Sink Description:
 - 1. Type A: Acid resistant coated body with 12-1/2 in. square nickel bronze top, 8 in. deep with sediment bucket; Jay R. Smith Figure #3150.
- B. Make: Josam, Jay R. Smith, Mifab, Watts or Zurn.

2.3 CLEANOUTS

- A. Floors: Cast iron body, nickel-bronze top with adjustable feature, bronze plug and flashing clamp where required, carpet marker and tile cover where applicable; Jay R. Smith Series #4028.
- B. Walls: Cast iron ferrule, with bronze plug and stainless steel smooth access cover.
 - 1. Horizontal: Jay R. Smith Figure #4402.

2. Vertical: Jay R. Smith Figure #4531.

C. Make: Josam, Jay R. Smith, Mifab, Watts or Zurn.

2.4 HOSE BIBBS (INTERIOR)

A. Inside sill faucet, vacuum breaker, lead-free, solder connection, 3/4 in. hose thread outlet, lock shield cap, loose key control, flanged female inlet, polished chrome plate finish for finished rooms, rough chromium for unfinished rooms.

B. Make: Woodford Model 84, Prier, Chicago Faucets or Acorn in finished room; Chicago Faucets #998 in Mechanical Rooms, Boiler Room, Penthouse, or other unfinished rooms.

2.5 SHOCK ABSORBERS

A. Hydropneumatically controlled with permanently sealed expansion chamber pre-charged with non-combustible gas; lead-free, threaded connection, meets or exceeds Plumbing and Drainage Institute Standard PDI WH-201 and ASSE Standard 1010.

1. Bellows Type: Stainless steel construction with stainless steel bellows.

2. Piston Type: Hard drawn copper body with brass piston, cap and adapter, and elastomer seals.

B. Elastomer or rubber compound type bellows not allowed.

C. Make: Watts #LF15M2, Precision Plumbing Products, Jay R. Smith, or Zurn.

2.6 TRAP GUARDS

A. Elastomeric, normally closed seal to prevent evaporation of P-traps. Inserts into throat of floor drain.

B. Make: Zurn, "Zshield".

PART 3 - EXECUTION

3.1 EQUIPMENT CONNECTIONS

A. Plumbing Contractor shall:

1. Provide all roughing and final water, waste, vent, gas, air, vacuum, diesel and/or oxygen connections to all equipment requiring same as called for on Contract Documents.

2. Refer to Contract Documents for roughing schedules, and equipment and lists indicating scope of connections required.

3. Install controls and devices furnished by others.

4. Provide cold water line with gate valve and backflow prevention device at locations called for. Continuation and connection to equipment by others.

3.2 CLEANOUTS

- A. Install cleanouts out of traffic patterns and flush to floor. Provide offset from sanitary line served. Do not locate under doors or under lockers. Maintain distance between cleanouts on piping 4 in. and smaller, 50 ft.; over 4 in., 100 ft. At changes in direction greater than 45°. Install at base of soil, waste, vent, stacks and roof conductors and where called for.
- B. Cleanouts: Same nominal size as pipe, but not larger than 4 in.

3.3 HOSE BIBBS

- A. Install at low points of piping system.

3.4 SHOCK ABSORBERS

- A. Install in vertical position.

3.5 GREASE TRAP

- A. Install in accordance with manufacturer's written installation instructions.
- B. Provide concrete hold down pad as indicated on drawing.
- C. Set trap on a 6 in. deep level bed of compacted pea gravel spread evenly over the top of the concrete pad.
- D. Secure trap to pad with anchor bolts hooked under reinforcing rods of the hold down pad. Coat bolts, rods and other exposed metal surfaces with three coats of black asphaltum.

3.6 TRAP GUARD

- A. Provide for each new floor drain.

END OF SECTION

SECTION 224000

PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

- A. Submit manufacturer's data in accordance with Basic Mechanical/Electrical Requirements. Obtain approval prior to ordering material.
- B. Provide submittals for all items specified under Part 2 - Products of this section.

1.3 DESCRIPTION OF FIXTURES

- A. Fixtures and trim shall be of those manufacturers listed, unless otherwise indicated. Fixtures for this project shall be of same manufacturer.
 - 1. Fixtures: American Standard, Kohler, Mansfield, Sloan, Toto, Watts or Zurn.
 - 2. Faucets: Chicago Faucets, Delta, Moen, Symmons, T&S Brass or Zurn. All faucets shall be lead-free in accordance with NSF 61 and NSF 372.
 - 3. Lab Faucets: Watersaver, Chicago Faucets
 - 4. Flushometers: Sloan "Regal XL" or Zurn.
 - 5. Closet Seats: Bemis, Beneke, Church or Olsonite.
 - 6. Fixture Carriers: Jay R. Smith, Watts, Wade, Josam or Zurn.
 - 7. Sinks: Elkay, Just or Kohler.
 - 8. Water Coolers: Elkay, Haws, Murdock or Oasis.
 - 9. Supplies, Stops and Traps: Brasscraft, EBC, McGuire or Sanitary Dash.
- B. Exposed parts of trim shall have polished chrome plated finish.
- C. Tubular drainage products ("P" traps, nipples, etc.) shall be 17 gauge brass.

1.4 QUALITY ASSURANCE

- A. Comply with requirements of the Plumbing Fixture Law of the New York State Department of Environmental Conservation.

- B. Comply with the American Disabilities Act Guidelines and ANSI A117.1 "Accessible and Usable Buildings and Facilities".
- C. All items here-in used to convey water for potable use shall be lead free in accordance with NSF Standard 61, Section 9 Standard for Drinking Water and Lavatory Faucets and NSF Standard 372 - Maximum Lead Requirements. Compliance shall be via third-party testing and certification.
- D. All fixture trim used to convey water for potable use shall be lead free.

PART 2 - PRODUCTS

2.1 SINKS

A. SK-C (HDCP):

- 1. Elkay Lustertone ELUHAD141855PD, 16 1/2 in. x 20 1/2 in. x 5 3/8 in. deep, nickel type 304 stainless steel single bowl sink, ADA compliant, 18 gauge, undermount installation, fitted with the following:
 - a. Chicago #201-GN2AE3-317XKAB two handle concealed mount sink faucet, 11-5/8 in. high, 5 3/8 in. reach swing spout, pressure compensating aerator, deck mounted, 8 in. centers, lead-free, ADA compliant and fitted with the following:
 - 1) 1.5 GPM aerator.
 - 2) #317, 4 in. wrist blade handles
 - 3) ADA complaint.
 - b. Elkay #LKAD18 stamped brass drain outlet with 3 in. perforated grid strainer and LKADOS 1-1/2 in. O.D. offset tailpiece.
 - c. McGuire #8912 semi-cast brass adjustable "P" trap, 1-1/2 in. x 1-1/2 in., with cleanout plug and cast brass escutcheon with set screw.
 - d. McGuire #LF2167LKF, lead-free, 1/2 in. copper sweat supplies with 1/2 in. OD flexible risers, loose key stops and cast brass escutcheons with set screws.

2.2 MOP BASINS

A. MB-A:

1. Fiat Model TSB, terrazzo, 36 in. x 24 in. x 12 in. deep, stainless steel flat strainer, 3 in. outlet, stainless steel cap on all sides, color as selected by the Architect, with the following:
 - a. T&S Brass #B-0665-BSTP, lead-free, exposed wall mounted faucet with integral stops, rough chrome finish, lever handles, top-brace spout with bucket hook, hose end and vacuum breaker.
 - b. Fiat # 832AA Hose and Hose Bracket.
 - c. Fiat #889CC Mop Hanger.
 - d. Fiat # E77AA Vinyl Bumper guard on exposed sides.
 - e. Fiat #MSG 36 Stainless Steel Wall Guard.
 - f. Provide silicone sealant between wall, floor and mop basin.

2.3 ELECTRIC WATER COOLER

A. EWC-A:

1. Elkay EZWS-ERPBM28K recessed two level wheelchair access model with bottle filler, ADA compliant, lead-free construction, type 304 stainless steel vandal resistant cabinet and front panel grille, one piece stainless steel basins, flexible bubbler, self-closing front push bar control with in-line stream regulator, adjustable temperature control, permanently sealed and lubricated fan motor, hermetically sealed compressor and control, 370 watts, 120V, capacity of 7.5 GPH at 80°F inlet water, 50°F outlet water with room temperature of 90°F, fitted with the following:
 - a. McGuire #LF165LKE, lead-free, 3/8 in. lavatory wall supply with loose key angle stop, 3/8 in. flexible tube riser, and cast brass escutcheons with set screws.
 - b. McGuire #8902, 1-1/4 in. x 1-1/2 in. semi-cast brass "P" trap with cleanout and cast brass escutcheon with set screw.
 - c. Jay R. Smith floor mounted carrier with rectangular uprights.
 - d. Acceptable Manufacturers: Elkay, Halsey Taylor.

- B. EWC-E:
1. Elkay #EZS8WSLK, wall mounted, ADA compliant, lead-free construction, one piece stainless steel basin, vandal resistant stream saver bubbler, self-closing front and side push bar control with in-line stream regulator, adjustable temperature control, permanently sealed and lubricated fan motor, hermetically sealed compressor and control, 1/5 HP, 120V, capacity of 8.0 GPH of 50°F water at 90°F ambient and 80°F inlet water. Bottle filling unit shall include an electronic sensor for no-touch activation with an automatic 20 second shutoff timer, bottle counter, antimicrobial protected plastic components. Capacity of 1.0 GPM flow rate with laminar flow to minimize splashing.
 - a. McGuire #LF165LKE, lead-free, 3/8 in. lavatory wall supply with loose key angle stop, 3/8 in. flexible riser, and cast brass escutcheon with set screw.
 - b. McGuire #8902, 1-1/4 in. x 1-1/2 in. semi-cast brass "P" trap with cleanout and cast brass escutcheon with set screw.
 - c. Jay R. Smith floor mounted carrier with rectangular uprights.
 - d. Acceptable Manufacturer: Elkay, Halsey Taylor.

PART 3 - EXECUTION

3.1 FIXTURES, EQUIPMENT AND SYSTEMS

- A. Install fixtures, equipment and systems as shown on Drawings or specified herein in accordance with provisions of each applicable Specification Section and all local and state codes having jurisdiction.

3.2 INSTALLATION OF PLUMBING FIXTURES

- A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturers written installation instructions.
- B. Carefully drill holes for through bolts to avoid chipping blocks or plaster.
- C. Except where carriers are specified, attach hangers or brackets to walls as follows:
 1. Masonry Construction: Secure fixture hangers to partition by thru-bolts extending through a steel plate on opposite side of partition. Obtain Owner's Representative's approval prior to work.
 2. Metal Stud Construction: Anchor backing for fixtures or equipment to 1/8 in. x 12 in. steel plate bolted or riveted to at least three studs. Obtain Owner's Representative's approval prior to work.
- D. Anchor carriers to concrete floor with 1/2 in. x 3 in. anchor or thru-bolts and washers. Provide for drilling of floor and installation of expansion shields.

- E. Seal fixtures in contact with walls, floors and counters using a sanitary-type, one-part, mildew-resistant, silicone caulk. Match color to fixture color.
- F. Set self-rimming lavatories and sinks in a bed of silicone caulk.
- G. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified and to building wall construction where no support is indicated.
- H. Fasten counter-mounting-type plumbing fixtures to casework.
- I. Immediately after installation, provide protective covering over fixtures and trim.

3.3 MOUNTING HEIGHT AND LOCATION

- A. Mount fixtures at height and location as indicated on Architectural plans and elevations.
- B. Mount accessible fixtures in conformance with the requirements of ANSI A117.1.

3.4 CONNECTIONS

- A. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other sections of Division 22.

3.5 ADJUSTING AND CLEANING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings and controls.
- B. Adjust water pressure at electric water coolers, faucets and flush valves to provide proper flow and stream.
- C. Replace washers of leaking and dripping faucets and stops.
- D. Clean fixtures, fittings, spout and drain strainers with manufacturers' recommended cleaning methods and materials.
- E. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components and retest. Repeat procedure until all units operate properly.

END OF SECTION

SECTION 230500

BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 ROUGHING

- A. The Contract Drawings have been prepared in order to convey design intent and are diagrammatic only. Drawings shall not be interpreted to be fully coordinated for construction.
- B. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, interferences, etc. Make necessary changes in contract work, equipment locations, etc., as part of a contract to accommodate work to avoid obstacles and interferences encountered. Before installing, verify exact location and elevations at work site. **DO NOT SCALE** plans. If field conditions, details, changes in equipment or shop drawing information require an important rearrangement, report same to Owner's Representative for review. Obtain written approval for all major changes before installing.
- C. Install work so that items both existing and new are operable and serviceable. Eliminate interference with removal of coils, motors, filters, belt guards and/or operation of doors. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation. Provide new materials, including new piping and insulation for relocated work.
- D. Coordinate work with other trades and determine exact route or location of each duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Obtain from Owner's Representative exact location of all equipment in finished areas, such as thermostat, fixture, and switch mounting heights, and equipment mounting heights. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers, and other items. Do not rough-in contract work without reflected ceiling location plans.
- E. Before roughing for equipment furnished by Owner or in other Divisions, obtain from Owner and other Divisions, approved roughing drawings giving exact location for each piece of equipment. Do not "rough in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment. For equipment and connections provided in this contract, prepare roughing drawing as follows:
 - 1. Existing Equipment: Measure the existing equipment and prepare for installation in new location.

2. New Equipment: Obtain equipment roughing drawings and dimensions, then prepare roughing-in-drawings. If such information is not available in time, obtain an acknowledgement in writing, then make space arrangements as required with Owner's Representative.

1.2 EQUIPMENT AND MATERIAL REQUIREMENTS

- A. Provide materials that meet the following minimum requirements:
 1. Materials shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, in accordance with NFPA 255.
 2. All equipment and material for which there is a listing service shall bear a UL label.
 3. Potable water systems and equipment shall be built according to AWWA Standards.
 4. Gas-fired equipment and system shall meet AGA Regulations and shall have AGA label.
 5. All electrical equipment and systems, as a whole, shall be tested and listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL) for the intended use in accordance with the applicable standards and have a physical label indicating such.

1.3 CONCEALMENT

- A. **Conceal all contract work** above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after their review. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

1.4 CHASES

- A. New Construction:
 1. Certain chases, recesses, openings, shafts, and wall pockets will be provided as part of General Construction Trade. Mechanical and Electrical trades shall provide all other openings required for their contract work.
 2. Check Architectural and Structural Design and Shop Drawings to verify correct size and location for all openings, recesses and chases in general building construction work.
 3. Assume responsibility for correct and final location and size of such openings.
 4. Rectify improperly sized, improperly located or omitted chases or openings due to faulty or late information or failure to check final location.

5. Provide 18 gauge galvanized sleeves and inserts. Extend all sleeves 2 in. above finished floor. Set sleeves and inserts in place ahead of new construction, securely fastened during concrete pouring. Correct, by drilling, omitted or improperly located sleeves. Assume responsibility for all work and equipment damaged during course of drilling. Firestop all unused sleeves.
 6. Provide angle iron frame where openings are required for contract work, unless provided by General Construction trade.
- B. In Existing Buildings:
1. Drill holes for floor and/or roof slab openings.
 2. Multiple pipes smaller than 1 in. properly spaced and supported may pass through one 6 in. or smaller diameter opening.
 3. Seal voids in fire rated assemblies with a fire-stopping seal system to maintain the fire resistance of the assembly. Provide 18 gauge galvanized sleeves at fire rated assemblies. Extend sleeves 2 in. above floors.
 4. In wall openings, drill or cut holes to suit. Provide 18 gauge galvanized sleeves at shafts and fire rated assemblies. Provide fire-stopping seal between sleeves and wall in drywall construction. Provide fire stopping similar to that for floor openings.

1.5 PENETRATION FIRESTOPPING

- A. Fire-Stopping for Openings Through Fire and Smoke Rated Wall and Floor Assemblies:
1. Provide materials and products listed or classified by an approved independent testing laboratory for "Penetration Fire-Stop Systems". The system shall meet the requirements of "Fire Tests of Penetrations Fire-Stops" designated ASTM E814.
 2. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, ductwork and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for drywall construction.
 3. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.
 4. The methods used shall incorporate qualities which permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion, and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.

5. Plastic pipe/conduit materials shall be installed utilizing intumescent collars.
 6. Provide a submittal including products intended for use, manufacturer's installation instructions, and the UL details for all applicable types of wall and floor penetrations.
 7. Fire-stopping products shall not be used for sealing of penetrations of non-rated walls or floors.
- B. Acceptable Manufacturers:
1. Dow Corning Fire-Stop System Foams and Sealants.
 2. Nelson Electric Fire-Stop System Putty, CLK and WRP.
 3. S-100 FS500/600, Thomas & Betts.
 4. Carborundum Fyre Putty.
 5. 3-M Fire Products.
 6. Hilti Corporation.

1.6 ACCESS PANELS

- A. Provide access panels for required access to respective trade's work. Location and size shall be the responsibility of each trade. Access panels provided for equipment shall provide an opening not smaller than 22 in. by 22 in. Panels shall be capable of opening a minimum of 90 degrees. Bear cost of construction changes necessary due to improper information or failure to provide proper information in ample time. Access panels over 324 square inches shall have two cam locks. Provide proper frame and door type for various wall or ceiling finishes. Access panels shall be equal to "Milcor" as manufactured by Inland Steel Products Co., Milwaukee, Wisconsin. Provide General Construction trade with a set of architectural plans with size and locations of access panels.

1.7 CONCRETE BASES

- A. Provide concrete bases for all floor mounted equipment. Provide 3,000 lb. concrete, chamfer edges, trowel finish, and securely bond to floor by roughening slab and coating with cement grout. Bases 4 in. high (unless otherwise indicated); shape and size to accommodate equipment. Provide anchor bolts in equipment bases for all equipment provided for the project, whether mounted on new concrete bases or existing concrete bases.

1.8 HVAC EQUIPMENT CONNECTIONS

- A. Contractor is responsible for draining, filling, venting, chemically treating and restarting any systems which are affected by work shown on the Contract Documents unless specifically noted otherwise.

- B. Provide final hot water connections to all equipment as required by the equipment. Provide final connections, including domestic water piping, wiring, controls, and devices from equipment to outlets left by other trades. Provide equipment waste, drip, overflow and drain connections extended to floor drains.
- C. Provide for Owner furnished and Contractor furnished equipment all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, insulation, sheet metal work, controls, dampers, as required.
- D. Refer to manufacturer drawings and specifications for requirements of special equipment. Verify connection requirements before bidding.

1.9 PLUMBING EQUIPMENT CONNECTIONS

- A. Contractor is responsible for draining, filling, venting, chemically treating and restarting any systems which are affected by work shown on the Contract Documents unless specifically noted otherwise.
- B. Provide roughing and final water, waste, vent connections to all equipment. Provide loose key stops, sanitary "P" traps, tailpiece, adapters, gas or air cocks, and all necessary piping and fittings from roughing point to equipment. Provide installation of sinks, faucets, traps, tailpiece furnished by others. Provide cold water line with gate valve and backflow prevention device at locations called for. Provide continuation of piping and connection to equipment that is furnished by others. Provide relief valve discharge piping from equipment relief valves.
- C. Provide valved water outlet adjacent to equipment requiring same. Provide equipment type floor drains, or drain hubs, adjacent to equipment.
- D. Install controls and devices furnished by others.
- E. Refer to Contract Documents for roughing schedules, and equipment and lists indicating scope of connections required.
- F. Provide for Owner furnished and Contractor furnished equipment all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, as required.
- G. Refer to Manufacturer drawings and specifications for requirements of kitchen equipment and special equipment. Verify connection requirements before bidding.

1.10 ELECTRICAL EQUIPMENT CONNECTIONS

- A. Provide complete power connections to all electrical equipment. Provide control connections to equipment. Heavy duty NEC rated disconnect ahead of each piece of equipment. Ground all equipment in accordance with NEC.
- B. Provide for Owner furnished and Contractor furnished equipment all power wiring, electric equipment, control wiring, switches, lights, receptacles, and connections as required.

- C. Refer to Manufacturer's drawings/specifications for requirements of kitchen equipment and special equipment. Verify connection requirements before bidding.

END OF SECTION

SECTION 230504

ELECTRIC WIRING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services for the complete installation of motor control wiring and temperature control wiring as required in Contract Documents. Provide wiring and conduit, required to connect devices furnished as part of or adjunctive to the automatic temperature control system and for motor control regardless of the source of supply. Control wiring includes 120 volt and lower voltage wiring for control signals directing equipment operation. Control circuits shall be 120 volt maximum. Provide wiring in accordance with requirements specified in Division 26 "Electrical" and the National Electrical Code. Provide devices required for proper system operation, including special electrical switches, transformers, disconnect switches, relays, and circuit breaker protection.
- B. Coordinate all work with Division 26 "Electrical".

1.2 WORK NOT INCLUDED

- A. Power wiring for motors, motor starters and associated starting and control equipment, as well as the motor starters (except in the case of equipment specified to have packaged control/starters), are included in Division 26 "Electrical", unless otherwise called for.

1.3 QUALIFICATIONS

- A. Wiring shall be installed in compliance with all requirements of Division 26 "Electrical".

1.4 SUBMITTALS

- A. Provide complete wiring diagrams for equipment systems. Deliver wiring diagrams to proper trades in time for roughing of conduit, equipment connections, and avoid delay in construction schedule. Wiring diagrams and roughing information to be wired as part of the Work of Division 26, "Electrical", shall be clearly indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Refer to Division 26 specifications for required wiring materials.
- B. Control Wiring:
 - 1. Unless specifically required otherwise by the BACS equipment manufacturer, all I/O wiring shall be twisted shielded cable. For communications, the BACS equipment manufacturer's installation guidelines and recommendations shall apply.

PART 3 - EXECUTION

3.1 GENERAL

- A. Check electrical wiring pertaining to equipment for completeness and correctness of connections. Correct any misapplied motor and/or motor starter, improper thermal overload device, or device which fails to function and resultant damage, whether due to incorrect connections or improper information on wiring diagrams.

3.2 WIRING FOR CONTROL SYSTEMS

- A. Provide motor control and temperature control wiring for equipment. All wiring shall be in conduit, unless otherwise noted. Refer to Section 260501 for type of conduit to be used in specific applications. All conduit containing control wiring shall be green. Provide 18 in. length flexible conduit at motors and devices subject to vibration. Conduit supported on 5 ft. centers. Do not attach directly to hot surfaces, piping, or ductwork. Control wiring shall be in separate conduit and raceway from all other wiring. Provide green grounding wire circuited from starter, and run ground wire through conduit to each remote auxiliary relay, pushbutton station, remote panel heating device, thermostat, or device with potentials in excess of 50 volts. For sensors with twisted shielded pair cable, the shield shall be ground at the panel and taped back at the sensor. Size ground wire as required by NEC.
- B. All temperature control wiring shall be plenum rated type, meeting the requirements of NEC Article 300. Control wiring shall have green jacketing, and be color coded and labeled at all points of termination.
- C. Control wiring shall be un-spliced from the controller to the sensor or device.
- D. Provide pushbutton stations, pilot lights, selector switches, auxiliary starter contacts, and other devices required to provide specified functions.
- E. Where allowable by Code and contract documents, temperature control wiring may be installed without conduit. Installation and wire insulation types shall be as described by NEC, Article 725. All low voltage wiring circuits 50 volt and under shall:
 - 1. Be installed in electrical metal tubing (EMT) with compression fittings when in vertical chases, non-accessible ceilings, mechanical rooms or other spaces in which it is readily accessible.
 - 2. Be installed in electrical metal tubing (EMT) with compression fittings or cable tray or raceway when in interstitial spaces.
 - 3. Be installed per all additional code requirement, when installed in outdoor locations or any area subject to moisture.
 - 4. Be plenum type, not installed in conduit, when installed above accessible ceiling spaces which are not laboratories or AHU's.

5. Be adequately supported and neatly organized using bridle rings spaced a maximum of 3 ft. on centers or other approved method when installed without conduit or cable tray.
6. Be installed in conduit in all cases not specifically covered by the above cases.

3.3 EQUIPMENT WIRING

- A. Provide power and control wiring between sections of electrical radiation units, between shipping splits, and between remote panels, thermostats, disconnect switches, and their respective units. Provide control wiring from the package control system, to each respective electric heat coil, reheat coil or motor. Properly mount control package. Power wiring to and including disconnect switch shall be by Division 26, "Electrical".

3.4 FIELD WIRING IN STARTERS, CONTROLLERS AND PANELS

- A. Wiring within starters, controllers, and temperature control panels, shall be routed neatly in gutter space, away from moving and/or heat producing parts. Provide suitably rated terminal blocks. Do not place more than two wire connections on pilot device or relay terminal. Where more than two circuit connections are required, use terminal blocks. Provide nylon insulated, ring spade terminal for all control wires. Cables and wires shall be neatly bundled and lashed with nylon cable straps.

END OF SECTION

SECTION 230513

MOTORS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

- A. Submit manufacturer's product data on all motors.
- B. Product Data: For each motor, provide dimensions; mounting arrangements; frame type, enclosure type, location for conduit entries; shipping and operating weights; and manufacturer's technical data on features, performance, electrical ratings and characteristics.
- C. Motor Performance Data: For each motor, include the following manufacturers' data:
 - 1. Motor Performance: Percent Efficiency, Power Factor, Torque, RPM, Duty Rating and Design Category.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Motor manufacturer shall be based and headquartered in the United States of America and shall design and manufacture motors in the United States.
 - 2. Motor manufacturer shall have over fifteen (15) years-experience in the motor industry and shall maintain active company-wide quality assurance program.
 - 3. Motor manufacturer shall maintain an authorized service center within 60 miles of the project site, capable of providing training, parts and emergency maintenance and repairs.
- B. Motor performance shall be warranted against material and workmanship defects by manufacturer's limited warranty and service policy for the period of at least 18 months from the day of shipment from the factory or the manufacturer's warehouse.
 - 1. Premium efficiency motors shall be warranted for 36 months.
 - 2. Severe duty motors (as applicable) shall be warranted for 60 months.
 - 3. Extended warranty shall be offered for certain products or as agreed by additional terms and specified elsewhere.

PART 2 - PRODUCTS

2.1 MOTORS

A. General Requirements:

1. Motors built for 60 Hz operation, three phase for 1/2 HP and larger; single phase for 1/3 HP and smaller.
 - a. In compliance with NEMA Standards, wound specifically for nameplate voltage, and selected for appropriate duty and environment.
 - b. 1.15 minimum service factor at rated voltage and frequency. 1.0 service factor for inverter duty motors.
 - c. Bearings: Bearings shall have a rated fatigue life of L-10 (B-10) of 150,000 hours for direct-coupled applications and 50,000 hours for belted applications minimum. Belted rating shall be based on radial loads and pulley sizes called out in NEMA MG 1-14.43. The calculation will be determined from the pulley centerline being at the end of the motor shaft.
 - d. V-belt connected motors with adjustable slide rail bases and pulleys.
 - e. Motors shall have Class F insulation system, with Class B temperature rise, insulation meeting NEMA MG 1 Part 31. Maximum allowable motor temperature rise for open drip-proof or totally enclosed fan cooled (TEFC) type at 1.15 service factor shall be 105°C above 40°C ambient with a total temperature rating of 155°C.
 - f. NEMA locked rotor kVA code as required to match unit equipment torque characteristics.
 - g. Single-phase motors shall be capacitor start, induction run, or split phase type.
 - h. Polyphase motors shall be constant speed, squirrel cage, unless otherwise specified.
 - i. Nameplates shall have as a minimum, all information as described in NEMA Standard MG-1-20.60. Motor nameplate shall be mounted on enclosure with stainless steel fastening pins.
2. Motors for use with adjustable speed drive applications shall be premium efficiency inverter duty rated in accordance with NEMA and be capable of a 20:1 turndown.
 - a. These motors shall meet NEMA corona inception voltage requirements, withstanding peak voltages up to 1600 volts, and be manufactured in accordance with NEMA MG 1 Part 30 and 31.

- b. All motors controlled by adjustable speed drives shall be equipped with circumferential micro-fiber shaft grounding rings to provide protection from electrical bearing damage, to meet NEMA MG 1, 31.4.4.3. Provide AEGIS Bearing Protection Ring Kit (or equal), installed in accordance with the manufacturer's recommendation. For motors controlled by adjustable speed drives and 50hp or greater the motor shall have a ceramic electrically insulating bearing assembly on the opposite end of the grounding brushes

3. EC Motors:

- a. The motor shall be DC rated with permanent magnet rotor and automatically resetting integral overload protection.
- b. The unit shall meet the scheduled voltage, phase, control and other requirements indicated.
- c. Input Control: The unit shall have the following control features as a minimum:
 - 1) Packaged Unit controls: DDC input to include start/stop/status/general trouble.
 - 2) External Control: Minimum of Modbus and/or BACnet digital start/stop, digital trouble, 0-10VDC and 4-20mA speed control input.
- d. Unit insulation shall be Class H.
- e. Electrical termination lugs shall be suitable for the intended feed circuit.
- f. Ratings shall be 90% minimum power factor and 10% maximum total harmonic distortion.
- g. Speed control suitable for 100% to 10% operational capability.
- h. Fully programmable and reviewable settings and parameters.
- i. Suitable for operation at ambient conditions of 32 to 104 degrees F.
- j. The power circuiting shall be separated from the low voltage control circuiting.
- k. Output parameters where indicated:
 - 1) Speed.
 - 2) Trouble indication.
 - 3) Overload indication.

4. Three phase motors rated 1 HP and greater shall be copper winding, re-lubable ball bearings, 1.15 service factor (1.0 service factor for inverter duty motors), premium efficiency, energy-saver type with a guaranteed NEMA nominal full-load efficiency, by IEEE Standard 112 Test Method "B". Efficiency rating shall appear on nameplate, and shall be not less than as follows; per NEMA MG 1 Part 12, Table 12-12, nominal minimum efficiencies:

MINIMUM NOMINAL FULL-LOAD MOTOR EFFICIENCY						
HP	ODP MOTORS (RPM)			TEFC MOTORS (RPM)		
	1200	1800	3600	1200	1800	3600
1.0	82.5	85.5	77	82.5	85.5	77.0
1.5	86.5	86.5	84	87.5	86.5	84
2.0	87.5	86.5	85.5	88.5	86.5	85.5
3.0	88.5	89.5	85.5	89.5	89.5	86.5
5.0	89.5	89.5	86.5	89.5	89.5	88.5
7.5	90.2	91.0	88.5	91.0	91.7	89.5
10	91.7	91.7	89.5	91.0	91.7	90.2
15	91.7	93.0	90.2	91.7	92.4	91.0
20	92.4	93.0	91.0	91.7	93.0	91.0
25	93.0	93.6	91.7	93.0	93.6	91.7
30	93.6	94.1	91.7	93.0	93.6	91.7
40	94.1	94.1	92.4	94.1	94.1	92.4
50	94.1	94.5	93.0	94.1	94.5	93.0
60	94.5	95.0	93.6	94.5	95.0	93.6
75	94.5	95.0	93.6	94.5	95.4	93.6
100	95.0	95.4	93.6	95.0	95.4	94.1
125	95.0	95.4	94.1	95.0	95.4	95.0
150	95.4	95.8	94.1	95.8	95.8	95.0
200	95.4	95.8	95.0	95.8	96.2	95.4

5. Nominal Motor Voltage Table:

Nominal System Voltage	Motor Nameplate
480V - 3 phase	460 volt
240V - 1 phase and 3 phase	230 volt
208V - 1 phase and 3 phase	200 volt
120V - 1 phase	115 volt

6. Motor Application; Provide the following enclosure types unless noted otherwise:

Environment/Location	Motor Enclosure Type
General Purpose	Open drip-proof, TEFC with cast iron frame, or encapsulated
Outdoors, below grade or high humidity	TEFC with cast iron frame
Hazardous	Explosion-proof
Packaged Refrigeration Compressors	Hermetic or semi-hermetic

7. Acceptable Manufacturers: Motors need not all be of the same manufacturer. Subject to the requirements of this section provide products by the following:
 - a. General Electric Energy & Saver NEMA Premium Efficiency/(ODP); General Electric XSD Ultra NEMA Premium Efficiency (TEFC).
 - b. Baldor-Reliance Super E.
 - c. Marathon XRI.

PART 3 - EXECUTION

3.1 MOTORS

- A. Furnished by equipment manufacturer and especially manufactured and/or selected, mounted, and installed for intended use. Install motors accessible for maintenance and belt adjustment.

END OF SECTION

SECTION 230523

VALVES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services as required for the complete installation and related Work designed in Contract Documents.

1.2 SUBMITTAL

- A. Submit product data for valves and accessories.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Valves shall have following requirements:
 1. Working pressure stamped or cast on bodies.
 2. Manufacturer valve tag identifying the valve type and major component materials.
 3. Stem packing serviceable without removing valve from line.
 4. Valves on insulated services shall have handle extensions so that the handle is fully beyond the insulation jacketing.
 5. Where possible, all valves of like type shall be of a single manufacturer.
 6. Plug or gate valves shall not be used on any services without approval by Facilities Engineering.
 7. Unless otherwise noted, all valves for shut-off and bypass service shall be as follows:
 - a. NPS 2 in. and below: Ball valve with thread, sweat, or socket weld connections. All lead free bronze valves shall have threaded connections.
 - b. NPS 2-1/2 in. and above: Butterfly valves with flanged/lugged connections.
 - c. NPS 2-1/2 in. and 3 in. copper piping systems: Ball valves with sweat or threaded connections.
 - d. Piping systems with press-fit fittings: The use of valves with press-fit connections are not allowed under any circumstances. Valves shall have thread or sweat connections.

8. All valves for all services shall be fully bi-directional and suitable for dead end service.
9. Insulated valves shall have extended handle stems.
10. On all valves the packing compression is to be independent of the stem, ball or handle systems. All valve stems are to be blowout proof. Packing shall be accessible without disturbing the insulation.
11. Combination devices and pre-piped manufacturer coil fit out kits are not permitted, including but not limited to the following:
 - a. Manual balance, control, ball isolation valves
 - b. Manual balance, strainer, ball isolation valves (TDV)
 - c. Y-strainer, ball isolation valves
 - d. Ball isolation, drain valves
 - e. Balancing, shutoff valves

B. Acceptable Manufacturers:

1. Ball Valves: See below for acceptable manufacturers and models.
2. To establish a standard of quality and to identify features, certain manufacturer's numbers are given in the following paragraphs.

2.2 BALL VALVES

A. General Duty

1. For all water services, low pressure steam, low pressure condensate and all other normal non-corrosive services, ball valves shall be as follows:

a.	Body	Bronze or Lead-Free Bronze
b.	Body Style	Full Port, Two piece
c.	Trim	316 Stainless Steel Ball and Stem
d.	Seat	Reinforced Teflon (RTFE), 15% glass filled double seal
e.	WOG Rating	300 psig Minimum
f.	Saturated Steam Rating	150 psig Minimum
g.	Actuator	Lever handle

2. Acceptable Models:

- | | | |
|----|--------|---|
| a. | Apollo | 70-140, 70-240, 77CLF-140 |
| b. | Nibco | T-585-70-66, S-585-70-66, T-585HP-66-LF |
| c. | Watts | LFB6080-G2-SS |

B. Hose Connection

1. 1/2 in. and 3/4 in. hose connection ball valve shall be as:

- | | | |
|----|-------------------------|-----------------------------------|
| a. | Body | Lead Free Bronze |
| b. | Body Style | Full Port, Two piece |
| c. | Trim | 316 Stainless Steel Ball and Stem |
| d. | Seat | PTFE or TFE |
| e. | Seat Working P/T Rating | 300 psig @ 250°F Minimum |
| f. | WOG Rating | 300 psig Minimum |
| g. | SWP Rating | 150 psig Minimum |

2. Acceptable Models:

- | | | |
|----|--------|----------------|
| a. | Apollo | 70LF-140-HC |
| b. | Nibco | T-585-66-LF-HC |

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Provide valves of type called for and where required to service equipment.
2. Provide at major building and systems sections.
3. Provide chain wheels, guides, and chain loops for valves, where called for or in Mechanical Rooms where valves are mounted higher than 8'-0" AFF.
4. Isolating valves for individual fan convectors, room units, terminal units, or other similar apparatus may be inside cabinet or at connection to branch mains where accessible.

5. Locate valves with handles at horizontal position when 5 feet or more above the floor, for greater visibility. Otherwise, locate valves with handles at or above horizontal position.
6. Provide hose threaded valves at low points, strainers, equipment, and as called for.
7. Install valves after welding adjacent to valve is complete to protect seat and disk.
8. The use of the following is not allowed:
 - a. Dielectric unions
 - b. Combination devices
 - c. Pre-piped manufacturer coil fit out kits
 - d. Automatic flow control valves
9. Provide ball valves for shut-off on all pressure gauges at the gauge and separate 1/2" (one half inch) ball valves for the various taps to the gauge on a manifold gauge.
10. On chilled water and glycol service use manual vents only. Do not use automatic vent valves.

END OF SECTION

SECTION 230553

MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 QUALIFICATION

- A. All identification devices shall comply with ANSI/ASME A13.1 for lettering size, length of color field, colors, directional arrow and viewing angles.

1.3 SUBMITTALS

- A. Submit manufacturer's technical product data and installation instructions for each identification material and device.
- B. Submit valve schedule for each piping system indicating valve number, location, and valve function.
- C. Submit schedule of pipe, equipment and name identification for review before stenciling or labeling.
- D. Submit system schematic diagram with location of valve and associated valve number.

1.4 MAKES

- A. Allen Systems, Inc.; Brady (W.H.) Co.; Signmark Div.; Industrial Safety Supply Co., Inc.; Seton Name Plate Corp.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide manufacturer's standard products of categories and types required for each application. In cases where this is more than one type specified for an application, selection is installer's option, but provide single selection for each product category.
- B. All adhesives used for labels in the interior of the building shall comply with the maximum Volatile Organic Compound (VOC) limits as called for in the current version of U.S. Green Building Council LEED Credits EQ 4.1 and EQ 4.2.

2.2 PIPING IDENTIFICATION

A. Identification Types:

1. Pressure Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color coded, pressure sensitive vinyl pipe markers complying with ANSI/ASME A13.1.
 - a. Provide a 360° wrap of flow arrow tape at each end of pipe label.

O.D. Pipe or Covering	Length of Color Field	Letter Size
3/4 in. to 1-1/4 in.	8 in.	1/2 in.
1-1/2 in., 2 in.	8 in.	3/4 in.
2-1/2 in. to 6 in.	12 in.	1 1/2 in.
8 in. to 10 in.	24 in.	2 1/2 in.
Over 10 in.	32 in.	3 1/2 in.

B. Colors:

Fluid Service	Colors & Letters Description
Potable, Cooling, Boiler Feed, Other Water	GREEN (White Letters)

C. Lettering:

1. Piping labeling shall conform to the following list:

Pipe Function	Identification
Heating Water Supply	HWS
Heating Water Return	HWR

2.3 VALVE IDENTIFICATION

A. Valve Tags:

1. Standard brass valve tags, 2 in. diameter with 1/2 in. high numerals. Identify between heating and plumbing services with 1/4 in. letters above the valve number. Lettering to be stamped and in-filled black. Seton, or equal.
 - a. Valve-tag Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Chart:

1. Provide valve chart for all valves tagged as a part of this project. Frame and place under clear glass. Hang in Mechanical Room.

2. Valve chart to include as a minimum, valve #, valve size, valve type, valve service description, valve location.

2.4 EQUIPMENT LABELS

A. Metal Labels for Equipment (Indoors):

1. Material and Thickness: Brass, 0.032 in. minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 in. by 3/4 in.
3. Minimum Letter Size: 1/4 in. for name of units if viewing distance is less than 24 in., 1/2 in. for viewing distances up to 72 in. and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment (Indoors):

1. Material and Thickness: Multilayer, multicolor, phenolic (micarta) labels for mechanical engraving, 1/8 in. thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 in. by 3/4 in.
6. Minimum Letter Size: 1/4 in. for name of units if viewing distance is less than 24 in., 1/2 in. for viewing distances up to 72 in., and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- C. Label Content: Include equipment's Drawing designation or unique equipment number.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2 in. x 11 in. bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.
- E. Provide for the following equipment:
 - 1. Variable Volume Air Terminal Units

2.5 ABOVE CEILING EQUIPMENT LOCATOR

- A. 3/4 in. diameter adhesive stickers placed on ceiling grid. Color coded. Provide for the following:
 - 1. Fire dampers/smoke dampers - RED
 - 2. Plumbing valves - BLUE
 - 3. HVAC valves - ORANGE
 - 4. Air Valves, VAV boxes or reheat coils - GREEN
 - 5. Fans - YELLOW
 - 6. Pumps - BLACK

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide piping identification with directional flow arrows for all piping on project, at maximum intervals of 20 ft.
 - 1. For piping installed through floors or walls, provide at least one pipe label on each side of penetration, for each pipe function.
 - 2. For piping adjacent to 3-way diverting/mixing valves and tee/wye branches, provide at least one pipe label on each side of valve/tee.
 - 3. Label all abandoned piping if abandoned piping is allowed by Owner/Engineer. Document locations of all abandoned piping on as-builts.
- B. Provide valve tags for all valves provided on project, except for service valves at terminal equipment.
- C. Provide equipment tags for all equipment listed above.

- D. Provide above ceiling equipment locator stickers on ceiling grid for all equipment listed above.

END OF SECTION

SECTION 230593

TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for complete adjusting and balancing Work as required in Contract Documents.
- B. This Section specifies the requirements and procedures of mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
- C. Test, adjust, and balance the following mechanical systems:
 - 1. Airside
 - a. Supply air systems, all pressure ranges; including constant volume and variable volume systems.
 - b. Return air systems.
 - c. Exhaust air systems.
 - 2. Hydronics
 - a. Variable flow systems.
- D. This Section does not include:
 - 1. Testing boilers and pressure vessels for compliance with safety codes;
 - 2. Specifications for materials for patching mechanical systems;
 - 3. Specifications for materials and installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing, refer to the respective system sections for materials and installation requirements.
 - 4. Requirements and procedures for piping and ductwork systems leakage tests.

1.2 SUBMITTALS

- A. Provide information in report form listing items required by specifications. Results shall be guaranteed. Contractor shall be subject to recall to site to verify report information before acceptance of the report by the Owner's Representative.

- B. Strategies and Procedures Plan: Within thirty (30) days of Contractor's Notice to Proceed, submit testing and balancing strategies and step-by-step procedures as specified in Section 3.1.B, "Preparation", and consistent with those listed in Part 3 of this specification.
- C. System Readiness Checklists: Within thirty (30) days of Contractor's Notice to Proceed, AABC agency shall provide system readiness checklists as specified in Section 3.1.C, "Preparation", to be used and filled out by the installing contractors verifying that systems are ready for Testing and Balancing.
- D. Examination Report: Provide a summary report of the examination review required in Section 3.1.D to the Engineer, documenting issues that may preclude the proper testing and balancing of the systems.
- E. Certified report format shall consist of the following:
 - 1. Title sheet with job name, contractor, engineer, date, balance contractor's name, address, telephone number and contact person's name and the balancing technician's name.
 - 2. Individual test sheets for air handlers, terminal units, air distribution, exhaust fans, duct traverses, pumps, air handling coils, reheat coils, radiation, convectors, cabinet unit heaters and unit ventilators.
 - 3. Manufacturer's pump and fan curves for equipment installed with design and actual operating conditions indicated.
 - 4. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" or TABB's "Testing, Adjusting and Balancing Bureau".

1.3 DEFINITIONS

- A. System testing, adjusting and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:
 - 1. The balance of air and water distribution;
 - 2. Adjustment of total system to provide design quantities;
 - 3. Electrical measurement;
 - 4. Verification of performance of all equipment and automatic controls.
- B. Test: To determine quantitative performance of equipment.
- C. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttling).

- D. Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.
- E. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.
- F. Report Forms: Test data sheets arranged for collecting test data in logical order for submission and review. This data should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.
- G. Terminal: The point where the controlled fluid enters or leaves the distribution system. There are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return supply or outside air inlets or outlets on terminals such as registers, grilles, diffusers, and louvers.
- H. Main: Duct or pipe containing the system's major or entire fluid flow.
- I. Submain: Duct or pipe containing part of the systems' capacity and serving two or more branch mains.
- J. Branch Main: Duct or pipe serving two or more terminals.
- K. Branch: Duct or pipe serving a single terminal.

1.4 QUALIFICATIONS

- A. Follow procedures and methods published by one or more of the following:
 - 1. Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) or Testing, Adjusting and Balancing Bureau (TABB).
 - 2. Individual manufacturer requirements and recommendations.
- B. Maintain qualified personnel at project for system operation and trouble shooting. TAB contractor shall change sheaves and perform mechanical adjustments in conjunction with balancing procedure.
- C. Balancing contractor shall be current member of AABC, NEBB, or TABB.
- D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in the *AABC National Standards for Total System Balance and SMACNA TAB Procedural Guide*.

1.5 GENERAL REQUIREMENTS

- A. Before concealment of systems visit the job site to verify and advise on type and location of balancing devices and test points. Make changes as required to balance facilities.

- B. Place systems in satisfactory operating condition.
1. Adjusting and balancing shall be accomplished as soon as the systems are complete and before Owner takes possession.
 2. Initial adjustment and balancing to quantities as called for or as directed by the engineer, to satisfy job conditions.
 3. All outdoor conditions (Db, Wb, and a description of the weather conditions) at the time of testing shall be documented in the report.
 4. Airside
 - a. Prior to balancing, adjust balancing devices for full flow and replace temporary filters.
 - b. Provide sheaves and belts as required to meet system performance requirements for all belt-driven fan motors 10 HP and greater. Adjust and align sheaves to obtain proper settings and operation. Verify motors are not overloading.
 - c. Installing contractor shall replace dampers in new systems and identify dampers in existing systems that cannot be manipulated to satisfy balancing requirements.
 - d. Traverse main ducts to determine total system air quantities after all outlets have been set prior to final adjustment if the system does not meet design requirements. A sum of room CFM's is not acceptable.
 - e. If duct construction and/or installation prohibits proper traverse readings, provide coil measurements at main coils and/or fresh air intake traverse with units operating in 100% outside air mode (where applicable).
 5. Hydronics
 - a. Prior to balancing, adjust balancing devices for full flow; fill, vent and clean hydronic systems, replace temporary strainers.
 - b. Installing contractor shall replace balancing cocks and flow balancers in new systems and identify flow balancers and balancing cocks in existing systems that cannot be manipulated to satisfy balancing requirements.

1.6 CONTRACTOR RESPONSIBILITIES

- A. Provide Testing and Balancing agency one complete set of contract documents, change orders, and approved submittals in digital and hard copy formats.
- B. Controls contractor shall provide required BAS hardware, software, personnel and assistance to Testing and Balancing agency as required to balance the systems. Controls Contractor shall also provide trending report to demonstrate that systems are complete.

- C. Coordinate meetings and assistance from suppliers and contractors as required by Testing and Balancing agency.
- D. Installing contractor shall replace or repair insulation as required by Testing and Balancing agency.
- E. Have the HVAC systems at complete operational readiness for Testing and Balancing to begin. As a minimum verify the following:
 - 1. Airside:
 - a. Provide additional dampers, sheaves and belts as required by Testing and Balancing agency.
 - b. Flag all manual volume dampers with fluorescent or other high-visibility tape.
 - c. Provide access to all dampers, test ports, nameplates and other appurtenances as required by Testing and Balancing agency.
 - d. All ductwork is complete with all terminals installed.
 - e. All volume, smoke and fire dampers are open and functional.
 - f. Clean filters are installed.
 - g. All fans are operating, free of vibration, and rotating in correct direction.
 - h. ASD start-up is complete and all safeties are verified.
 - i. System readiness checklists are completed and returned to Testing and Balancing agency.
 - 2. Hydronics:
 - a. Provide additional valves as required by Testing and Balancing agency.
 - b. Provide access to all valves, test ports, nameplates and other appurtenances as required by Testing and Balancing agency.
 - c. Piping is complete with all terminals installed.
 - d. Water treatment is complete.
 - e. Systems are flushed, filled and air purged.
 - f. Strainers are pulled and cleaned.
 - g. Control valves are functioning per the sequence of operation.
 - h. All shutoff and balance valves have been verified to be 100% open.

- i. Pumps are started, and proper rotation is verified.
 - j. Pump gauge connections are installed directly at the pump inlet and outlet flange or in discharge and suction pipe prior to any valves or strainers.
 - k. ASD start-up is complete and all safeties have been verified.
 - l. System readiness checklists are completed and returned to Testing and Balancing agency.
- F. Promptly correct deficiencies identified during Testing and Balancing.
- G. Maintain a construction schedule that allows the Testing and Balancing agency to complete work prior to occupancy.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Provide tools, ladders, recording meters, gauges, thermometers, velometers, anemometers, Pitot tubes, inclined gauge manometers, magnehelic gauges, amprobes, voltmeters, psychrometers and tachometers required.
- B. Instrumentation Calibration: Calibrate instruments at least every six (6) months or more frequently if required by instrument manufacturer.
 - 1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine Bid Documents and submittals and notify Owner's Representative and Engineer of any questions regarding balancing.
 - 1. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper Testing and Balancing of systems and equipment.
 - 2. Examine the approved submittals for HVAC systems and equipment.
 - 3. Examine equipment performance data including fan and pump curves.
- B. Prepare a Testing and Balancing Strategies and Procedures Plan that includes:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.

3. Instrumentation to be used.
 4. Sample forms with specific identification for all equipment.
- C. Prepare system-readiness checklists, as described in the *AABC National Standards for Total System Balance and SMACNA TAB Procedural Guide*, for use by contractors in verifying system readiness for Testing and Balancing. These shall include, at a minimum:
1. Airside:
 - a. All ductwork is complete with all terminals installed.
 - b. All volume, smoke and fire dampers are open and functional.
 - c. Clean filters are installed.
 - d. All fans are operating, free of vibration, and rotating in correct direction.
 - e. Permanent electrical power wiring and ASD start-up is complete and all safeties are verified.
 - f. Automatic temperature-control systems are operational.
 - g. Ceilings are installed.
 - h. Windows and doors are installed.
 - i. Suitable access to balancing devices and equipment is provided.
 - j. Equipment and duct access doors are securely closed.
 2. Hydronics:
 - a. Piping is complete with all terminals installed.
 - b. Water treatment is complete.
 - c. Systems are flushed, filled and air purged.
 - d. Strainers are pulled and cleaned.
 - e. Control valves are functioning per the sequence of operation.
 - f. All shutoff and balance valves have been verified to be 100% open.
 - g. Pumps are started and proper rotation is verified.
 - h. Pump gauge connections are installed directly at the pump inlet and outlet flange or in discharge and suction pipe prior to any valves or strainers.

- i. Permanent electrical power wiring and ASD start-up is complete and all safeties are verified.
 - j. Suitable access to balancing devices and equipment is provided.
- D. Examine construction and notify Owner's Representative and Engineer of outstanding issues related to balancing, as part of "Examination Report" submittal.
 - 1. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, clean permanent filters are installed, and controls are ready for operation.
 - 2. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected, configured by the controls contractor and functioning.
 - 3. Airside
 - a. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas.
 - b. Examine systems for installed balancing devices, such as test ports, gage cocks, flow-control devices, and manual volume dampers prior to pressure testing. Note the locations of devices that are not accessible for testing and balancing.
 - 4. Hydronics
 - a. Examine strainers to verify that Mechanical Contractor has replaced startup screens with permanent screens and that all strainers have been cleaned.
 - b. Examine two-way valves for proper installation and function.
 - c. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
 - d. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
 - e. Examine air vents to verify that mechanical contractor has removed all air from all hydronic systems.
 - f. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings and weld-o-lets prior to pressure testing. Note the locations of devices that are not accessible for testing and balancing.

3.2 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" or TABB's "SMACNA TAB Procedural Guide" and this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.
- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.3 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure fan static pressures to determine actual static pressure as follows:
 - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and treating equipment.
 - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
 - 3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.

4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
 5. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to sheaves sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
 6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 2. Re-measure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure terminal outlets and inlets without making adjustments.
1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.
1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.4 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

- A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.
- B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
 1. Set outside-air dampers at minimum, and return-and exhaust-air dampers at a position that simulates full-cooling load.
 2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
 3. Measure total system airflow. Adjust to within indicated airflow.
 4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
 5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.
 - a. If air outlets are out of balance at minimum airflow, report the conditions but leave outlets balanced for maximum airflow.
 6. Re-measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.
 7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that the adequate static pressure is maintained at the most critical unit.
 8. Record the final fan performance data.

- C. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

3.5 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports for pumps, coils and heat exchangers. Obtain approved submittals and any manufacturer-recommended testing procedures. Cross check the summation of required coil and heat exchanger gpm with pump design flow rate.
- B. Verify that hydronic systems are ready for testing and balancing:
 - 1. Check liquid level in expansion tank and verify that tank is set to specified pressure for system fill and expansion.
 - 2. Check that makeup water has adequate pressure to highest vent.
 - 3. Check that control valves are in their proper positions.
 - 4. Check that air has been purged from the system.
 - 5. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
 - 6. Verify that motor starters are equipped with properly sized thermal protection.

3.6 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Adjust pumps to deliver total design gpm.
 - 1. Measure total water flow.
 - a. Position valves for full flow through coils.
 - b. Measure flow by main flow meter, if installed.
 - c. If main flow meter is not installed, determine flow by pump total dynamic head (TDH) or exchanger pressure drop.
 - 2. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves or fittings.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gauge heights.

- d. On single stage centrifugal pumps, verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - e. With all valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
- B. Adjust flow measuring devices installed in mains and branches to design water flows.
1. Measure flow in main and branch pipes.
 2. Adjust main and branch balance valves for design flow.
 3. Re-measure each main and branch after all have been adjusted.
- C. Adjust flow measuring devices installed at terminals for each space to design water flows.
1. Measure flow at all terminals.
 2. Adjust each terminal to design flow.
 3. Re-measure each terminal after all have been adjusted.
 4. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
 5. Perform temperature tests after all flows have been balanced.
- D. For systems with pressure-independent valves at the terminals:
1. Measure differential pressure and verify that it is within manufacturer's specified range.
 2. Perform temperature tests after all flows have been verified.
- E. For systems without pressure-independent valves or flow measuring devices at the terminals:
1. Measure and balance coils by either coil pressure drop or temperature method.
 2. If balanced by coil pressure drop, perform temperature tests after all flows have been verified.
- F. Verify final system conditions as follows:
1. Re-measure and confirm that total water flow is within design.

2. Re-measure all final pump operating data, TDH, volts, amps, static profile.
 3. Mark all final settings.
- G. Verify that all memory stops have been set.

3.7 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

- A. Adjust the variable-flow hydronic system as follows:
1. Verify that the differential pressure (DP) sensor is located per the Contract Documents.
 2. Determine if there is diversity in the system.
- B. For systems with no diversity:
1. Follow procedures outlined for constant-flow hydronic systems.
 2. Prior to verifying final system conditions, determine the system DP setpoint.
 3. If the pump discharge valve was used to set total system flow with ASD at 60 Hz, at completion open discharge valve 100% and allow ASD to control system DP setpoint. Record pump data under both conditions.
 4. Mark all final settings and verify that all memory stops have been set.
- C. For systems with diversity:
1. Determine diversity factor.
 2. Simulate system diversity by closing required number of control valves, as approved by the design Engineer.
 3. Follow procedures outlined for constant flow hydronic systems.
 4. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance the terminals that were just opened.
 5. Prior to verifying final system conditions, determine the system DP setpoint.
 6. If the pump discharge valve was used to set total system flow with ASD at 60 Hz, at completion open discharge valve 100% and allow ASD to control system DP setpoint. Record pump data under both conditions.
 7. Mark all final settings and verify that all memory stops have been set.

- D. For systems with pressure-independent valves at the terminals:
 - 1. Measure differential pressure and verify that it is within manufacturer's specified range.
 - 2. Perform temperature tests after all flows have been verified.

3.8 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans: Zero to plus 10 percent.
 - 2. Air Outlets and Inlets: Plus or minus 10 percent.
 - 3. Minimum Outside Air: Zero to plus 10 percent.
 - 4. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.
 - 5. Heating-Water Flow Rate: Plus or minus 10 percent.
 - 6. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.9 FINAL TEST & BALANCE REPORT

- A. The report shall be a complete record of the HVAC system performance, including conditions of operation, items outstanding, and any deviations found during the Testing and Balancing process.
The final report also provides a reference of actual operating conditions for the owner and/or operations personnel. All measurements and test results that appear in the reports must be made on site and dated by the technicians or Test and Balance Engineers.
- B. The report must be organized by systems and shall include the following information as a minimum:
 - 1. Title Page:
 - a. AABC or NEBB Certified Company Name.
 - b. Company Address.
 - c. Company Telephone Number.
 - d. Project Identification Number.
 - e. Location.
 - f. Project Architect.
 - g. Project Engineer.

- h. Project Contractor.
 - i. Project Number.
 - j. Date of Report.
 - k. Certification Statement.
 - l. Name, Signature, and Certification Number.
- 2. Table of Contents.
 - 3. National Performance Guaranty.
 - 4. Report Summary:
 - a. The summary shall include a list of items that do not meet design tolerances, with information that may be considered in resolving deficiencies.
 - 5. Instrument List:
 - a. Type
 - b. Manufacturer
 - c. Model
 - d. Serial Number
 - e. Calibration Date
- C. Required Airside data - Test, adjust and record the following:
- 1. Motors:
 - a. RPM
 - b. BHP
 - c. Full load amps
 - d. Sheave sizes, number and size of belts
 - e. Shaft diameter
 - f. Complete nameplate data
 - 2. Fans:
 - a. Cfm
 - b. RPM
 - c. Suction static pressure
 - d. Discharge static pressure
 - e. Sheave sizes, number and size of belts, key sizes, shaft, diameter
 - f. Complete nameplate data
 - g. Sketch of system's inlet and outlet connections
 - h. Location of test port

3. Duct: Traverse Zones:
 - a. Cfm
 - b. Static Pressure
 4. AHU – Air handling units, Fan coil units (In both minimum O.A. and economizer modes):
 - a. Minimum outdoor air Cfm
 - b. Total discharge and return Cfm
 - c. Static profile thru unit
 - d. Complete nameplate data
 5. Coil:
 - a. Entering air temperature (DB/WB)
 - b. Leaving air temperature (DB/WB)
 - c. Static differential
 - d. Face velocity and area
 - e. Cfm
 - f. Complete nameplate data
 6. VAV Boxes:
 - a. Minimum Cfm
 - b. Maximum Cfm
 7. Registers/Grilles/Diffusers:
 - a. Cfm
 - b. Set, adjust and record air flow pattern
 8. Filter Banks:
 - a. Nameplate data
 - b. Static pressure drop
- D. Required Fluid Data: Test, adjust and record the following:
1. Heat Transfer Devices: Including, but not limited to air handlers, convectors, fin tube radiation sections, unit ventilators, fan coils, cabinet heaters, unit heaters, heat pumps, heat exchangers.
 - a. GPM (coil and bypass)
 - b. Entering water temperature
 - c. Leaving water temperature
 - d. Water pressure drop
 - e. Complete nameplate data

- E. The final test and balance report shall be provided as a formal project submittal for review by the Engineer of Record.

END OF SECTION

SECTION 230710

INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTAL

- A. Submit product data, product description, manufacturer's installation instructions.
- B. Submit schedule of types and thicknesses for each application, and location of materials.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 232010 - Piping Systems and Accessories.
- B. Section 233100 - Sheet Metal and Ductwork Accessories Construction.

PART 2 - PRODUCTS

2.1 GENERAL

- A. See Exhibits at the end of this section for where insulating materials shall be applied, thickness, jacketing and remarks.
- B. Provide work in compliance with the following Codes and Standards based on the current edition in effect at project location:
 - 1. Energy Conservation Code of New York State.
- C. Insulation, jackets, adhesive, and coatings shall comply with the following:
 - 1. Products shall not contain asbestos, lead, mercury, or mercury compounds.
 - 2. Insulation, including jackets, finishes and adhesives on the exterior surfaces of ducts, pipes, and equipment, shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, when tested in accordance with ASTM E84 or UL 723.
 - a. Plenums: Insulation materials shall be noncombustible or listed and labeled per ASTM E84 or UL 723.
 - b. Treatment of jackets or facing for flame and smoke safety must be permanent. Water-soluble treatments are not permitted.

3. All adhesives, coatings and sealants used for insulation in the interior of the building shall comply with the maximum Volatile Organic Compound (VOC) limits as called for in the current version of U.S. Green Building Council LEED Credits EQ 4.1 and EQ 4.2.
4. Provide materials which are the standard products of manufacturers regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least two (2) years prior to bid opening. Provide insulation systems in accordance with the approved MICA or NAIMA Insulation Standards.
5. Insulation shall be clearly marked with manufacturer's name, identification of installed thermal resistance (R) value, out-of-package R value, flame spread and smoke developed indexes in accordance with Energy Code requirements.
6. Products that come into contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C 871.
7. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable in accordance with ASTM C 795.

2.2 ACCEPTABLE MANUFACTURERS

- A. Flexible Elastomeric: Armacell AP ArmaFlex/FS (Indoor: AP ArmaFlex up to 1", FS 1-1/2" to 2"; Outdoor: All sizes), Aeroflex (Indoors/Outdoors: All sizes), K-Flex Insul-Lock (Indoors: All sizes), K-Flex Titan (Indoors: Up to 1-1/2"; Indoors/Outdoors: All sizes), or approved equal.
- B. Fiberglass: Johns Manville, Knauf/Manson, Owen-Corning, or approved equal.
- C. Jacketing: Johns Manville (PVC) or approved equal.
- D. Adhesives, Coatings, Mastics, Sealants: Childers, Foster, or approved equal.

2.2 FLEXIBLE ELASTOMERIC

- A. Closed-cellular, sponge or expanded-rubber with integral vapor barrier.
- B. Tube and Sheet:
 1. Product meeting ASTM C 534, Type I/II Grade 1.
 2. 'K' Value at 75°F mean temperature
 - a. 0.245 BTU-in/ft² hr. °F (up to 1 in. wall thickness).
 - b. 0.28 BTU-in/ft² hr. °F (1-1/2 in. to 2 in. wall thickness).

- C. Sheet:
 - 1. Density: As required to meet specified R-value in Exhibit, unless otherwise noted.

2.3 FLEXIBLE FIBERGLASS

- A. Glass fibers bonded with a resin.
- B. Blanket:
 - 1. Product meeting ASTM C 553 Types I, II and III, and ASTM C 1290; Greenguard compliant.
 - 2. 'K' Value: 0.27 BTU-in/ft² hr. °F at 75°F mean temperature.
 - 3. Maximum Service Temperature (Faced): 250°F.
 - 4. Vapor Retarder Jacket: FSK conforming to ASTM C 1136 Type II.
 - 5. Density: As required to meet specified R-value in Exhibit, unless otherwise noted.

2.4 RIGID FIBERGLASS

- A. Pre-formed glass fibers bonded with a thermosetting resin.
- B. Pipe:
 - 1. Product meeting ASTM C 547, ASTM C 585, and ASTM C 795; rigid, molded, noncombustible.
 - 2. 'K' Value: 0.23 BTU-in/ft² hr. °F at 75°F mean temperature.
 - 3. Maximum Service Temperature: 1000°F.
 - 4. Vapor Retarder Jacket: Factory applied ASJ/SSL conforming to ASTM C 1136 Type I, secured with self-sealing longitudinal laps and butt strips.
 - 5. Field applied PVC Fitting Covers with Flexible Fiberglass Insulation: Proto Corporation 25/50 or Indoor/Outdoor, UV resistant fittings, jacketing and accessories, white or colored. Fitting cover system consists of pre-molded, high-impact PVC materials with blanket type fiberglass wrap inserts. Blanket fiberglass wrap inserts shall have a thermal conductivity ('K') of 0.26 at 75°F mean temperature. Closures to be stainless steel tacks, matching PVC tape, or PVC adhesive per manufacturer's recommendations.
- C. Board:
 - 1. Product meeting ASTM C 612 Type IA and IB. Maximum Service Temperature: 450° F.

2. 'K' Value: 0.24 BTU-in/ft² hr. °F at 75°F mean temperature.
3. Vapor Retarder Jacket:
 - a. ASJ conforming to ASTM C 1136 Type I
 - b. FSK or PSK conforming to ASTM C 1136 Type II.
4. Density: As required to meet specified R-value in Exhibit, unless otherwise noted.

2.5 ADHESIVES, COATINGS, MASTICS, SEALANTS

- A. Provide per manufacturer product requirements for associated system and application/installation location.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. All materials shall be installed by skilled labor regularly engaged in this type of work and installed in strict accordance with manufacturer's recommendations, building codes, and industry standards. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system per manufacturer requirements. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- B. Locate insulation and cover seams in the least visible location. All surface finishes shall be extended in such a manner as to protect all raw edges, ends and surfaces of insulation. No glass fibers shall be exposed to the air. Install insulation with longitudinal seams at top and bottom of horizontal runs. Install multiple layers of insulation with longitudinal and end seams staggered and with the least number of joints possible.
- C. All pipe and duct insulation shall be continuous through hangers.
- D. Provide thermal insulation on clean, dry surfaces and after piping, ductwork and equipment (as applicable) have been tested. Do not cover pipe joints with insulation until required tests are completed.
- E. All cold surfaces that may "sweat" must be insulated. Vapor barrier must be maintained; insulation shall be applied with a continuous, unbroken moisture and vapor seal. All hangers, supports, anchors, or other projections that are secured to cold surfaces shall be insulated and vapor sealed to prevent condensation.
- F. Items such as boiler manholes, handholds, clean-outs, ASME stamp, and manufacturers' nameplates, may be left uninsulated unless omitting insulation would cause a condensation problem. When such is the case, appropriate tagging shall be provided to identify the presence of these items. Provide neatly beveled edges at interruptions of insulation.

- G. Provide protective insulation as required to prevent personnel injury: Piping from zero to seven feet above all floors and access platforms including hot (above 140°F) piping and any other related hot surface.
- H. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site.
- I. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- J. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.
- K. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.

3.2 PENETRATIONS

- A. Interior Floor, Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Fire-Rated Floor, Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

3.3 PIPE INSULATION

- A. All pipes shall be individually insulated. Cover valves, fittings and similar items in each piping system with insulation as applied to adjoining pipe run. Extra care must be taken on piping appurtenances to insure a tight fit to the piping system.
- B. Piping insulation is allowed to be reduced in thickness only when a specific UL assembly detail for piping passing thru a rated wall indicates a maximum insulation thickness that is less than this specification section calls for. In this case reduce the insulation thickness just for the rated wall penetration. The reduction of insulation thickness shall be limited to the length of the penetration only.
- C. Coordinate insulation installation requirements for heat tracing that may apply.

3.4 DUCTWORK INSULATION

- A. Provide external thermal insulation for ductwork. Not required where ducts have internal acoustical insulation. Make special provisions at dampers, damper motors, thermometers, instruments, and access doors.
- B. Provide factory ASJ jacket for ductwork required to be insulated and to be painted.

EXHIBIT "I" - PIPE INSULATION MATERIALS

<u>SERVICE</u>	<u>INSULATION MATERIAL</u>	<u>THICKNESS</u>	<u>REMARKS</u>
Hot water and glycol/hot water (up to 200°F)	Rigid Fiberglass	1-1/2 in. and Larger: 2 in. 1-1/4 in. and Smaller: 1-1/2 in.	

EXHIBIT "II" - DUCT INSULATION MATERIALS

<u>SERVICE</u>	<u>INSULATION MATERIAL</u>	<u>THICKNESS</u>	<u>REMARKS</u>
Supply (concealed)	Flexible Fiberglass	2 in.	Min. installed R value of 6
Supply (within mechanical rooms or exposed at 8'-0" or less above finished floor)	Rigid Fiberglass	1-1/2 in.	Min. installed R value of 6
Return and exhaust within heated building envelope	Not insulated	Not insulated	
Exhaust, relief or vent ducts and plenums (concealed)	Flexible Fiberglass	2 in.	Min. installed R value of 6 Insulate ducts 15 ft. from exterior opening and plenums.
Interior ductwork indicated to be lined (DBL)	Not insulated	Not insulated	

END OF SECTION

SECTION 230923

BUILDING AUTOMATION CONTROL SYSTEM

PART 1 - GENERAL

1.1 INTRODUCTION

- A. The Building Automation Control System (BACS) is configured as a network with control functions at multiple levels, and with multiple points of operator control and supervision. The BACS includes web-based access, the Energy Management and Controls System (EMCS), data transmission systems, field panels and controllers, necessary interfacing controls, sensors and actuators. The controllers contain microprocessors and other supporting electronics that perform local control functions and execute application programs without requiring communications with the centralized head-end computers or workstations.

1.2 DESCRIPTION

- A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Drawings. Extend existing Building Automation Control System (BACS), to perform the functions described in this Section. All new equipment shall be compatible with the existing system. Provide wiring and conduit required to connect devices furnished as a part of, or accessory to, this automatic control system. Control wiring is defined as wiring up to and including 120 volts. Install wiring in accordance with requirements of "Electrical Wiring" in Section 230504, and the National Electrical Code. Provide all required devices for proper system operation, including special electrical switches, transformers, relays, pushbutton stations, etc.
 - 1. All Actuation of valves and dampers shall be electric unless specifically called out elsewhere in the specifications or drawings.

1.3 QUALITY ASSURANCE

- A. The complete automatic temperature control system shall be comprised of electric control devices with a microprocessor based Direct Digital Control System. All work shall be installed only by skilled mechanics employed by the BACS Contractor or Subcontractor.
- B. The BACS Contractor/Subcontractor shall have a minimum of five (5) years experience in systems of similar size, type and complexity installed within a 100 mile radius.
- C. The BACS Contractor/Subcontractor shall have a local service department (within a 50 mile radius) and have available a minimum of three (3) factory trained technicians within a 24 hour period.
- D. All components shall be fully tested and documented to operate as a complete system.
- E. Supplier must guarantee that all replacement parts will be carried in stock for a period of ten (10) years minimum from the date that the system is commissioned.

- F. Electrical standards: Provide electrical products that comply with the following agency approvals:
 - 1. UL 916; Energy Management Systems for Temperature Control components and ancillary equipment.
 - 2. UL 873; Temperature Indication and Regulating Equipment.
 - 3. FCC, Part 15, Subpart J, Class A Computing Devices.
- G. All products shall be labeled with the appropriate approval markings. System installation shall comply with NFPA, NEMA, Local and National codes.

1.4 ACCEPTABLE MAKES

- A. The complete Building Management System is designed and based on that manufactured by Automated Logic Corporation. Acceptable Make: Automated Logic Corporation.

1.5 SUBMITTALS

- A. Submit for review, a brochure containing the following:
 - 1. Floor Plans: Floor plans shall include all controllers/control panels, sensors, interface devices, remote pressure transmitters, smoke detectors, control valves, control dampers, flow meters, UPS's, etc., and all network components (repeaters, routers, etc.). Network wiring shall be shown and identified on the floor plan drawings.
 - 2. Control System Architecture Diagram: System architecture one-line diagrams shall indicate schematic location of all controllers, LAN switches and interface devices, gateways, etc. Indicate address and type for each control unit; as well as physical media, protocol, communication speed, and type of each LAN.
 - 3. Control Schematic Drawings: Control schematics shall be generated to graphically indicate each functional system, show the schematic configuration of the systems and location of control devices, define the point names and addresses (as applicable), and define the setpoints for control elements. The following information shall be included in the control schematics at a minimum:
 - a. BACS legend and abbreviations.
 - b. BACS one-line Architecture diagram.
 - c. Point names and types.
 - d. Normal position of output devices.
 - e. Setpoints.
 - f. Point addresses and device ranges per Cornell Standard Section 230901.

2. BACS User's Guides (Operating Manuals) for each controller type.
3. BACS Programming Manuals for each controller type.
4. All information provided during the submittal phase; updated with as-built information. As-built panel drawings shall also be included as part of the O&M manual process. The drawings that are located in each panel shall incorporate all the systems controlled from that particular panel. The drawings shall include the system schematic and detailed panel wiring diagram. The specific locations of any remote devices such as remote static pressure sensors and differential pressure sensors shall be noted on the plans.
5. Each control panel on the project shall include an as-built hard copy of all drawings and documentation associated with that panel and its field devices. This documentation shall be provided in a plastic protective pocket mounted inside the panel door.
6. As-Built Program: Databases with logic, graphics, trends, setpoints, and tuning parameters.

1.6 SCOPE OF WORK

- A. Except as otherwise noted, the control system shall consist of all Ethernet Network Controllers, Standalone Digital Control Units, software, sensors, transducers, relays, valves, dampers, damper operators and other accessory equipment, along with a complete system of electrical interlocking wiring as required to fill the intent of the specification and provide for a complete and operable system.
- B. The BACS Contractor/Subcontractor shall review and study all HVAC drawings and the entire specification to familiarize themselves with the equipment and system operation and to verify the quantities and types of dampers, operators, alarms, etc. to be provided.
- C. All interlocking, wiring and installation of control devices associated with the equipment shall be provided under this Contract. The BACS Contractor/Subcontractor shall demonstrate the operation of the system to the Owner and prove that it complies with the intent of the drawings and specifications.
- D. Provide services and manpower necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor and Owner's representative. Commissioning reports showing the testing of each BACS point on the system shall be submitted to the Engineer for review and approval upon completion of the commissioning process. Refer to the Commissioning Specification Section 019113.

1.7 WORK INCIDENTAL TO TEMPERATURE CONTROL CONTRACTOR

- A. The BACS Contractor/Subcontractor shall furnish the following materials, installation by the HVAC Contractor:
 - 1. For piping work:
 - a. Control valves in piping.
 - b. Immersion sensing wells in piping systems.
 - c. Valved pressure taps.
 - 2. For sheet metal work:
 - a. All automatic dampers, the BACS Contractor/Subcontractor shall assemble multiple section dampers with required interconnecting linkages and extend required number of shafts through duct for external mounting of damper and motors.
 - b. The HVAC Contractor shall provide access doors or other means of access through ducts or ceilings and walls for service and adjustment of controllers, valves, and dampers.
- B. Control manufacturer shall furnish written details, instructions and supervision for the above trades to ensure proper installation size, and location of any equipment furnished for installation by others.
- C. BACS Contractor/Subcontractor is responsible for providing 120 volt dedicated power to all DDC panels.
- D. BACS Contractor/Subcontractor is responsible for providing 120 volt dedicated power and control transformers at all microprocessor based VAV terminal unitS. As an option, provide control transformers sized to serve multiple VAV terminal unit controllers laboratory control valves. The Electrical Contractor is responsible for providing a junction box or boxes to obtain power, on a per floor basis. See electrical plans for locations.
- E. BACS Contractor/Subcontractor is responsible for providing Ethernet data drops at building controller(S).

1.8 CONTROL SYSTEM GUARANTEES

- A. Guarantee the new control system to be free from defects in material and workmanship, for a period of one year after final acceptance. Guarantee System to:
 - 1. Maintain temperatures within 1°F above and below setting.
 - 2. Humidity devices shall maintain relative humidity conditions within 3% of span 0-100% RH.

- B. Provide one (1) year maintenance service of control components, to start concurrently with the guarantee specified above. Such service shall include software updates and 24 hour, 7 day emergency and seasonal inspection and adjustment of operating controls and replacement of parts or instruments found deficient and defective during this period.
- C. Provide monitoring of the DDC system as soon as the system is operating and then for a minimum of one (1) year (24 hours/day, 7 days/week) after the acceptance date. A monthly report will be sent to the Owner with a description of general system status and any alarms or off-normal conditions.
- D. Guarantee future availability of continuous, 24 hour, 7 day a week service for the systems through available maintenance contracts.

1.9 APPLICABLE STANDARDS

- A. The following standards shall govern the design and selection of equipment supplied to fulfill the requirements of this section:
 - 1. ANSI/ASHRAE Standard 135-2012: *BACnet®. - A Data Communication Protocol for Building Automation and Control Networks*, as amended, and hereinafter referred to as "BACnet". American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. 2012.
 - 2. ATA/ANSI 878.1 (1992), ARCNET Local Area Network.
 - 3. ISO/IEC 8802-3 (1993), Information processing systems - Local area networks - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.

1.10 PROCEDURES

- A. For connection of devices and reconfiguration of existing devices on the Cornell University Building Automation and Control System Network:
 - 1. Contractor making changes to existing devices or installing new devices on the Cornell University Building Automation and Control System Network shall contact the Energy Management and Control System (EMCS) Operation at 607-255-5777 at least one (1) business day in advance of the anticipated work to initiate a service request with the Cornell Control Shop. The requestor shall provide the following information:
 - a. Desired time to, start work and the expected duration
 - b. The IP address of the device to be installed or configured
 - c. The physical location of the device including facility and room number.
 - d. Cell phone contact information for the installer.

2. Work will be permitted from 7:00 AM — 1:00 PM on business days Monday through Thursday. The one (1) day notice requirement and hours restrictions will be waived if the work is deemed an emergency. Personnel shall notify EMCS when the work is complete. Personnel are expected to be able to respond on site if contacted by EMCS to correct any anomalies related to the work for a period of up to four (4) hours after work is complete or if released by the FMCS, whichever is sooner.

1.11 BACNET/IP CHECKOUT

- A. Prior to connection to the campus backbone network, it must be demonstrated to Cornell personnel that these criteria have been met:
 1. The LP address, subnet mask and IP gateway address of the device to be connected must be shown to be correct for the network connection about to be made.
 2. The device's Device Instance Number (DIN) must be shown to conform to Cornell standards.
 3. In the case of devices that route to subordinate BACnet MS/TP or ARCNET networks, the network numbering must be shown to conform to Cornell numbering standards.
 4. The BACnet alarm Recipient List must contain the DIN (or BACnet Address, i.e., (BACnet Network Number, MAC Address)) of both the appropriate vendor server (ALC) and the EMCS alarm server (currently Jarlsberg, DIN 510).
 5. For each device containing network variables, a list of network variables must be provided showing that each references a valid network-accessible point.
 6. For each device containing points that are to issue Unconfirmed COV Notifications, a list of the points and their respective Change of Value (COV) increments must be provided to prove that the device will not generate COV storms.
 7. BACnet Broadcast Management Device (BBMD) capability must be shown to be disabled unless explicitly authorized by Cornell, i.e., the device's Broadcast Distribution Table (BDT) must be shown to be empty or non-existent.

1.12 WARRANTY

- A. Except as otherwise specified, the Contractor shall warrant and guarantee all work against defects in materials, equipment, and workmanship for a period of one (1) year from the date of acceptance of the work as evidenced by a resolution to that effect by the Owner, and for that period of time noted in special or extended warranties.
- B. The period of one (1) year shall be extended with respect to portions of the work first performed after substation completion by the period of time between substantial completion and actual performance of the work.

- C. The Contractor shall provide all recommended preventative maintenance of the materials, equipment, and workmanship as necessary and as described in the operating and maintenance manuals during the warranty period. In addition, the Contractor shall provide two (2) semi-annual service visits (i.e., one visit during the peak cooling season and one visit during the peak heating season) to test and evaluate the performance of the equipment. The Contractor shall provide a written report of the test and evaluation results.

The service visits shall include, but not be limited to:

1. Checking and, if necessary, correcting the calibration of the sensors, transducers, and transmitters for air flow, liquid flow, pressure, temperature, and humidity.
2. Checking and, if necessary, correcting the operation of the dampers and damper actuators.
3. Checking and, if necessary, correcting the operation (i.e., monitoring and command) of the system points.

PART 2 - PRODUCTS

2.1 GENERAL

- A. This section defines requirements for the sensors, controllers, computers, and generally the components that make up the system and the means and methods by which they are installed.
- B. Software and Hardware Updates - At the end of the first six months, and during the second six months, the Contractor shall update the equipment and any controllers, servers, and HMI Web servers with the latest modifications and improvements in software, firmware, and hardware that the manufacturer may have incorporated in the furnished equipment.

2.2 CONTROLLERS

- A. Overview
1. The control system shall consist of an inter-network of controllers.
- B. Controller Installation Requirements
1. Building- and system-level controllers shall be capable of operating independently, in stand-alone fashion, with no communication to other devices on the network while performing their monitoring and control routines using programs and operating parameters stored in the controllers' memory.

2. All points and functions that make up a functional system (typically that shown on one control schematic) shall be included in one controller to qualify for this stand-alone functionality. Where control sequences depend on global variables such as OAT, the controller shall have the capability of either using the last value or a default value. Design professional shall specifically indicate point groupings for stand-alone capability. Examples of required functional point groupings are:
 - a. All points and functions required to control an air handler with all directly associated supply, return, and exhaust fans. This excludes the terminals that may be associated with that air handler. Values that may be received across the network include:
 - 1) Humidity;
 - 2) Emergency power source indication;
 - 3) Terminal based reset parameters;
 - 4) Smoke modes.
 - b. All points associated with the supply side of a hydronic system: pumps, flow meters, temperature and pressure sensors, proof indications, valves etc. This excludes the terminals on that hydronic system. Values that may be received across the network include:
 - 1) OAT and humidity;
 - 2) Emergency power source indication;
 - 3) Terminal based reset parameters.
 - c. All points and functions required to control one terminal system including dampers, valves, flow meters, temperature and humidity sensors, etc. This does not include the scheduling period or any OA that may be necessary for control.
3. Controller software must be capable of detecting hardware and software failures and forcing all outputs to a predetermined state, consistent with the failure mode requirements defined on the drawings. In this state it shall issue an alarm.
4. Controllers must include sufficient memory for all required operation and all required trending, when trending is buffered in the controller. Where control system operation is hindered by the shortage of memory, contractor shall, at no cost to the Owner, either upgrade the memory or provide multiple controllers. The mix of points for multiple controllers shall not violate the stand-alone requirements. Volatile memory is required to be backed up in the event of power loss. Software stored in non-volatile memory will not have to be downloaded from the central server after an interruption of power occurs.
5. Controllers used for time-scheduled operations must be equipped with a battery backed internal real-time clock function to provide a time base for implementing time-dependent programs. Provision shall be made for the routine updating of the controllers' clocks via a time master.

6. Resumption of power after an outage shall cause the controllers to automatically restart and establish communications as needed by their applications. Controller shutdown based on a self-diagnosed failure in the power supply, hardware, or software must set each piece of controlled equipment to a predetermined failure mode.
7. Controllers shall be powered from the most reliable source that powers any of the systems it serves. In the situation where a controller will be required to continuously collect data to be transmitted to a workstation, or where it monitors critical recovery information such as the presence of emergency power, it may be necessary to provide a UPS for the controller as well as any critical sensors. Where panels are provided with a different power source as the equipment (such as when the panel is on a UPS), the panel shall be provided with a means of monitoring the power source to the controlled equipment. This can be a dedicated power monitor or a value coming from transfer switch contacts.

2.3 SENSORS

- A. General: The following indicates basic requirements for the I/O devices.
- B. Temperature Sensors / Transmitters
 1. General:
 - a. Sensor Resolution - When matched with A/D converter of the controller, sensor range shall provide a resolution of no less than 0.4°F (unless noted otherwise).
 - b. Sensor Accuracy: +/- 0.4°F accuracy at calibration point. When used in combination with a humidity and/or CO2 sensor, +/- 0.5°F is acceptable.
 - c. Sensing Element: Thermistor.
 - 1) For outside air temperature and liquid immersion sensors, use of an integrated circuit element is acceptable. Use of thermistors is not allowed.
 2. Room Temperature Sensor - These shall be an element contained within a ventilated cover, suitable for wall mounting. Provide an insulated base.
 - a. Provide set-point adjustment and appropriate cabling where indicated for zones. Public spaces shall not have setpoint adjustment. The setpoint adjustment shall be a warmer/cooler indication that shall be scalable via the BACS system;

- b. Occupancy Override: Generally, the preferred method of occupancy override is with occupancy and vacancy sensors, which in most cases eliminates the need for a manual override button. Where spaces do not have occupancy/vacancy sensors, provide a button on the room sensor enclosure where indicated. Public spaces shall not have occupancy overrides. This shall be a momentary contact closure.
 - c. Provide the sensor with an alphanumeric display.
 - d. Provide sensor with communications jack and appropriate cabling for connection to the BACS.
 - e. Temperature sensor shall be mounted at 46" A.F.F. to center line of device. Coordinate mounting height with all devices on a common wall. All devices shall be installed in alignment.
3. Single Point Duct Temperature Sensor - These shall consist of a sensing element, junction box for wiring connections, and a gasket to prevent air leakage or vibration noise. The temperature range as required for resolution is indicated above. The sensor probe shall be stainless steel.
 4. Averaging Duct Temperature Sensor - These shall consist of an averaging element, junction box for wiring connections and gasket to prevent air leakage. Provide sensor lengths and quantities to result in one foot of sensing element for each, two square feet of coil/duct face area. Temperature range shall be as required for resolution as indicated above.
 5. Liquid Immersion Temperature Sensor
 - a. These shall include brass or stainless steel thermowell, sensor and connection head for wiring connections.
 - b. Sensing element - RTD, thermistor, or integrated circuit, +/- 0.4°F accuracy at calibration point. The temperature range shall be as required for resolution of 0.3°F;
 - c. Refer to Cornell's metering specification for temperature sensors that are used for metering.
 6. OA Sensors
 - a. These shall consist of a sensor, sun shield, utility box, and watertight gasket to prevent water seepage. The temperature range shall be as required for the resolution indicated above. Materials shall be non-corroding and be resistant to UV exposure.
 - b. Sensing element - RTD, thermistor, or integrated circuit, +/- 0.4°F accuracy at calibration point;
 - c. On major/critical systems, one shall be provided for each;

- d. Sensors shall be located on a north wall of the building and installed with stand-offs. On 100% OA systems and lab buildings, locate sensor in outside air plenum.
- e. Provide one sensor per mechanical room or building-level controller.

C. Humidity Sensors:

- 1. Device shall be suitable for duct, wall, or outdoor mounting, and shall be combined with the temperature sensor in the same device. Sensors shall be two-wire transmitters utilizing bulk polymer resistance change or thin film capacitance change. Units shall produce linear continuous output of 4-20 mA for % RH.
- 2. Shall be combined into one device with temperature/CO2 sensors, as applicable.
- 3. Sensors shall have the following minimum performance and application criteria:
 - a. Input Range: 10 to 100% RH.
 - b. Operating Range: As required by the application.
 - c. Long Term Stability: Less than 1% drift per year.
- 4. Accuracy:
 - a. General Duty, monitoring: +/- 3% RH between 20-90% RH at 77 °F, including hysteresis, linearity, and repeatability.
 - b. High Accuracy control, enthalpy calculation, dewpoint calculation, humidification and dehumidification control: +/- 2% RH between 20-90% RH at 77 °F, including hysteresis, linearity, and repeatability.

D. CO2 Sensors:

- 1. Application: Demand controlled ventilation of high-density occupancy spaces, such as auditoriums, classrooms, lecture rooms, and conference rooms.
- 2. Shall be combined into one device with temperature/humidity sensors, as applicable.

E. Dewpoint Sensors

- 1. Devices shall only be used for compressed air dewpoint monitoring service. These shall not be used for space conditioning or control of HVAC systems.
- 2. Acceptable Manufacturer: Vaisala, Model DPT146

- F. Pressure Sensors - The pressure transducers will be either diaphragm or strain gauge types:
1. Air Differential Pressure Sensor / Transmitters:
 - a. Applications: Duct static pressure, filter DP, measuring probes, display, zero and span adjustments.
 - b. Provide the smallest range feasible for the application, but no more than two times the working differential pressure of the system to allow the highest resolution possible. Provide zero and span adjustments, measuring probes and display.
 - c. Accuracy: +/- 1% of full scale.
 - d. Acceptable Manufacturers: BAPI, Dwyer, Mamac, Setra, Veris Industries.
 2. Liquid Differential Pressure Transmitters:
 - a. Signal: linear 4 to 20 mA or 0-10 VDC signal.
 - b. Three-valve manifold for venting, draining, and calibration; pressure/temperature test ports in lieu of pressure gauges. Wetted parts shall be stainless steel with a silicone fluid-filled diaphragm.
 - c. External span and zero adjustments. Span shall be no greater than 2 times the working differential pressure of the system to allow the highest possible resolution.
 - d. Rating: 150 PSIG, static pressure.
 - e. Accuracy: 1% accuracy over the entire span.
 - f. Repeatability: +/- 0.5% at maximum span.
 - g. Acceptable Manufacturers Mamac, Setra, Veris Industries.
 3. Air Differential and Static Pressure Switches:
 - a. Span shall be no greater than 2 times the measured value to allow the highest possible resolution. The switches shall be installed in accordance with the manufacturer's installation instructions. All switches shall be mounted in accessible and, to the extent possible, vibration-free locations (i.e., not on duct work).

4. Liquid Differential Pressure Switches:
 - a. Barksdale Model EPD1HAA40 or Penn P74 differential pressure switches shall be provided when pressure sensing is required to determine status. All switches shall be mounted in accessible and, to the extent possible, vibration-free locations.
 - b. Do not use differential pressure switches for run status on pumps. Current switches shall be used on constant volume pumps and drive contacts shall be used for pumps with VFDs.

G. Flow Sensors

1. General:

- a. Flow sensors shall be carefully placed to ensure flow profiles that are required for accurate flow sensing. Designs shall specifically indicate the location of the sensors and indicate the length of unobstructed duct or pipe upstream and downstream from the sensor.

2. Water:

- a. Water flow sensors shall meet the requirements necessary for use for test and balance duty as defined in the BACS specifications.
- b. Service: Sub-Metering.
- c. Type: Magnetic (Turbine & Annubar types are not allowed).
- d. Acceptable Make & Model:
 - 1) Siemens – Sitrans MAG 3100 Electromagnetic
 - 2) Emerson – Flexim Ultrasonic
 - 3) Dwyer – Series TUF Ultrasonic

3. Air Flow Sensors/Transmitters:

- a. Type: Use a pitot-tube averaging grid of a material compatible with the environment.
 - 1) Fan inlet grids shall be used where possible to measure fan flow. Fan inlet grids shall be provided by the fan vendor and shall not block or affect fan efficiency. The use of “golf ball” type airflow probes is not acceptable.
 - 2) The use of combination control damper/flow measurement devices is not acceptable.
- b. Accuracy: +/- 0.25%

- c. Stability: +/- 0.5% of full scale per year or less
- d. Auto-zero capability by venting ports to atmosphere
- e. Acceptable Manufacturers: Air Monitor, Paragon, Accutrol VorTek

H. Current Switches (CS):

- 1. For Constant Speed Motors:
 - a. CS shall be provided for status indication of constant speed motors.
 - b. Switch shall indicate loss of status when current falls below an adjustable trip point.
 - c. CS shall include LED indication of status.
 - d. Acceptable Manufacturer: Veris Industries (H708/ H908 series).
- 2. For Variable Speed Motors:
 - a. Typically, status indication that indicates VSD or bypass operation shall be derived from contacts on the VSD. The VSD must be specified to include this option.
 - b. Otherwise, a current switch shall be provided for status indication. The switch shall be microprocessor based and suitable for use on a VSD.
 - c. Self-adjusting trip setpoint.
 - d. Factory programmed to detect belt loss undercurrent conditions.
 - e. CS shall include LED indication of status.
 - f. Acceptable Manufacturer: Hawkeye.

I. Occupancy/Vacancy Sensors:

- 1. HVAC and lighting control systems using occupancy/vacancy sensors shall be integrated. See Cornell Design and Construction Standard 260923.

J. Condensate Sensors:

- 1. Application: Moisture sensing on chilled water supply systems to terminal chilled beam and radiant cooling devices.
- 2. Acceptable Manufacturers and Model Numbers:
 - a. Siemens QXA 2000

- b. Sauter EGH 102
- c. Honeywell H7018A1003

K. Break Glass Ventilation Shutdown Switch

1. Complete break-lens emergency operator station with spare lens.
2. NEMA 1 surface mount box.
3. Red "Break Lens - Push Button" maintained operator.
4. Operator station shall read "EMERGENCY - VENTILATION STOP"
5. Normally Closed stackable contact block with 2 contacts.
6. Design make: Pilla ST120-SN1
7. Acceptable Manufacturers: Pilla or Equal.

2.4 CONTROL VALVES

A. General

1. All valves shall be provided and sized by the control trade.
2. Valves shall be suitable for the rated pressure and temperature service. Close off pressures must be determined in concert with the actuators and valves shall be provided to close off against extreme anticipated conditions. Valves shall be selected such that they are not oversized.
3. Modulating valves shall be carefully selected to control in a smooth and stable fashion across the range of anticipated conditions. Split ranging of heating and cooling valves controlled by the BACS is not acceptable. A separate output from the BACS shall be provided for all control valves. Electric Input shall be 4-20 mA or 0-10 VDC.

B. Pressure independent control valves shall not be used.

C. Actuators shall be electric, one motor only. Deviations where stacking of actuators is deemed necessary shall be approved by Cornell.

1. Acceptable Manufacturer:
 - a. Belimo

D. Steam

1. Steam control valves shall be rated for the highest system pressure and temperature and shall not lift when subjected to that pressure with the control system set to “fully closed.” Steam control valves have a flanged or screw body with a rating of 400°F or higher, as appropriate. Trim shall be rated for 400°F.
2. Use high performance segmented V-ball control valves for all steam control applications. Since Cornell does not require 1/3-2/3 sizing, these valves are extremely cost-effective; the energy savings associated with the reduced pass-through leakage often pays for the higher cost premium. In addition, these valves require less packing maintenance and use much less vertical space than comparable valves. Steam valves shall have the following characteristics:
 - a. Leakage Class: ANSI Class IV, minimum
 - b. Flow Characteristic: Equal Percentage
 - c. Rangeability: 300:1 turndown
3. On steam control valves with a normal differential pressure of 15 PSIG or greater, stainless steel noise reducing trim shall be used.
4. Acceptable Manufacturers:
 - a. Fisher
 - b. Neles
 - c. Valve Solutions, Inc.
5. Fail positions shall generally be as follows:
 - a. Heat Exchangers/Converters: Normally closed, spring return (to protect for high temperature).
 - b. Clean Steam: Normally closed, spring return.
 - c. Humidification Systems: Normally closed, spring return.

E. Water

1. Chilled Water Recirculating Loop Valve (two-way)
 - a. General:
 - 1) Typically CV shall be selected to give a 2 PSIG drop @ maximum building flow with the valve at the 90% open CV. Verify the necessary pressure drop with the Department of Utilities and Energy Management (Utilities).

For buildings located at extremities, check with Utilities since requirements may not be typical.

- 2) Valve shall seat against 40 PSI differential pressure (typical values; check with Cornell Utilities for location-specific values).

b. Performance:

- 1) Type: Rotary-segmented ball ported industrial control valve
- 2) Body: Flanged carbon steel
- 3) Seat: Composition or stainless/Teflon
- 4) ANSI leakage class: IV, minimum.
- 5) Trim: 316 Stainless
- 6) Flow Characteristics: Equal percentage or modified equal

c. Fail Position: Fail Last

d. Acceptable Make: Belimo, Fisher, Neles, Valve Solutions, Inc.

2. Coil Valves

a. General:

- 1) Modulating water valves will generally be ball valves with an equal percentage characteristic. Modulating water valves shall typically be sized for 50-100% of the typical controlled circuit pressure drop at 70% wide open CV. The minimum design CV shall be no less than 1.9.
- 2) Water and glycol control valves shall be rated to remain closed (zero leakage) against 120% of the full shutoff head of the pumps, when the control signal is set to "fully closed".

b. Performance:

- 1) Type: Two-way, V-port valve with characterizing disc, 1/4 turn.
- 2) Packing: EPDM O-rings, lubricated.
- 3) Ball & Stem: Stainless steel.
- 4) Seat: Fiberglass reinforced Teflon.
- 5) Flow characteristics: Equal percentage

- c. Fail positions shall generally be as follows, contact Cornell for special circumstances requiring deviation from these requirements:
 - 1) Terminal hot water radiation: Fail Last
 - 2) Duct mounted re-heat coils serving animal rooms: Normally Closed, Spring Return.
 - 3) Duct mounted re-heat coils serving laboratories: Fail Last
 - 4) Duct mounted re-heat coils serving offices: Fail Last
 - 5) Fan Coil Unit cooling coils: Normally Closed, Spring Return
 - 6) Pre-heat coils in Air Handling Units: Normally Open, Spring Return
 - 7) Chilled water coils in Air Handling Units: Normally Closed, Spring Return
 - 8) Chilled Beam terminal cooling: Normally closed, Spring return
- d. Acceptable Manufacturers: Belimo, Valve Solutions, Inc.

2.5 CONTROL DAMPERS

- A. Dampers shall be applicable for the rated pressure and velocity service. Damper structural rating shall exceed extreme anticipated conditions like fan deadhead.
- B. Modulating dampers shall be carefully selected to control in a smooth and stable fashion across the range of anticipated conditions. Provide separate minimum outside air dampers from economizer dampers to ensure proper control performance.
- C. Except where size dictates a single blade, dampers shall always be opposed blade.
- D. When a large section of damper is to be connected to a single jackshaft, size limitations shall be followed. This will prevent excessive damper area or, more importantly, length from being connected to a single jackshaft. Typically, the manufacturer's recommendation shall be sufficient for specifying a limit to the size of a damper bank that may have field fabricated jackshaft connections.
- E. Whenever possible, dampers shall have external crankshafts to allow the connection of the damper actuator outside of the air stream. This will allow for easier access to the actuators for maintenance.
- F. Outside air (OA) control dampers shall be low leakage dampers with damper seals.
- G. Output to modulating control dampers shall be analog.
- H. Design make: Ruskin.

- I. Acceptable Manufacturers: Greenheck, Ruskin, and Nailor.
- J. Actuators:
 - 1. Size actuators and linkages to operate their appropriate dampers or valves with sufficient reserve torque or force to provide smooth modulating action or two-position action and adequate close off rating as required.
 - 2. Actuators shall be electronic.
 - 3. Acceptable Manufacturers: Belimo.
 - 4. For AHU/ duct mounted dampers:
 - a. Standard Electronic Actuators: Shall be designed for a minimum of 60,000 full cycles at full torque and be UL 873 listed. Provide stroke indicator. Actuators shall have a positive positioning circuit and selectable inputs. Full stroke shall be within 90 seconds. Where fail positions are required, provide spring return on the actuator with adequate close off force.
 - 5. For terminal unit dampers:
 - a. Standard Electronic Actuators: Shall be designed for a minimum of 60,000 full cycles at full torque. Provide stroke indicator. Output to modulating damper actuators may be analog or floating.

2.6 CONTROL PANELS

- A. Enclosures:
 - 1. BACS control panels shall be fully enclosed cabinet, baked enamel, steel, aluminum or composite material construction. Enclosures located in mechanical rooms shall be NEMA 4 and Enclosures located in labs and other relatively dust free and dry spaces may be NEMA 1. Enclosures shall have removable back plates and keyed, hinged covers. Enclosures shall be either free-standing or wall-mounted. Provide support steel framing.
 - 2. The Contractor shall size the panel such that no more than 80% of the surface of the enclosure back plate is used.
 - 3. Network level boards shall be installed inside a protective enclosure.
 - 4. Plastic wire way (e.g., Panduit) shall be used to organize all wiring in the panel. Sufficient wire way shall be provided in the panel such that it is filled no more than 80% capacity.

5. Cover exposed electrical connections. Each component on front panel shall have an appropriate engraved label describing its function. Components inside the panel shall be appropriately labeled for ease of identification. Stick-on labels are not acceptable.
- B. Low Voltage Power Supplies:
1. The Contractor shall provide a regulated, protected low voltage power supply as required with the ability to produce at least 33% more current than required by the transmitters and controls being installed. Output regulation shall be less than 0.5mV. There shall be no overshoot on turn on or off. Operating temperature shall be -20 to +70°C.
 2. Class II transformers shall be used.
- C. Line Voltage Power Source:
1. Careful consideration must be given to the propagation of information across controllers as they wake up from a power interruption. This may require certain critical controllers to be powered from uninterruptible power source (UPS) to ensure rapid propagation of the emergency status.

PART 3 – BACS CONFIGURATION AND INSTALLATION

3.1 GENERAL SYSTEM REQUIREMENTS

- A. This section defines the requirements for configuration and installation of the BACS.
- B. Devices (i.e., sensors, meters, instruments, etc.) that are resettable must be installed in a readily accessible location (e.g., the device must be accessible at floor level without the use of a ladder). No device shall require shutting down a building system for calibration.
- C. Devices that are installed in an exposed location (i.e., not mounted within a cabinet) must be suitable for such installations (e.g., do not install a device that is intended to be installed in a cabinet in an exposed location).
- D. All existing DDC controllers and sensors removed from the project shall be turned over the Owner in good condition.
- E. This contract shall be responsible for decommissioning of the temperature control systems being removed and modifications to existing system graphics and software programming.

3.2 SYSTEM COMPONENTS

- A. Sensors: All sensors and transmitters shall be located in accessible locations that do not require system shutdown for calibration. Locate all remote transmitters in control panels 5 foot above finished floor.

- B. Valves: Union or flanged connected. Locate close to apparatus controlled with pipe reducers and increasers located closest to valve. Locate, arrange, and pipe per installation diagram.
- C. Thermostats/Sensors: Room thermostats or sensors shall be mounted symmetrical with adjacent items such as light switches (nominally 44 inch to the center of the device and in accordance with ADA requirements). Verify exact room location to avoid doors, fixed and portable equipment. Install to minimize damage. Do not install adjacent to lighting dimmers or other heat generating equipment.
- D. Dampers and Damper Operators: Tag dampers for proper location. Install per manufacturer's printed instruction as to motor size and quantity, linkage arrangement, drive connection point. Adjust to close tightly. Allow for conduit sleeve or blank space for roof fan dampers. Where ducts are insulated, set damper operators at least 2 in. away from side of duct to allow for insulation.

3.3 CONTROL WIRING

- A. All control wiring shall comply with requirements of "Electrical Wiring" in Section 230504.

3.4 BACS CONFIGURATION

- A. Vendors providing controls for Cornell University shall maintain site-wide configuration documentation. Whenever the BACS is extended, the documentation required in this section shall be provided/updated per configuration management requirements to reflect the entire installation on the campus. Device naming and addressing must conform to Cornell's specific conventions as detailed in Cornell's specific convention as detailed in Cornell Design & Construction Standard 230901. No device will be connected to a Cornell network until these conventions have been understood and met.

3.5 CONTROL PANELS

- A. The control panels and enclosures housing the controllers shall be coordinated to the extent possible, to share vertical and horizontal wire-ways to facilitate and minimize the cost of home-runs to terminal equipment.
- B. Cornell must have quick, direct access to all control panels to maintain building integrity similar to that provided for fire emergencies without going through user spaces. Panels shall be located outside of user areas where practical. If field panels must be located in user areas, they shall be in areas with easy access. Protection and separation for user activities will be provided.
- C. Enclosures:
 - 1. All BACS mechanical room control panels shall be installed in metal enclosures containing the controller, I/O modules, power supplies, termination strips, battery (if not integral to the controller or I/O module) and a spare AC outlet.

2. Control panels shall be located in the equipment rooms, where practicable, and in locations such that the ambient conditions are between 50 and 90°F and 10 to 85% relative humidity. Control panels located in areas where conditions are outside of these ranges shall have enclosures outfitted with heating or cooling devices to provide the proper environmental conditions.
3. All terminal controllers shall be installed in a protective sheetmetal enclosure. Coordinate with the terminal unit vendor.
4. All penetrations of the BACS or outboard gear panels in mechanical rooms shall be from the bottom of the enclosure with wireway and conduit stubs from the wireway up to the panel.
5. Panel layout and construction shall be neat and professional.
6. All controllers, wiring, and components in the panels shall be labeled. All labeling shall match the reference numbers on the cabinet drawings that shall be provided for each panel.
7. All transformers and power supplies shall be mounted outside of the central panel.

D. Low Voltage Power Supplies:

1. The BACS Contactor shall certify, in writing, at the time of shop drawing submittal that the DDC equipment provided will not cause, as a result of its operation, either directly or indirectly, electrical interference to be induced into the building's electrical power systems.

E. Live Voltage Power Source:

1. Controllers shall be powered from emergency power sources whenever the controlled equipment is connected to emergency power source.
2. An un-interruptible power source (UPS) shall be provided on Ethernet network gateways (headends) and switches.
3. Line voltage power sources to controls shall be labelled with its source panel and circuit number.

3.6 CONTROLLERS

- A. The controllers provided shall meet the performance requirements for throughput, response time, point capacity, trend log capacity, etc., as stated in this section and Section 230901. The controllers shall also be configured and programmed to carry out the sequences of operation contained in the project documents. While specification 230901 contains several constraints on the controller system architecture, it is recognized that a variety of configurations may be equally acceptable. For example, it may be possible to meet the project requirements with a single large controller or several smaller ones.

Therefore, this guideline does not generally prescribe controllers' system architecture or controllers' detailed characteristics, such as processor speed, amount of memory, amount of I/O, power supply details, etc.

- B. Since these guidelines with respect to controllers are performance oriented, rather than prescriptive, they will generally refer simply to “controllers” meaning computers capable of direct digital control. In those cases where distinguishing between controllers with differing capabilities is needed, the following nomenclature will be used:
1. Building-level controller: These are controllers that are connected to the campus backbone network and communicate over Ethernet using BACnet/IP. They will typically be used to control and monitor one or more large systems or be applied to other building-wide functions. They shall, at a minimum, meet the requirements of a BACnet Building Controller (B-BC).
 2. System-level controller: These controllers will also be BACnet/IP connected to the campus backbone network. They will typically be dedicated to the control of a single large piece of equipment such as an air handler or chiller, and a lab environment with fume hoods. They shall, at a minimum, meet the requirements of a BACnet Advanced Application Controller (B-AAC).
 3. Field-level controller: These controllers are typically used for control of “unitary” devices such as VAV boxes, fan coil units, etc. These controllers will be BACnet/IP connected to the campus backbone network or in special spaces may be on a lower performance BACnet LAN such as MS/TP or ARCNET. They shall, at a minimum, meet the requirements of a BACnet Application Specific Controller (B-ASC).
- C. Controllers: Controllers shall be provided with a real-time operating system resident in ROM. It shall support all specified functions. It shall provide a command prioritization scheme to allow functional override of control functions. At a minimum, the following shall be provided:
1. Real-time operating system software.
 2. Real-time clock/calendar and network time synchronization (with the exception field-level controllers).
 3. Controller diagnostic software.
 4. DDC software.
 5. Alarm processing and buffering software.
 6. Energy management software.
 7. Data trending, reporting, and buffering software.

8. I/O (physical and virtual) database. Inputs and outputs shall have the capability to be overridden for emergency modes and testing. If the design documentation does not specifically indicate for which points this is required, control vendor shall request in writing a list of such points. If this has not been requested, the vendor shall reprogram or reconfigure the systems as required during testing.
- D. Programming: The programming shall be logically segmented, documented, and titled, and expand on the specified sequence of operations. Each segment shall contain control logic for a specific controlled component of a system. This is to improve the ability of the end user to understand and interpret the logic easily.
- E. Trending: To support commissioning and building data mining, the BACS shall be capable of trending and archiving all points on building-level and system-level controllers at a minimum of 15 minute intervals. The BACS shall also have the capability of trending at least five points on each field-level controller at an interval of 15 minutes. The trend data shall be uploaded to a central database as needed to prevent buffer overflow in the controller. Controller memory capability, network architecture, and communications bandwidth shall be designed to account for this trending. The BACS vendor shall provide control trends during start up and prior to functional performance testing of the systems. Reports shall be scheduled to output the data to a common format such as comma separated text, Microsoft formats such as Excel and Access, and portable database format. Trended data will be archived in an Owner-accessible SQL database for a minimum period of 2-years.
- F. Trend Graphs: Web-based software shall provide for displaying graphic plots of the trended values. The software shall support multiple scales, points and point types simultaneously. Control vendor shall configure these graphs in a logical manner for each system. Consult with the commissioning team members and project manager for required configuration. Provide a trend for every analog control loop that includes the setpoint, process variable, and control output.
- G. Real-time Plotting: Software shall be provided for real time plotting/graphing of multiple values in user-defined time intervals. These graphs will typically be used in commissioning to observe loop responses and system reactions. Control vendor shall configure these graphs in a logical manner for each system. Consult with the commissioning team members and project manager for required configuration.
- H. Web-based Graphic: The following screens shall be provided:
 1. Floor Plan Screens:
 - a. Provide floor plan screens for each floor and/or section of the building. Indicate the location of all equipment that is not located on the equipment room screens. Indicate the location of temperature sensors and the device associated with each temperature-controlled zone (i.e., reheat coils, VAV terminals, fan-coils, single-zone AHU's etc.) on the floor plan screens. Each floor plan screen shall show thermographic space temperatures and lighting on/off status.

- b. Display the space temperature point adjacent to each temperature sensor symbol. Indicate room numbers as provided by Cornell University. Provide a graphic link from each zone and/or equipment symbol shown on the graphic floor plan screens to each corresponding equipment schematic graphic screen.
- c. Provide floor plan screens for each mechanical equipment room and, if mechanical equipment is situated there, the roof. Indicate the location of each item of mechanical equipment. Provide a link from each equipment symbol shown on the plan view screen to each corresponding mechanical system schematic graphic.
- d. If multiple floor plans are necessary to show all areas, provide a graphic building key plan. Use elevation views and/or plan views as necessary to graphically indicate the location of all of the larger scale floor plans. Link the graphic building key plan to larger scale partial floor plans. Provide links from each larger scale floor plan graphic to the building key plan and to each of the other graphic floor plan screens.
- e. Provide a graphic site plan with links to and from each building graphic.
- f. Locate central system static and differential pressure sensors, linkable from the floor plan drawings.

2. System Schematic Screens:

- a. Provide graphics for each air handling system. Indicate OA temperature and enthalpy, and mode of operation as applicable (i.e., occupied, unoccupied, warm-up, cool-down, etc.). Link screens for air handlers to the heating system and cooling system graphics. Link screens for supply and exhaust systems, if they are not available in a single graphic.
- b. Each I/O point in the project shall appear in at least one graphic. System graphics shall include flow diagrams with status, setpoints, current analog input and output values, operator commands, etc., as applicable. General layout of the system shall be schematically correct. I/O devices shall be shown in their schematically correct locations. Include appropriate engineering units for each displayed point value. Verbose names (English language descriptors) shall be included for each point on all graphics; this may be accomplished by the use of a pop-up window accessed by selecting the displayed point with the cursor. Indicate all adjustable setpoints on the applicable system schematic graphic or, if space does not allow, on a supplemental linked setpoint screen. All outputs shall be represented in terms of percent open and include a pop-up link to the control logic.
- c. Provide a system schematic graphic for each HVAC subsystem controlled.
- d. Provide a graphic for each hydronic system.

- e. Link screens for heating and cooling system graphics to utility history reports showing current and monthly energy usage, demands, peak values, etc.
 - f. Link screens to all schedules and setpoints.
3. Zone Schematic Screens, HVAC:
- a. Provide a graphic for each zone, including all terminal units such as fan coil units, chilled beams and VAVs shown on the graphic even if provided with different terminal level controllers.
 - b. In addition to points associated with the unit, indicate mode of operation as applicable (i.e., normal occupied, unoccupied, warm-up, maximum heating, maximum cooling, etc.). Provide links between the applicable floor plan screen and this screen.
 - c. Provide links to the graphics representing the parent systems.
4. Zone Schematic Screens, Lighting Controls:
- a. Refer to Cornell University Standard, 260923
- I. Alarm Programming: Alarms shall be intelligent based upon the algorithm in this section
1. Alarm programming related to DDC controlled equipment shall reside at the controller level along with the functional programming for equipment control.
- a. Intrinsic alarming associated with AI, AV, BI or BV objects (or any of the other BACnet objects that support intrinsic alarming) shall only be used where the alarm is valid regardless of the state of the associated equipment or where there is a ready means for automatically suppressing alarm generation when the associated equipment is operationally secured.
 - b. Alarm points shall be separate BACnet objects actuated by associated alarm programming.
 - c. Alarm objects shall have descriptive BACnet object names. BACnet alarm object names shall end in "Alarm". For detailed information on proper point naming conventions, see Section 230901 Building Automation and Control System Communications and Interoperability.
 - d. If it is necessary for the alarm to have latching functionality, the user shall be provided easy unlatching capability from within the DDC system if appropriate, taking into account equipment safety concerns. This is in addition to any local alarm reset.
 - e. Alarms designated for monitoring by EMCS shall be set up in the DDC system to report to the EMCS alarm server.

- f. Generally, only central system alarms shall be annunciated at EMCS. Zone and or equipment alarms shall be considered on a case by case basis.
2. Analog Deviation Alarms: Analog deviation alarms shall be based upon the comparison between the controlled variable and the controlled variable setpoint (whether calculated or fixed).
- a. When controlled variable deviates from setpoint above or below user adjustable high or low alarm thresholds, the alarm shall be activated.
 - b. High and low alarm threshold values shall have associated adjustable deadbands (hysteresis values) for alarm clearing conditions as the controlled variable falls below the high alarm threshold or rises above the low alarm threshold.
 - c. Alarm programming shall include user adjustable alarm delays for active equipment operation.
 - d. Alarm programming shall include startup delays to prevent nuisance alarms during equipment startup.
 - e. Analog deviation alarms shall be disabled if the associated equipment is operationally secured.
3. Analog High Limit Alarms: Analog high limit alarms shall be based upon the comparison between the controlled variable and a user adjustable high limit alarm value.
- a. When controlled variable rises above the user adjustable high limit, the alarm shall be activated.
 - b. High alarm limit value shall have associated adjustable deadband (hysteresis value) for alarm clearing condition as the controlled variable falls below the high alarm limit.
 - c. Alarm programming shall include user adjustable alarm delays.
 - d. High limit alarms shall be disabled if the associated equipment is operationally secured, unless needed due to equipment safety considerations.
4. Analog Low Limit Alarms: Analog low limit alarms shall be based upon the comparison between the controlled variable and a user adjustable low limit alarm value.
- a. When controlled variable falls below the user adjustable low limit, the alarm shall be activated.

- b. Low alarm limit value shall have associated adjustable deadband (hysteresis value) for alarm clearing condition as the controlled variable rises above the low alarm limit.
 - c. Alarm programming shall include user adjustable alarm delays.
 - d. Low limit alarms shall be disabled if the associated equipment is operationally secured, unless needed due to equipment safety considerations.
5. Binary Run Status Alarms: Status alarms shall be based upon the comparison between run status and equipment command where applicable.
- a. Alarm Status programming shall include user adjustable alarm delays.
6. Binary Alarming: Alarms shall be triggered upon associated BI changing state to the non-normal or alarm state.
- a. Alarm Status programming shall include user adjustable alarm delays.
 - b. Binary alarms shall be disabled if the associated equipment is operationally secured, unless needed due to equipment safety considerations.

3.7 OPERATOR INTERFACES

- A. All interface to the BACS shall be web-based.
- B. During construction, the DDC shall be hosted on a construction server and transferred to the owner's central server at the earliest convenience.
- C. The project shall be responsible for upgrading the campus central server location.

3.8 EXISTING CONTROL DEVICES

- A. The bid for the control work shall be based on the premise that existing control devices are operational and are not in need of repair and replacement, unless otherwise noted.
- B. This contractor shall notify the Owner's Representative of existing control devices that need to be replaced or repaired that may be noticed in the process of installation of new work.

3.9 COMMISSIONING

- A. Commissioning (Cx) is the process of ensuring that all building systems are installed and perform interactively according to the design intent; that systems meet the Owner's operational needs; that the installation is adequately documented; and that the Operators are adequately trained. It serves as a tool to minimize post-occupancy operational problems. It establishes testing and communication protocols in an effort to advance the building systems from installation to full dynamic operation and optimization.

- B. All new BACS installations and expansions of existing systems shall be fully commissioned. All acceptance testing, documentation and training shall be required.
- C. The BACS Trade's responsibilities for commissioning and check-out include the following:
1. Ensure that the start-up, testing, adjusting, and balancing of systems and equipment has been completed prior to field commissioning.
 2. Provide all logic, graphics, and trends for review prior to the start of field commissioning activities.
 3. Provide a complete calibration and operational check for each individual point and function contained within the BACS.
 4. Conduct the checkout with the use of point/function log sheets to be prepared by the contractor. The Owner shall approve the log sheet format.
 5. Submit log sheets to the Owner prior to the commencement of any final acceptance testing.
 6. Certify, in writing, to the Owner prior to the commencement of final acceptance testing that all components of the BACS system are functioning as per the requirements of the contract documents.
 7. Provide to the Owner as-built drawings and documentation at least four (4) weeks prior to the commencement of any final BACS acceptance testing. Ensure all trends and graphics are completed and approved by Cornell.
 8. The BACS contractor shall issue a report upon project completion stating that the system is complete, has been adjusted, and has had all hardware and software functions verified, that all analog control loops are tuned, and is operating in accordance with the specifications. Any deviations from specified settings or operations necessitated during system adjustment shall be specifically noted.
 9. The Contractor shall check out the installation with a representative from Cornell's Energy Conservation Control Team. The checkout shall consist of verifying the ability of the BACS to communicate with the central EMCS system, verifying the calibration of each sensor and/or transmitter, and verifying the operation of each control point.
 10. All software processes shall be thoroughly demonstrated to the Owner's representative. Alarm conditions shall be simulated for conformance. Analog control points shall be exercised through their entire range. All control interlocks and sequences shall be completely verified. The checkout shall be a thorough and exhaustive review of the installation to assure proper operation of the total system.

3.10 TRAINING

- A. Upon completion of the work and acceptance by the Owner, factory representatives of the control manufacturer shall provide instruction to the Owner’s operating personnel who have responsibility for the mechanical systems and controls installed by the contractor. The contractor shall provide 8 hours of training.
- B. The contractor shall make available to the Owner regular, scheduled training courses for ongoing training of the Owner’s operating personnel. Programs shall include hardware- and software-oriented courses as well as energy conservation and management courses.

3.11 CONTROL SEQUENCE

- A. Refer to plan for control diagrams, sequence of operation and points lists.

3.12 RESPONSIBILITY MATRIX:

- A. For spaces with standalone lighting controls, the sensors are to be provided by the electrical trade to control both HVAC and lighting; The BACS vendor shall provide a single gang box with face plate at the sensor. The following chart outlines the BACS / Division 26 Responsibilities with regard to standalone lighting controls:

STANDALONE LIGHTING CONTROLS	BACS	DIV 26
Emergency Switched 277/120 VAC Power		X
120 VAC Power		X
Emergency Lighting Control Unit		X
Emergency Lighting Transfer Switch		X
Emergency Light Fixture		X
Emergency Lighting Dimming Override		X
Normal Power Light Fixture		X
Controller		X
24 VAC Power		X
Transformer		X
Primary Power Pack Relay		X
Secondary Power Pack Relay		X
HVAC OCC/UNOCC COMMAND	X	
Dimming Wall Switches		X
Dimming Control Relay		X
Occupancy Sensors		X
OCCUPANCY	X	
Daylight Sensors		X

- B. Certain zone types require that the BACS perform the lighting controls. The following chart outlines the BACS / Division 26 Responsibilities with regard to BACS lighting controls:

BACS LIGHTING CONTROLS	BACS	DIV 26
Emergency Switched 277/120 VAC Power		X
120 VAC Power		X
Emergency Lighting Control Unit		X
Emergency Lighting Transfer Switch		X
Emergency Light Fixture		X
Emergency Lighting Dimming Override		X
Normal Power Light Fixture		X
Controller	X	
24 VAC Power	X	
Transformer	X	
Primary Power Pack Relay	X	
LIGHT ENABLE COMMAND	X	
LIGHT STATUS	X	
Secondary Power Pack Relay	X	
HVAC OCC/UNOCC COMMAND	X	
Dimming Wall Switches		X
Dimming Control Relay	X	
DIMMING COMMAND	X	
DIMMING ENABLE COMMAND	X	
Occupancy Sensors	X	
OCCUPANCY	X	
Daylight Sensors	X	
LIGHT LEVEL	X	

END OF SECTION

SECTION 232010

PIPING SYSTEMS AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

- A. Schedule of pipe materials, fittings, and connections.
- B. Applicable miscellaneous materials (i.e. dielectric protection, hangers, inserts, supports, sealing elements, firestop systems etc.).
- C. Welding certification (Refer to Part 3).
- D. Water Treatment Product Data (Refer to Part 3).
- E. Cleaning of various hydronic piping systems (Refer to Part 3)
 - 1. Submit typewritten letter to inform Owner's Representative upon completion of the work.
- F. Water Testing (Refer to Part 3)
 - 1. Certification of successful pressure testing (Refer to Part 3)

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pipe and fittings shall be new, marked with manufacturer's name and comply with applicable ASTM and ANSI Standards.
- B. All adhesives, sealants, primers and paint used for piping in the interior of the building shall comply with the maximum Volatile Organic Compound (VOC) limits called for in the current version of U.S. Green Building Council LEED Credits EQ 4.1 and EQ 4.2.

2.2 STEEL PIPING AND FITTINGS

- A. Pipe: ASTM A53, Schedule 40, or extra strong (Schedule 80) weight; black or galvanized finish as called for; ends chamfered for welding.

- B. Fittings: Same material and pressure class as adjoining pipe.
1. Welded Fittings: Factory forged, seamless construction, butt weld type, chamfered ends. Where branch connections are two or more sizes smaller than main size, use of "Weldolets", "Thredolets", or "Sockolets" are acceptable. Socket weld type, 2000 psi wp, where required.
 - a. Mitered elbows, "shaped" nipples, and fabricated reductions and fabricated branch connections are not acceptable unless specifically required and reviewed by the Engineer.
 2. Threaded fittings: Cast or malleable iron, black or galvanized, as called for; drainage type where called for. Street type 45° and 90° elbows are not acceptable.
- C. Flanges, Unions and Couplings:
1. Threaded Connections:
 - a. Flanges: Cast iron companion type; for sizes 2-1/2 in. and larger.
 - b. Unions: Malleable iron, bronze to iron seat, 300 lb. wwp; for sizes 2 in. and smaller.
 - c. Couplings: Malleable iron, 150 or 300 lb. wwp, based on system pressure. Steel thread protectors are not acceptable as couplings.
 2. Welded connections:
 - a. Flanges: Welding neck type. Slip-on type not allowed unless noted and shall not be installed in conjunction with butterfly valves.
 - b. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents and working temperatures and pressures.
 - c. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Gauge and Instrument Connections: Nipples and plugs for adapting gauges and instruments to piping system shall be IPS brass.

Base Elbows:

1. Cast iron or steel type, flange connections; Crane 500 or equivalent. Made from welding elbows, with welded pipe support and steel base. Reducing elbows where necessary.

ELBOW SIZE	SUPPORT SIZE	BASE PLATE
2 in. to 3 in.	1-1/4 in.	6 in. x 6 in. x 1/4 in.
4 in. to 6 in.	2-1/2 in.	8 in. x 8 in. x 1/4 in.
8 in. and larger	6 in.	14 in. x 14 in. x 5/16 in.

2. Anchor bolt holes in each corner of base for securely bolting to floor or concrete base; minimum 3/4 in. bolts.

2.3 COPPER TUBE AND FITTINGS - SOLDER JOINT

- A. Pipe: ASTM B88; Type L hard temper. Plans show copper tube sizes.
- B. Tees, Elbows, Reducers: Wrought copper, ASME B16.22; ASME B16.18 solder end connections.
- C. Unions And Flanges: 2 in. and smaller use unions, solder type, cast bronze, ground joint, 150 lb. swp; 2-1/2 in. and over use flanges, cast bronze, companion type, ASME drilled, solder connection, 150 lb. swp.
- D. Solder Materials: No-lead solder, using alloys made from tin, copper, silver and nickel.
- E. Make: Harris "Stay-Safe 50" and "Bright", Engelhard "Silverbright 100", Willard Industries "Solder Safe (silver bearing), Canfield "Watersafe" or approved equal.

2.4 DIELECTRIC PIPE FITTINGS

- A. Description: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.
- B. Dielectric unions shall not be used due to their tendency to leak. Provide a dielectric waterway fitting or a brass nipple for dielectric protection. A brass valve is also an acceptable method of dielectric protection.
- C. Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300 psig minimum pressure to suit system fluid pressures and temperatures with flange insulation kits and bolt sleeves.
- D. Waterway Fittings: 300 psi maximum working pressure at 230°F, male threaded or grooved ends, electroplated ductile iron or steel body with LTHS high temperature polyolefin polymer liner.
- E. Make: EPCO, Capitol Manufacturing, Watts or approved equal.
- F. The use of brass valves and brass nipples (3 in. and larger) may be used for dielectric isolation.

2.5 HANGERS, INSERTS, AND SUPPORTS

- A. Hangers, Inserts, Clamps: B-Line, Grinnell, Michigan Hanger, PHD Manufacturing, Anvil, Hilti.

B. Hangers:

1. Adjustable, wrought malleable iron or steel with electroplated zinc or cadmium finish. Copper plated or PVC coated where in contact with copper piping. Hot-dipped galvanized finish for exterior locations.
2. Adjustable ring type where piping is installed directly on hanger for piping 3 in. and smaller.
3. Adjustable steel clevis type for 4 in, and larger, and where insulation passes through hanger.
4. Hangers sized to permit passage of insulation through the hanger for all piping.

C. Nuts, washers and rods with electroplated zinc or cadmium finish. Hot-dipped Hanger Shields:

1. Pre-Insulated Type:

- a. Insulated pipes shall be protected at point of support by a 360° insert of high density, 100 psi waterproof calcium silicate, encased in a 180° sheet metal shield. Insulation insert to be same thickness as adjoining pipe insulation and extend 1 in. beyond sheet metal shield. Insulation shall be provided with a factory installed ASJ.

2. Field-Insulated Type:

- a. #18 USSG, galvanized steel shields, minimum 120° arc. Provide ICA-HAMFAB-BLOCK, 18# density molded fiberglass inserts, between pipe and hanger shield to maintain proper spacing for insulation. Insulation inserts shall extend 1 in. beyond the sheet metal shields. Material shall comply with ASTM E84 25/50, have a thermal conductivity of K=.30 (stable) and have a service temperature of -120°F to +650°F. Install in accordance with manufacturer's printed instructions.

3. Shield Sizing:

PIPE SIZE	SHIELD LENGTH	MINIMUM GAUGE
1/2 in. to 3-1/2 in.	9 in.	20
4 in.	9 in.	20
5 in. and 6 in.	9 in.	20
8 in. to 12 in.	12 in.	18
14 in. to 24 in.	18 in.	16

4. Hanger shield gauges listed are for use with band type hangers only. For point loading (roller support), increase shield thickness by one gauge, and length by 50%.

- D. Hanger Spacing Schedules: (Based upon most stringent requirement of MCNYS and ASME B31.9)

COPPER OR PLASTIC PIPE SIZE	COPPER PIPE HANGER SPACING	PLASTIC PIPE HANGER SPACING	HANGER ROD SIZE
3/4 to 1 in.	6 ft.	3 ft.	3/8 in.
1-1/4 in.	6 ft.	4 ft.	3/8 in.
1-1/2 to 2 in.	8 ft.	4 ft.	3/8 in.
2-1/2 to 4 in.	10 ft.	4 ft.	1/2 in.
5 in. and larger	10 ft.	4 ft.	3/4 in.

STEEL PIPE SIZE	STEEL PIPE HANGER SPACING	HANGER ROD SIZE
3/4 to 1 in.	8 ft.	3/8 in.
1-1/4 in.	10 ft.	3/8 in.
1-1/2 to 2-1/2 in.	12 ft.	3/8 in.
3 to 4 in.	12 ft.	1/2 in.
5 in. and larger	12 ft.	3/4 in.

- E. Inserts: Carbon steel body and square insert nut, galvanized finish, maximum loading 1,300 lbs., for 3/8 in. to 3/4 in. rod sizes. Drill through decking for hanger rods and secure devices with integral support plate strap with sheet metal screws. Devices shall have a safety factor of four.
- F. Beam Attachments:
1. C-Clamp, locknut, electroplated finish, UL listed, FM approved, for pipe sizes 2 in. and smaller.
 2. Center load style with clamp attachments that engage both edges of beam, electroplated finish, UL listed, FM approved, for pipe sizes larger than 2 in., refer to "Supports" for additional requirements.
 3. Welded beam attachments may be considered only upon the review and acceptance of the structural engineer of record with written confirmation of weld meet configuration, location and service/pipe size submitted to the Mechanical Engineer for review.
- G. Supports:
1. Provide intermediate structural steel members where required for hanger attachment. Secure member to structure. Select size of members based on a minimum factor of safety of four.
 2. For Weights Under 1000 lbs.: Insert, "U" shaped channel, beam clamps or other structurally reviewed support. The factor of safety shall be at least four. Follow manufacturer's recommendations.

3. For Weights Above 1000 lbs.: Drill through floor slabs and provide flush plate welded to top of rod or provide additional inserts and hangers to reduce load per hanger below 1000 lbs.
4. Make: Hilti, ITW Ramset, Phillips "Red Head", or approved equal.

H. Trapeze Hangers:

1. For use on 1-1/2" and smaller piping only. Use of trapeze hangers for piping 2" and greater may be considered only upon the review and acceptance of the structural engineer of record with written confirmation of configuration, location and service/pipe size submitted to the Mechanical and Structural Engineer for review.
2. Hangers shall be supported with rod sized with a safety factor of four.
3. May be manufactured type "U" shaped channel, or suitable angle iron or channel. Round off all sharp edges.
4. Securely fasten piping to trapeze with "U" bolt or straps, dissimilar metals shall not touch, use isolation gaskets.
5. Make: B-Line, Kindorf, Unistrut, or approved equal.

2.6 PIPING ACCESSORIES

- A. Escutcheon Plates: Provide escutcheon plates on uninsulated piping in exposed and finished areas. Steel or cast brass polished chrome, split hinge type with setscrew, high plates where required for extended sleeves.
- B. Pipe Roll Stand: Cast iron roll stand. Make: Advanced Thermal Systems, Carpenter and Patterson, ITT Grinnell, Pipe Shields.

2.7 SLEEVES

- A. Standard Type:
 1. Schedule 40 black steel pipe sleeves shall be used for sleeves in horizontal and vertical applications through structural surfaces. Sleeves shall extend a minimum of 1 in. beyond both sides of the structure surface being penetrated. The sleeve shall be sized to account for the total diameter of the service, inclusive of insulation and the appropriate annular space for firestopping installation or requirements of the sealing element manufacturer.
 2. Full circle water stop collar for sleeves located in below grade walls, wet wells and waterproofed surfaces. The collar shall be fabricated from steel plate and welded to the sleeve around its entire circumference.

3. Schedule 40, PVC sleeves or sheet metal sleeves for nonstructural surfaces and existing construction. Sheet metal sleeves shall be 18 gauge minimum and braced to prevent collapsing. Sleeves shall extend a minimum of 1/2 in. beyond both sides of the non-structural vertical surface being penetrated.
The sleeve shall be sized to account for the total diameter of the service, inclusive of insulation and the appropriate annular space for firestopping.

B. Pre-Insulated Type:

1. Adjustable or fixed length metal cans, 24 gauge minimum sized for 1 in. spacing between insulation and can. Insulation shall consist of a 360° waterproofed calcium silicate insert sized to extend 1 in. beyond wall or floor penetration. Calcium silicate insert shall be the same thickness as adjoining pipe insulation. Spacing between shield and can packed at each end with double neoprene rope positively fastened.

2.8 FIRESTOP SYSTEM FOR OPENINGS THROUGH FIRE RATED WALL FLOOR ASSEMBLIES

- A. Materials for firestopping seals shall be listed by an approved independent testing laboratory for "Penetration Firestop Systems". The system shall meet the standard fire test for Penetration Firestop Systems designated ASTM E814. Firestop system shall be provided at locations where piping passes through fire rated wall, floor/ceiling, or ceiling/roof assembly. Minimum required fire resistant ratings of the assembly shall be maintained by the Firestop System. Installation shall conform with the manufacturer's recommendations and other requirements necessary to meet the testing laboratory's listing for the specific installation.

2.9 PIPING MATERIALS AND SCHEDULE

- A. See Exhibit "A", "Schedule of Piping Materials" at end of this Section for (HVAC) piping.

PART 3 - EXECUTION

3.1 EQUIPMENT AND SYSTEMS

- A. Provide equipment and systems in accordance with laws, codes, and provisions of each applicable section of these specifications. Accurately establish grade and elevation of piping before setting sleeves. Install piping without springing or forcing (except where specifically called for), making proper allowance for expansion and anchoring. Arrange piping at equipment with necessary offsets, union, flanges, and valves, to allow for easy part removal and maintenance. Offset piping and change elevation as required to coordinate with other work. Avoid contact with other mechanical or electrical systems. Provide adequate means of draining and venting units, risers, circuits and systems. Install drains consisting of a tee fitting with a 3/4 in. ball valve with hose end cap and chain, at low points in hydronic piping system mains, and elsewhere as required for system drainage.

- B. Conceal piping unless otherwise called for. Copper tubing shall be cut with a wheeled tubing cutter or other approved copper tubing cutter tool. The tubing must be cut square to permit proper joining with the fittings. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction. Install piping parallel with lines of building, properly spaced to provide clearance for insulation. Make changes in direction and branch connections with fittings unless submitted and accepted per Part 2. Do not install valves, union and flanges in inaccessible locations. Provide trap seal of adequate depth on drain pans.
- C. Provide reducers at all control valves, where control valve is smaller than pipeline size. Reducers for steam control valves shall be eccentric type. Provide unions at each side of every control valve and reducers directly adjacent to the unions.
- D. Provide reducers at all balance valves, where balance valve is smaller than pipeline size.

3.2 PIPING OVER ELECTRICAL EQUIPMENT

- A. Contractor shall route piping to avoid installation directly over electric equipment, including, but not limited to panels, transformers, disconnects, starters, motor control center, adjustable speed drives and fused switches.
- B. Piping shall not be installed in the dedicated electric and working space as defined by NEC 110. Dedicated electrical space is generally equal to the depth and width of electrical equipment, and extends 6 ft. above the electrical equipment, or to a structural ceiling. Dedicated working space is a minimum of 30 in. wide or the width of equipment (whichever is larger) a minimum of 6 ft.-6 in. tall, with a depth of 3 ft. to 9 ft. depending on the voltage.

3.3 WATER SYSTEMS

- A. Top connection for upfeed, bottom or side connection for downfeed. Grade off level; up in direction of flow and down toward drain.

3.4 HANGERS, INSERTS AND SUPPORTS

- A. Piping shall not be supported by wires, band iron, chains, or from other piping. Support each pipe with individual hangers from concrete inserts, welded supports, or beam clamps of proper configuration and point loading design requirements for each location including the designated safety factor. Trapeze hangers are acceptable for racking of multiple pipes of 1-1/2 in. or less in size. Follow manufacturer's safe loading recommendations. Suspend with rods of sufficient length for swing and of size as called for, using four nuts per rod. Provide additional rustproofed structural steel members, where required for proper support. Provide oversized hangers where insulation/supports must pass between pipe and hanger. Only concentric type hangers are permissible on piping larger than 2-1/2 in., "C" types are permitted for piping 2-1/2 in. and smaller. Provide riser clamps for each riser at each floor.
- B. Provide a pipe hanger within 12 in. of pipe unions and piping connections to equipment, in order to facilitate disconnections of piping without pipe sagging.

3.5 HANGERS ATTACHED TO JOISTS

- A. Individual hangers may be suspended directly from the bottom chord panel point provided that the sum of the concentrated loads within the chord panel does not exceed 100 pounds and the attachments are concentric to the chord. (Eccentrically loaded joists using beam clamps or other attachment methods are not acceptable.)
- B. For nominal concentrated loads between panel chords, which have been accounted for in the specified uniform design load for the joists, this Contractor is to provide struts to transfer the load to a panel point on the opposite chord as reviewed and acceptable by the Structural Engineer of Record.

3.6 PIPE CONNECTIONS

- A. Solder Connections: Nonacid flux and clean off excess flux and solder.
- B. Threaded Connections: Clean out tapering threads, made up with pipe dope; screwed until tight connection. Pipe dope must be specific for each application.
- C. Flanged Joints: Select appropriate gasket material, size, type and thickness for service applications. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- D. Dielectric Pipe Fittings: Provide dielectric protection devices at ALL piping connections and ALL equipment connections, where dissimilar metals meet. Follow all applicable manufacturer's recommendations at equipment connections. Dielectric protection systems are not required for air or gas systems.

3.7 WELDING

- A. Welding shall be performed in compliance with the welding procedure specifications prepared by the National Certified Pipe Welding Bureau. Welded pipe fabricated by certified welder. Contractor shall submit proof of current certification of each welder if requested by Owner. Use full-length pipe where possible; minimum distance between welds, 18 in. on straight runs. Welds must be at least full thickness of pipe inside smooth and remove cutting beads, slag and excess material at joints; chamfer ends. Minimum gap 1/8 in., maximum 1/4 in., for butt welds. Overlaps on position and bench welds to be not less than 3/4 in. One internal pass and one external pass minimum required on slip-on flanges. Do not apply heat to rectify distorted pipe due to concentrated welding; replace distorted pipe. When welding galvanized pipe, apply cold galvanizing on joint after welding.

3.8 HANGER SHIELDS

- A. Provide at hangers for all piping. Pre-insulated type or field-insulated type at Contractor's option.

3.9 SLEEVES

- A. Provide for pipes passing through floors, walls or ceilings. Not required for floors which are core-drilled, except where floor is waterproofed.

- B. Pre-Insulated Type: Required for chilled water.
- C. Standard type: Provide for piping, except as called for.
- D. Extend 1/8 in. above finished areas. In above grade mechanical and other areas with floor drains; use steel pipe sleeves 2 in. above floor. Use pipe sleeves in bearing walls, structural slabs, beams and other structural surfaces, and where called for. Sleeves shall be as small as practical, consistent with insulation, so as to preserve fire rating. Fill abandoned sleeves with concrete. Provide rubber grommet seals for pipes passing through ducts or air chambers or built-up housings.

3.10 SLEEVE PACKING

- A. Seal void space at sleeves as follows
 - 1. Interior locations: Firmly pack with fiberglass and caulk.
 - 2. Fire rated, partitions and floor slabs: Use fire rated sealing elements, materials and methods. Provide per manufacturer's instructions to maintain firestop.
 - 3. Waterproofed walls and floors: Use waterproof sealing element, device, or compound.

3.11 ESCUTCHEON PLATES

- A. Provide polished chrome escutcheon plates for uninsulated exposed piping passing through floors, walls or ceilings in finished areas.

3.12 CLEANING HOT WATER SYSTEMS

- A. Provide the services of an experienced Water Treatment Subcontractor.
- B. After each closed system has been tested and thoroughly flushed, the entire piping system shall be cleaned by, or as per, the Water Treatment Subcontractor.
- C. Pumps shall not be operated continuously until system is flushed, strainers cleaned and water treatment is complete.
- D. Cornell University's continual approach of protecting its community and the environment must be adhered to in the application of chemicals pertinent to process water loops. In addition, University policy dictates that "under no circumstances should chemicals be disposed of by pouring into sinks or other drains leading to sanitary or storm sewers".
- E. All chemicals and formulations prescribed for the cleaning and treatment of process water systems at the University must meet the following specified criteria:
 - 1. They must be ecologically compatible so that any discharge will not create an environmental impact. All chemicals and formulations must comply with NY State SPDES (State Pollution Discharge Elimination System) regulations and be free of compounds listed by the EPA on the Priority Pollutant List as defined by 40 CFR Part 423 Appendix A.

2. They must be industrial and toxicologically safe so as to minimize personnel and equipment exposure to hazardous conditions.
 3. Every effort must be made to maintain a sense of uniformity in chemical formulation to insure a line of continuity. Deviation from existing formulations that are applied across the University are not allowed. This relieves the University of any burden that arises from trying to maintain adequate protection using numerous treatments.
 4. Ethylene Glycol (CAS 107-21-1): This material is considered hazardous substance per the 6 NYCRR Part 598. Any release (defined as unauthorized pumping, pouring, emitting, emptying, overfilling, spilling, leaking, leaching, or disposing, directly or indirectly into the environment⁰ in the amount of 1 pound of ethylene glycol into the air, land or water must be reported to the New York State Department of Environmental Conservation. For this reason, Cornell prohibits the use of ethylene glycol.
- F. All water treatment proposed for application at Cornell University must have the prior approval of Cornell University Environmental Health and Safety, Facilities Engineering and the Facilities Management Water Treatment Lab prior to purchase, delivery or application. In order to thoroughly evaluate the products performance, it is recommended that the following be submitted at the time of proposal:
1. Safety Data Sheets (SDS) for all products that are to be applied, which shall contain the complete formulation. Further documentation of qualitative composition must be included if SDS's do not supply all product(s) components.
 2. Product Data Sheets specifying overall product description and application guidelines.
 3. Methods of analysis for determining product residuals. Proposals should specify qualitative and quantitative procedures of evaluating actual product levels. They should also include recommended parameters for all products, expressed in either terms of parts per million or milligrams per liter.
 4. Expected performance levels of products; this should include expected corrosion rates, expressed in mils per yea. If the product is a biostatic nature, what levels of biological growth should be expected if the product is applied at recommended dosages.
 5. Provisions should be submitted for the removal for any unused chemicals. In addition, provisions must be provided for the disposal of all empty containers.
- G. Cleaning:
1. Cleaning procedures for newly installed systems shall be as follows:
 - a. Step 1: Adjust all control valves and balancing valves to full open position during the cleaning and treatment process.

- b. Step 2: Fill system and add a general dispersant for iron, mud, silt, and microbiological matter at a concentration recommended by the chemical manufacturer. Pay particular attention to the type of material being cleaned (steel, copper, aluminum, etc.) Test for concentration. Circulate solution for a minimum of eight hours. Flush system until system water pH and iron levels are consistent with the feed domestic water levels. Clean strainers and dead end piping legs. Provide test results to the Facilities Management Water Treatment Lab;
 - c. Step 3: Arrange for inspection by a representative from the Facilities Management Water Treatment Lab before proceeding to chemical treatment.
2. For extensions to existing building systems, follow the procedures for newly installed systems. Provide temporary piping, valving, and pumping system isolated from the existing building system as needed to perform cleaning procedures prior to final connection to the existing building system.

H. Water Treatment:

1. After system cleaning, furnish report of water test to determine quality.
2. Water treatments shall be deemed complete when acceptance received by Cornell University the Facilities Management Water Treatment Lab.
3. Existing Systems – Field verify existing treatment chemical quantities to ensure correct quantities are added back to the system following construction.
4. Treatment Chemicals for hydronic heating and chilled water cooling systems, not connected to the campus chilled water loop, shall be as follows:
 - a. Non-Glycol Systems (non-potable): After cleaning and inspection, immediately add a molybdate based corrosion inhibitor. Acceptable corrosion inhibitors shall include a combination of sodium molybdate, sodium hydroxide, tolytriazole and organic polymers. Test for residual concentrations as follows:

1)	Molybdate (M06):	150 ppm (hot water systems)
2)	pH:	8.3-9
3)	Tolytriazole (TTA):	10-20 ppm
 - b. Arrange for inspection by a representative from the Facilities Management Water Treatment Lab prior to final acceptance.

I. Identification

1. Provide a three ring binder for each hydronic system treated with chemicals that includes the following information:
 - a. SDS
 - b. Product data sheets

- c. Chemical type
- d. Test points
- e. Control limits
- f. System volume
- g. Direction to drain system to sanitary.
- h. System volume shall be stenciled on the system expansion tank and glycol tank in a visible location.

3.13 TESTS

- A. Test piping and accessories before insulation, connection to existing piping, or concealment. Repeat as many times as necessary to prove tight system. Notify Owner's Representative at least seven days in advance of each test. Isolate valves and equipment not capable of withstanding test pressures. Make leaks tight; no caulking permitted. Remove and replace defective fittings, pipe or connections. Furnish necessary pumps, gauges, equipment, piping, valving, power and labor for testing. Certify that tests have been successfully completed.
- B. Test: No change in pressure under stable temperature conditions.
- C. Schedule of Test Requirements:
 - 1. Hot: Hydrostatic, 100 psig at high point of system; two hours duration.
 - 2. Equipment: Test at working pressures.

3.14 PROTECTION AGAINST PHYSICAL DAMAGE

- A. In concealed locations where piping, other than cast-iron or steel, is installed through holes or notches in studs, joists, rafters or similar members less than 1-1/2 in. from the nearest edge of the member, the pipe shall be protected by shield plates. Protective steel shield plates having a minimum thickness of 0.0575 in. (No. 16 gage) shall cover the area of the pipe where the member is notched or bored, and shall extend not less than 2 in. above sole plates and below top plates.

3.15 PIPE LINE SIZING

- A. Pipe sizes called for are to be maintained. Pipe sizing changes made only as reviewed by Owner's Representative. Where discrepancy in size occurs, the larger size shall be provided.

EXHIBIT "A" - PIPING MATERIALS (HVAC)

<u>SERVICE</u>	<u>PIPE MATERIALS</u>	<u>FITTINGS</u>	<u>CONNECTIONS</u>
Hot water heating 3 in. and larger	ASTM A53 Schedule 40, black steel	ASME B16.9 Wrought steel	ASME B16.9 Butt weld
Hot water heating 2-1/2 in. and smaller	ASTM B88 Type L hard copper	ASME B16.22 Wrought copper	ASTM B32 95 Sn/5 Sb solder or 95.5 Sn/4 cu/.5 Ag solder

END OF SECTION

SECTION 232110

WATER SYSTEMS SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

- A. Submit product data on water system specialties.

1.3 GENERAL REQUIREMENTS

- A. Equipment and accessories shall be rated for a minimum of 125 psi wwp, and 250°F temperatures.
- B. All equipment shall be installed in accordance with manufacturer's written installation instructions and schematics.
- C. Combination devices and pre-piped manufacturer coil fit out kits are not permitted, including but not limited to the following:
 - 1. Manual balance, control, ball isolation valves
 - 2. Manual balance, strainer, ball isolation valves (TDV)
 - 3. Y-strainer, ball isolation valves
 - 4. Ball isolation, drain valves
 - 5. Balancing, shutoff valves

PART 2 - PRODUCTS

2.1 FLOW BALANCERS

- A. High Performance, Bronze Body, Y-Pattern with brass readout valves with integral self-sealing EPT readout valves.
- B. Valve shall be multi-turn globe style with calibrated digital hand wheel capable of at least four turns with graduations at 1/10th turn. Hand wheel shall be equipped with a positive, tamper-resistant memory stop that effectively prevents opening valve past the stop.
- C. Valve shall not be integral to flow balancer. Combination services are not acceptable.

- D. Valve shall be provided with an integral, positive, tamper-resistant memory stop feature which is not subject to accidental readjustment when the valves is operated as a shut-off for service purposes. Memory stop shall require a tool for adjustment.
- E. Valve shall have provisions for a seal to prevent re-setting.
- F. Valve shall exhibit an accuracy of +/- 5% within its normal operation flow range.
- G. Valves shall be rated for a maximum temperature of 230°F and a maximum pressure of 250 psig.
- H. Valves shall be manufactured from Bronze or Dezincification resistant brass in sizes through 2" nominal, and bronze or cast iron in sizes above 2" nominal.
- I. For chilled water applications, valve shall be provided with preformed insulation to permit access for balance and readout.
- J. Mechanical Contractor shall supply Testing and Balancing Contractor with flow calculator (circular slide rule, etc.), if requested.
- K. Balance valve sizes shall be based upon gpm range rather than pipe size.

Balance Valve Size	GPM Range
1/2 in.	Up to 2.5
3/4 in.	2.5 - 4.5
1 in.	4.5 - 10
1-1/4 in.	10 - 15
1-1/2 in.	15 - 30
2 in.	30 - 60
2-1/2 in.	60 - 100
3 in.	100 - 180
4 in.	180 - 300
5 in.	300 - 450
6 in.	450 - 600

- 1. Design Equipment: Tour & Anderson.
- 2. Manufacturers: MMA, Macon, Tour & Anderson.
- L. 5 in. and Larger: Nickel-plated flow meter with provisions for connecting a portable differential pressure meter. Shall be individually calibrated. Provide with a butterfly valve with memory stop at each location.
 - 1. Flow meter size shall be based upon manufacturer's recommended gpm range rather than pipe size.
 - 2. Design Equipment: Tour & Anderson.
 - 3. Manufacturers: MMA, Macon, Tour & Anderson.

2.2 STRAINERS

- A. Cast semi-steel body or cast iron construction for steel piping and bronze body construction for copper piping; equipped with removable, monel or stainless steel water screen; maximum pressure drop 2 psi with free area at least four times area of pipe. Provided with blow-off outlet.
- B. Sizes 5 in. and Smaller, Y-Pattern Strainer: 125 psig working pressure; flanged ends for NPS 2-1/2 in. and larger, threaded connections for NPS 2 in. and smaller, bolted cover, perforated stainless steel basket and bottom drain connection.
- C. Design Equipment: Mueller.
- D. Manufacturers: Elliott, Keckley, Mueller, Webster, Watts, Spirax-Sarco.

2.3 AIR VENTS

- A. Manual air vents shall be a 3/4 in. ball valve with bronze body, nickel plated bronze ball, hose end, cap and chain, Watts B6000CC.
- B. Automatic air vents shall be float type, 35 psig rated, Armstrong No. 502CV OR float type, 150 psig rated, Armstrong No. 75 or Spirotop. Provide unit with an appropriate rating, as necessary for location.
- C. High Capacity Automatic Air Vent:
 - 1. Cast iron body. 150 psig rated. Stainless steel float.

2.4 PRESSURE/TEMPERATURE TEST PLUGS

- A. 1/4 in. NPT plug shall be capable of reading either a pressure or temperature. Use extended body style to allow for insulation thickness. 1/8 in. o.d. rated for 275°F with zero leakage from vacuum to 500 psig with dual seal core material as follows:
 - 1. Hot water, Glycol - Nordel (EPDM) seat.
 - 2. Chilled water, Cold water - Neoprene seat
- B. Test kit consisting of: one 2-1/2 in. test gauge 0-100 psi, one gauge adapter 1/8 in. probe, and two 5 in. stem pocket testing thermometers - one 0° to 220° and one 25° to 125°F.
- C. Makes: Peterson Equipment Company, Sisco P/T plugs.

2.5 FLEXIBLE PIPE AND PUMP CONNECTIONS (BRAIDED STAINLESS STEEL)

- A. Braided stainless steel pump and pipe connector(s) shall be constructed of annular corrugated stainless steel close-pitch hose with stainless steel overbraid. The corrugated metal hose, braid(s) and a stainless steel ring-ferrule/band (material gauge not less than .048 in.) shall be integrally seal-welded using a 100% circumferential, full-penetration TIG weld. Fittings shall be attached using a 100% circumferential TIG weld.
- B. Braided stainless steel pump and pipe connector(s) must be suitable for operating temperatures up to 850°F. The rated working pressure of the braided metal hose must have a minimum 4:1 safety factor.
- C. Each braided stainless steel connector shall be individually leak tested by the manufacturer using air-under-water or hydrostatic pressure.
- D. Braided stainless steel connectors shall carry a three (3) year warranty when installed in accordance with all specifications and installation instructions as described by the manufacturer.
- E. End fittings shall be flat-faceplate steel flanges with 150# ANSI drilling, and outside diameter, carbon steel MPT ends, flanged by Schedule 40 grooved ends or increasing ends.
- F. Acceptable Manufacturers: Flexhose Pumpsaver or equivalent Keflex, Metraflex, Mason-Mercer.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Obtain detailed instructions from each manufacturer for proper method of installation.
- B. The use of the following is not allowed:
 - 1. Dielectric unions
 - 2. Combination devices
 - 3. Pre-piped manufacturer coil fit out kits
 - 4. Automatic flow control valves

3.2 SYSTEM FILLING

- A. After cleaning, fill each system from low point.
- B. With pumps off, vent mains, risers, run-outs, and units, working consecutively from low to high point of building. Obtain approximately 2 psi at highest point. Obtain proper air cushion in compression/expansion tanks.

3.3 AIR VENTING

- A. Provide where specifically called for in piping details and at all points in piping systems where air may collect due to changes in piping elevation.
 - 1. Manual air vent assembly consisting of 1-1/4 in. x 4 in. air collection chamber with 3/4 in. hose end ball valve with cap and chain.
 - 2. Automatic air vent with a ball valve for the purpose of isolation and service or replacement. Do not use automatic vents on chilled water and glycol service; use manual vents only.
 - 3. Unless otherwise indicated, automatic air vents shall only be installed in Mechanical Rooms. Pipe high capacity air vent discharge down to floor.
- B. Equipment Vents:
 - 1. When equipment is above mains: Connect run-outs or risers to upper quadrant or top of mains. Install vent assembly concealed within enclosure, consisting of 1 in. diameter by 4 in. to 6 in. long air collection chamber with 1/4 in. soft copper tube to manual valve. Mount securely near bottom of enclosure, but not fastened to enclosure. For individual units, radiators, fan convectors and units with return grilled: Provide screwdriver operated manual valve, operated from discharge grille or access door. Drill enclosure and position valve for operating without removing enclosure.
 - 2. When equipment is below mains: Connect piping run-outs or risers to bottom or lower quadrant of mains. Vent assembly not required in unit. Provide means of purging and draining each unit if required. Use tees instead of ells at low point of run-outs.

3.4 FLOW BALANCERS

- A. Where flow balancers are smaller than pipe line size, provide reducers directly adjacent to flow balancers.
- B. Provide on each hydronic unit and where called for. Meter connection points shall not point downward.

3.5 STRAINERS

- A. Install strainers on supply side of each control valve, pressure reducing valve, solenoid valve, in-line pump and elsewhere as indicated. Install NPS 3/4 in. nipple and ball valve in blowdown connection of strainers NPS 2 in. and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2 in.

3.6 TEST PLUG

- A. Provide test plugs at locations as called for. In addition, test plugs shall be provided on each coil bank and at all permanent pressure gauge location.
- B. Deliver test kit to Owner and obtain receipt.
- C. Provide a minimum of ten (10) test plugs to be installed at location(s) identified by Cx Agent. Contractor shall request locations prior to filling the system(s).

END OF SECTION

SECTION 233100

SHEET METAL AND DUCTWORK ACCESSORIES CONSTRUCTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services required for the complete installation designed in Contract Documents.

1.2 QUALITY ASSURANCE

- A. Ductwork shall be fabricated and installed in compliance with latest edition of the following standards and with the edition of the Codes in effect at the time the building permit is obtained.
 - 1. SMACNA Duct Construction Standards - Metal and Flexible Ductwork.
 - 2. SMACNA Duct Liner Application Standard.
 - 3. SMACNA HVAC Air Duct Leakage Test Manual.
 - 4. Mechanical Code of New York State.
 - 5. Energy Conservation Construction Code of New York State.
 - 6. Plans and Specifications which exceed the requirements in any of the referenced standards.
- B. All sheet metal shall be fabricated and installed by an experienced Contractor specializing in this type of work.
- C. All ductwork and fittings shall have a computer generated label affixed to the exterior surface of each section, detailing all applicable information including the duct dimensions, gauge, reinforcement type/class and connection type by systems manufacturer. Galvanizing thickness shall be clearly stenciled on each duct section.
- D. All ductwork on the project shall meet the SMACNA Duct Cleanliness For New Construction Guidelines, "Advanced Level" of duct cleanliness for production, delivery, storage and installation of ductwork.

1.3 SUBMITTALS

- A. Ductwork Shop Drawings.
- B. Duct Access Doors.
- C. Flexible Duct.

- D. Submit a complete shop standard manual including miscellaneous materials, and construction details for all shop fabricated materials including, but not limited to, volume dampers, turning vanes, duct sealant, equipment flexible connections, access doors, flexible duct, acoustical duct lining, etc.

1.4 GENERAL

- A. All adhesives, sealants, primers and paint used for ductwork in the interior of the building shall comply with the maximum Volatile Organic Compound (VOC) limits called for in the current version of U.S. Green Building Council LEED Credits EQ 4.1 and EQ 4.2.

1.5 DUCTWORK CLASSIFICATION

- A. Duct systems are to be classified and constructed per the SMACNA Velocity-Pressure classification system as follows:
 1. All ductwork shall be constructed for a minimum pressure class of 2 in. w.g. (unless stated otherwise) for the following systems, as applicable:
 - a. Supply duct downstream of terminal units.
 - b. Typical low pressure supply ductwork.
 - c. Typical return ductwork.
 - d. Typical low pressure exhaust ductwork.
 2. Supply duct upstream of terminal units shall be constructed for a minimum pressure class of 3 in. w.g. unless otherwise stated or required as per below.
 3. Pressure classes above 3 in. w.g. shall be provided as follows, based upon the external static pressure as scheduled for each specific fan.

<u>Scheduled External Static Pressure</u>	<u>Pressure Class</u>
Over 3 in. up to 4 in. w.g.	4 in. w.g.
Over 4 in. up to 6 in. w.g.	6 in. w.g.
Over 6 in. up to 10 in. w.g.	10 in. w.g.

1.6 DUCTWORK SHOP DRAWINGS

- A. Prepare minimum 1/4 in. scale drawings:
 1. Detailed ductwork shop drawings shall include size, layouts and pressure classifications. Any ductwork installed without benefit of review by the Engineer of Record may be subject to replacement at the expense of the Contractor.
 2. Constructed from actual field inspections and measurements so as to assure a complete job.

3. Incorporate dimensions of actual equipment proposed for use on the project.
 4. Showing adequate sections, elevations, and plan views and indicating the bottom of ductwork elevations from the finished floor.
 5. Indicating all volume dampers, fire dampers, smoke dampers, damper access doors and other accessories required for a completed project.
- B. Call to the attention of the Engineers immediately, any major deviations from the Contract Drawings, which must be made. All deviations shall be documented in writing.
 - C. Indicate roof, wall and floor opening dimensions and locations shown on shop drawings.
 - D. Submit prints to each Contractor of the other trades for review for interference's and coordination with their work.

PART 2 - PRODUCTS

2.1 DUCTWORK MATERIALS

- A. Unless otherwise called for, provide materials in accordance with Exhibit I at the end of this section.

2.2 SQUARE AND RECTANGULAR DUCTWORK

- A. Materials:
 1. Galvanized Sheet Metal: Comply with ASTM A653 and A924, with G90/Z275 coating.
 2. Stainless-steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in Exhibit "I"; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D or No. 3 as indicated in Exhibit "I".
 3. Aluminum sheets: Comply with ASTM B 209 (ASTM B 209M) Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
 4. Gauges per SMACNA HVAC Duct Construction Standards, Metal and Flexible.
- B. Transverse and longitudinal duct seams reinforcement shall conform to appropriate tables and figures per SMACNA Velocity-Pressure Classification for duct construction.
 1. Transverse joints shall be sealed with duct joint sealant. "Ductmate" or "Nexus" 4-bolt connection systems may be used in lieu of standard construction.
 2. Field assembled longitudinal seams shall be sealed with duct sealant. Factory or shop fabricated rolled or machine pressed longitudinal seams does not require sealant.

- C. Corner closures shall be required as described and illustrated by SMACNA Duct Construction Standards.
- D. Throat radius on all elbows shall not be less than the dimension of the duct plane of radius. Where this cannot be maintained, use shorter radius with internal guide vanes, or square elbow with turning vanes.
- E. Bracing and hanging of ductwork shall be per SMACNA Standards for size and system class of ductwork being used.
- F. Any transformations shall not reduce the ductwork cross-sectional area. Maximum angle in straight duct, 20° for diverging flow and 30° for contraction flow. Transformation from square to round seams welded or brazed.

2.3 ROUND DUCTWORK

A. Standard Round Ductwork:

- 1. Materials:
 - a. Galvanized Sheet Metal: Comply with ASTM A653 and A924, with G90/Z275 coating.
 - b. Stainless-steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in Exhibit "I"; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D or No. 3 as indicated in Exhibit "I".
 - c. Aluminum sheets: Comply with ASTM B 209 (ASTM B 209M) Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
 - d. Gauges per SMACNA Duct Construction Standards. Spiral lock-seam or longitudinal fusion-welded.
- 2. All spiral ducts shall have locked seams so made as to eliminate leakage under pressure for which this system has been designed. Longitudinal seams duct shall have fusion-welded butt seams.
- 3. No stovepipe will be allowed.
- 4. Round Ductwork Fittings:
 - a. All fittings fabricated per SMACNA Standards for round ductwork, material to match straight pieces of ductwork.
 - b. Fittings shall have continuous, welded seams.

- c. 90° tees shall be conical type. 90° tees and 45° laterals up to and including 12 in. diameter tap size shall have a radiused entrance into the tap, produced by machine or press forming. The entrance shall be free of any restrictions.
 - d. Round taps off the bottom of rectangular ducts down to diffusers shall be made with a 45° square to round shoe-tap.
5. Elbows:
- a. Diameters 3 in. through 8 in.: Two-section stamped and continuously welded elbows, material to match straight pieces of ductwork.
 - b. Over 8 in.: Gored construction with standing seam construction and internally sealed or continuously welded. Less than 35° - two gores, 36° to 71° - three gores, over 71° - five gores.
 - c. Fabricated to a centerline radius of 1.5 times the cross-section diameter.
 - d. Adjustable elbows are not allowed.
6. Joints:
- a. For duct construction pressure 3 in. w.g. or greater:
 - 1) Round Joints:
 - a) Unexposed Duct 3 in. - 30 in. Diameter: Connect round duct with a one piece interior slip coupling, at least two gauges heavier than duct wall, beaded at center and fastener to duct with screws. Seal joint with an approved sealant applied continuously around both end of coupler prior to assembling and after fastening.
 - b) All Exposed Duct and Unexposed Duct 30 in. - 72 in. Diameter: Install using a three piece, gasket flanged-joint consisting of two internal flanges, with integral mastic sealant, and one external closure band, which compress the gasket between the internal flanges.
 - (1) Acceptable Manufacturer: Ductmate Industries "Spiralmate" system or approved equal.
 - c) Above 72 in. Diameter: Install using companion angle flanged joints as defined in Figure 3-1 of the 2005 SMACNA Manual, "HVAC Duct Construction Standards, Metal and Flexible" Third Edition. Refer to manual for proper sizing and construction details.

- d) Dust collection systems and exposed duct 3 in. - 14 in. use a one piece, polyethylene lined gasket connector with integrated bolt for the closure system.
 - (1) Acceptable Manufacturer: Ductmate Industries "Quicksleeve" or approved equal.
- b. Pipe-to-pipe joints in diameters up to 60 in. shall be by the use of sleeve couplings, reinforced by rolled beads.
- c. Pipe-to-fitting joints in diameters up to 60 in. shall be by slip-fit of projecting collar of the fitting into the pipe.
- d. Insertion length of sleeve coupling and fitting collar shall be 2 in. up to 36 in. diameter and 4 in. above 36 in. diameter.
- e. Pipe-to-pipe and pipe-to-fitting connections in ductwork above 60 in. in diameter shall be made by angle ring flanges. The flange on the pipe shall be a 2 in. x 2 in. x 3/16 in. angle attached to the pipe with a continuous weld. The fittings shall have a loose ring "Van Stone" flange. A 5/8 in. flange shall be provided to act as a gasketing surface for sealing with the angle ring being a rolled, welded ring 2 in. x 2 in. x 3/16 in. Bolt hole spacing for angle rings shall be 6 in. centers.
- f. If longitudinal seam duct greater than 60 in. in diameter is supplied in lengths greater than 4 ft., one angle ring must be welded to the duct on 4 ft. centers for support.

2.4 DUCTWORK SEALING

- A. SMACNA Duct Sealing Classification shall be used for duct systems using the following criteria:
 - 1. Ductwork and all plenums with pressure class ratings shall be constructed to seal Class A, as required to meet the requirements of SMACNA Duct Construction Standards and with standard industry practice, including transverse joints, longitudinal seams, fitting connections, and all penetrations of the duct wall.
 - 2. Openings for rotating shafts shall be sealed with bushings or other devices that seal off air leakage. Pressure sensitive tape or sealing compounds shall not be used. Sealing compounds used to seal openings for rotating shafts shall not be used.
 - 3. All connections shall be sealed, including but not limited to spin-ins, taps, other branch connections, access doors, access panels and duct connections to equipment.
 - 4. Sealing that would void product listings is not required.
 - 5. Spiral lock seams need not be sealed.

- B. Duct sealant for indoor applications shall be non-fibrated, water based, Hardcast Iron-Grip IG-601, Ductmate PRO Seal, Foster 32-17 or Childers CP146.
- C. Duct sealant for outdoor applications shall be fibrated, water based, Hardcast Versa-Grip VG-102, Ductmate Fiberseal, Foster 32-17 or Childers CP148.
- D. Sealants and tapes shall be listed and labeled in accordance with UL 181A or UL181B and marked according to type.

2.5 TURNING VANES

- A. Provide in mitered elbows as shown on contract drawings. Vanes 36 in. or longer shall be double wall air foil type. All turning vanes shall be installed as per the latest SMACNA Standards. Turning vane size and spacing shall be as per SMACNA. Turning vane spacing greater than SMACNA Standards is not acceptable.
- B. Turning vanes shall be Harper or equivalent double wall turning vanes fabricated from the same material as the duct.
- C. Turning vane front and back panels shall be securely locked together with adequate crimping to prevent twisting of vane. Vane shall be capable of withstanding 250 pounds of tensile load when secured according to the manufacturer's instructions.
- D. Rails for mounting turning vanes shall have self locking, friction fit tabs designed to facilitate proper alignment of vanes. Tab spacing shall be as specified in Figure 4-3 of the 2005 SMACNA Manual, "HVAC Duct Construction Standards, Metal and Flexible". Rail systems with non-compliant tab spacing shall not be accepted.
- E. Acoustical Turning Vane: Shall be used in applications that require quiet operating systems. Mounting rails shall have friction insert tabs that align the vanes automatically.
- F. Acceptable Manufacturer: Ductmate Industries PRO-Rail Turning Vane or approved equal.

2.6 DAMPERS IN DUCTWORK

- A. Blade Type Volume Dampers: Constructed per SMACNA, one gauge heavier than duct material, securely fastened to 3/8 in. sq., cold rolled steel operator rod. Provide stainless steel operator rod in stainless steel ductwork. Provide Ventlock 639 elevated dial regulator for 2 in. insulated ductwork or equal. Provide Ventlock 635 dial regulator for non-insulated ductwork or equal.
- B. Multiple Blade Type Volume Dampers: Provide multiple blade volume dampers in ductwork above 12 in. in height.
 - 1. Heavy duty, manual balancing dampers suitable for application in HVAC systems with velocities to 1,500 ft. per minute, open position and max. pressure of 3 in. w.g. close position. Ruskin MD 35 or equivalent.

2. Fabrication:
 - a. Frame: 5 in. x minimum 16 gauge roll formed, galvanized steel hat-shaped channel, reinforced at corners. Structurally equivalent to 13 gauge U-channel.
3. Blades:
 - a. Style: Single skin with 3 longitudinal grooves.
 - b. Action: Opposed.
 - c. Orientation: Horizontal
 - d. Material: Minimum 16 gauge equivalent thickness, galvanized steel.
 - e. Width: Nominal 6 in.
4. Bearings: Molded synthetic sleeve, turning in extruded hole in frame.
5. Linkage: Concealed in frame.
6. Axles: Minimum 1/2 in. diameter, plated steel, hex-shaped, mechanically attached to blade.
7. Control Shaft: 3/8 in. square plated steel.
8. Finish: Mill galvanized.
 - a. Actuator: Hand quadrant for 3/8 in. square extended shaft.
 - b. Hand Quadrant Standoff Bracket: 2 in. standoff for insulated ductwork.
 - c. Oillite bearings.
 - d. Factory Sleeve: Minimum 20 gauge thickness, minimum 12 in. length.
- C. Fire and Smoke Dampers: See "Fire and Smoke Dampers" Section.
- D. Automatic Air Dampers: Furnished as part of "Building Management System" Section 230923, and installed by this Contractor.
- E. Blast Gates: Aluminum housing, locking thumbscrew, galvanized slide blade. Provide stainless steel housing and slide blade in welded stainless steel ductwork.

2.7 FLEXIBLE CONNECTIONS TO FANS AND EQUIPMENT

- A. Basis-of-Design: Ventfabrics, Inc.
- B. Acceptable Manufacturers: Ductmate Industries, Inc., Duro Dyne Inc., Elgen Manufacturing, Ward Industries, Inc.; a division of Hart & Cooley, Inc.

- C. Materials: Flame-retardant or noncombustible fabrics, water and mildew resistant UL Standard 214.
- D. Coatings and Adhesives: Comply with UL 181, Class 1.
- E. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 in. wide attached to two (2) strips of 2-3/4-in. wide, 0.028-in. thick, galvanized sheet steel or 0.032 in. thick aluminum sheets. Provide metal compatible with connected ducts.
- F. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd.
 - 2. Tensile Strength: 480 lbf/in. in the warp and 360 lbf/in. in the filling.
 - 3. Service Temperature: Minus 40 to plus 200°F.
- G. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
 - 1. Minimum Weight: 24 oz./sq. yd.
 - 2. Tensile Strength: 530 lbf/in. in the warp and 440 lbf/in. in the filling.
 - 3. Service Temperature: Minus 50 to plus 250°F.
- H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.
 - 1. Minimum Weight: 14 oz./sq. yd.
 - 2. Tensile Strength: 450 lbf/in. in the warp and 340 lbf/in. in the filling.
- I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
 - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 - 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-in. movement at start and stop.

2.8 ACCESS DOORS

A. General:

1. Provide access doors of adequate size to allow easy access to the equipment that will require maintenance. Provide insulated or acoustically lined doors to prevent condensation where applicable.
2. Manufacturer to provide an installed neoprene gasket around perimeter of access door for airtight seal.
3. Systems 3 in. w.g. or less shall utilize a hinged, cam, or hinged and cam square framed access door.
4. Systems 4 in. w.g. and above shall utilize a sandwich type access door. Construct doors in accordance with Figure 7-3 of the 2005 SMACNA Manual, "HVAC Duct Construction Standards, Metal & Flexible" Third Edition.
5. Approved Manufacturer: Ductmate Industries "Sandwich" style door or approved equal.
6. All access doors shall be continuous piano hinged type, unless noted otherwise.
7. Non-hinged only allowed where clearance to ceiling does not allow a full 90° swing.
8. Double panel insulated type when used in insulated duct.
9. Single panel uninsulated type allowed in un-insulated duct.
10. Pressure rated according to system in which being installed. Door-to-frame and frame-to-duct gasketing.
11. Provide specified Seal Class A or B ductwork sealing around frame, and hand adjust the latch tension for proper seal, on all access doors other than sandwich panel (Ductmate) style.
12. MINIMUM access door size for ducts 12 in. or less in depth is 12 in. x 8 in.
13. MINIMUM access door size for ducts 12 in. to 18 in. in depth is 18 in. x 14 in.
14. MINIMUM access door size for ducts more than 18 in. in depth is 24 in. x 18 in.
15. In ducts which require multiple section fire dampers due to duct size, provide one access door for each fire damper section.

16. Access doors for fire and smoke dampers shall be permanently labeled with 1/2 in. high lettering reading "SMOKE DAMPER" or "FIRE DAMPER".

B. Door Types:

1. Low Pressure Systems (2 in. w.g. pressure class): National Controlled Air ADH-1, Ruskin ADH22, Vent Products 9701, Air Balance FSA-100, Safe Air SAH, Nailor.
2. Medium and High Pressure Systems (3 in. w.g. pressure class and higher):
 - a. Rectangular Duct: Ductmate Industries "Ultimate" Style Door, or equal.
 - b. Round Duct: Ductmate Industries Round Sandwich type, or equal. 8 in. x 4 in. for ducts 14 in. and less in diameter. Ductmate Industries Round Sandwich type 16 in. x 12 in. for ducts more than 14 in. in diameter.
 - c. Furnish and install factory supplied protector molding on cut medal edge for all Ductmate access doors.

2.9 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Ventlock 699 or 699-2 based upon insulation thickness.
- C. Install duct test holes where required for duct traverse testing and balancing purposes.

PART 3 - EXECUTION

3.1 REQUIREMENTS

- A. Equipment and systems shall be installed in accordance with local and state codes and regulations having jurisdiction. Bracing and hanging of ductwork shall be per SMACNA - HVAC Duct Construction Standard.
- B. Install all ductwork concealed and tight to the structure above unless noted otherwise on shop drawings. Fabricate only after the approval of shop drawings, and in locations to avoid interferences. Ductwork installed without approved shop drawings, which requires removal/modification and/or reinstallation due to conflicts or improper installation shall be repaired at no cost to the Owner.
- C. Sizes given on contract drawings are inside dimensions.
- D. The ductwork sizes and types (round and rectangular) were selected for space limitation and acoustical requiremetns within the building. In addition, the ductwork sizes and types were chosen to allow space above the ceilings for future ductwork, piping and/or conduit. It is not acceptable for the contractor to change the size or type of ductwork for bidding or installation unless specifically approved by the engineer.

- E. Keep openings continuously closed and sealed with protective plastic wrapping during construction to prevent entrance of dirt and debris.
- F. Extend access openings, damper rods and levers, to outside of external insulation make systems airtight.
- G. No piping, conduit or other obstruction to airflow is permitted in ductwork.
- H. Provide necessary openings, hanger inserts, framing, chases, and recesses, not provided by other trades.
- I. Exposed exhaust or return registers and grilles shall be flush with face of duct; exposed supply registers and grilles shall be mounted outside airstream with 45° shoe-tap extension collars.
- J. Provide 14 gauge sleeves for ducts passing through Mechanical Room floors. Set sleeves 4 in. above finished floor in Mechanical Rooms, seal watertight to floor.
- K. Where a return or exhaust duct is shown to be left open ended, provide hardware mesh screen at opening.
- L. Do not utilize flexible ductwork or connection in any way to connect variable or constant volume boxes to ductwork.
- M. For duct penetrations of non-rated walls, provide sheet metal angle framing or sheet metal closure panels around the entire perimeter of each duct wall penetration on both sides of the wall, where the gap exceeds 1/4 inch. Where the gap is less than 1/4 inch, the gap may be caulked on both sides of the wall. Non-rated wall penetrations SHALL NOT be fire caulked under any circumstances.
- N. For duct penetrations of rated walls, see Specification Section 230500 - Basic Mechanical and Electrical Requirements.
- O. Ductwork that is called for to be welded shall be fully welded, continuous around the entire perimeter at all joints/seams, and shall be fully airtight and watertight.

3.2 FLEXIBLE CONNECTIONS

- A. Provide flexible connections for the intake and discharge connections of duct connected to fans and air handling equipment.
- B. Round connections are to be made with adhesive and metal drawbands with ends tightly bolted.
- C. Rectangular connections shall be made with material securely held in grooved seam between flanges. Attach with adhesive and mechanical fasteners on 6 in. centers.
- D. Connections shall be made with a minimum of 2 in. space between duct and equipment collars, installed in line, and with 1 in. excess material folded so as not to interfere with airflow through connection.

- E. Mechanically fastened and sealed, with specified duct sealant, at duct and equipment connections.

3.3 TURNING VANES

- A. Install only in square elbows of equal dimensions.
- B. Install as per latest SMACNA Standards.
- C. Secure vane runners to duct with spot welding, riveting or sheet metal screws.
- D. When installing in ductwork with internal insulation.
 - 1. Install runners in ductwork inside insulation and bolt through insulation and duct sides, welding bolts to insure rigid installation. Provide build-outs for duct Velocity-Pressure classes above 2 in. w.g.

3.4 DUCT CLEANLINESS AND CLEANING AFTER INSTALLATION

- A. Duct Cleanliness:
 - 1. All ductwork on the project shall meet the SMACNA Duct Cleanliness For New Construction Guidelines, "Advanced Level" of duct cleanliness for production, delivery, storage and installation of ductwork.
 - 2. Prior to shipment to the jobsite, all duct ends and openings must be covered with a heavy duty, dual-ply, clear polyethylene protective film. Open ends are to be kept covered during transport, storage, and installation. As ductwork is installed at the job site, open ends are to be covered to maintain cleanliness.
 - 3. The film must be securely affixed to protect against dirt and debris, and must be translucent to facilitate inspection of interior surfaces without removing the film. The film is have a elongation rating of 600% and a break strength of 13.1 lbs./in. The film shall contain no VOC's, and shall leave no residue on duct after removal.
 - 4. Manufacturer: Ductmate Industries ProGuard (heavy duty grade clear).
- B. Cleaning After Installation:
 - 1. Interior surfaces shall be free of dust and debris prior to initial start up. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes. Any cleaning of duct systems shall comply with recommendations of NAIMA and NADCA.
 - 2. Clean external surfaces of foreign substances that might cause corrosion, deterioration of the metal, or where ductwork is to be painted.
 - 3. Clean debris from system before fans are turned on.

4. Keep openings continuously closed during the construction period.
5. Pay damages resulting from dirt blown on painted or other finished surfaces.
6. Repair or replace damaged fan wheels, dampers, or other system parts damaged as a result of debris.
7. Clean system as many times as required until the entire system is dirt free.

3.5 INSTALLATION OF ROUND DUCTWORK

- A. Use factory-fabricated couplings for joints.
- B. After the joint is slipped together, sheet metal screws are placed 1/2 in. from the joint bead for mechanical strength.
- C. Sealer is applied to the outside of the joint and covering the screw heads.
- D. Flanged joints shall be made with neoprene rubber gaskets.

3.6 TEST OF DUCTWORK

- A. Conduct duct leakage tests per SMACNA "HVAC Air Duct Leakage Test Manual" and per the requirements of the Energy Conservation Construction Code of New York State, for ductwork systems as indicated below. Positive pressure leakage testing is acceptable for negative pressure ductwork. The rate of air leakage (CL) must be less than or equal to 4.0 for rectangular ductwork and 2.0 for round ductwork, as determined by the equation in the code referenced above, which reads: $CL=F/P^{0.65}$ where F = measured leakage rate in CFM per 100 sq. ft. of duct surface, and P = static pressure of the test. When leakage above stated limits occurs, ascertain location of leaks and rebuild, repair, or seal the ductwork as required. Repeat tests as required to obtain allowable leakage rates. Prepare a report similar to that suggested by SMACNA and submit for review.
- B. Leakage testing shall be witnessed by representatives from Cornell University.
- C. Systems designed to operate at 3-inches w.c. and below: All duct mains and duct risers as well as all associated ductwork located out-of-doors shall be leak tested. If any of the sections fail the leakage test, the entire system shall be leakage tested.
- D. Systems designed to operate at static pressures of 3.0" w.c. and below: All duct mains, duct sub-mains, duct branch mains, and duct risers shall be leak tested. If any of the duct sections fail the leakage test, the entire system shall be re-tested until it passes. Duct mains and sub-mains shall include all supply and return ductwork from an air handling unit, to the space(s) served. Branch ducts to terminal units, diffusers and grilles do not require testing, and pressure testing should be done prior to making the branch duct connections.
 1. A duct main is defined as a duct containing the system's total airflow.
 2. A duct sub-main is defined as a duct containing part of the system's airflow and serving two or more duct branch mains.

3. A duct branch main is defined as a duct serving two or more terminals.
 4. A branch duct is defined as a duct serving a single terminal.
 5. A terminal unit is defined as a VAV terminal.
- E. Systems designed to operate in excess of 3-inches w.c.: The entire system shall be leak tested.
 - F. Provide test reports indicating pressure tests performed. Include date, section tested, test pressure and leakage rate.
 - G. Ductwork not required to be tested for leakage, shall be checked and guaranteed to meet the standards of the specified SMACNA Duct Seal Class A. Air balancing and testing shall be used to determine satisfactory operation of duct systems. Balancing reports indicating excessive leakage amounts shall be required to rebuild, repair or seal ductwork having excessive leakage.

3.7 DAMPERS AND AIR CONTROL DEVICES

- A. Provide volume dampers at all air outlets, diffusers, grilles and as noted on plans. Provide volume dampers at all low pressure supply, return and exhaust, branch ducts and as noted on the plans.
- B. Provide dampers necessary to permit proper balancing of air quantities. Comply with code requirements for smoke and fire control. Prevent introduction of uncontrolled outside air into building through roof and wall openings.
- C. When dampers are installed in acoustically lined ductwork, install with insulated "build-outs" per SMACNA.
- D. Install fire and smoke dampers in accordance with "Fire and Smoke Dampers" Section and applicable codes.
- E. Install all dampers furnished as part of "Building Management System" Section.

3.8 ACCESS DOORS

- A. Provide for access to upstream side of duct mounted reheat coils, dampers, damper motors, fire dampers, smoke dampers, smoke detectors, control devices, fan bearings, and equipment requiring periodic inspection or service. Provide labels for fire and smoke dampers as called for in Part 2 - Products.
- B. For ducts that are too small to install an access door of the minimum specified size, provide a 12" long section of removable ductwork for maintenance and inspection access. Removable ductwork shall be fastened between device requiring access and next duct section with duct flanges or Donaldson Torit clamp with PVC foam seal. For ducts that are required to be insulated, provisions shall be made to allow insulation to be easily removed and re-installed.

3.9 DUCT SUPPORTS

- A. Provide per SMACNA, same material as duct. Hanger bands to extend down sides and turn under bottom 2 in. Minimum two metal screws per hanger. Angle iron on larger duct spaced per building structural system but not greater than 8 ft. Provide extra support angles as required.
- B. Provide additional supports as required to support reheat coils, air terminal units, filter enclosures, and any other duct mounted equipment independent from the associated ductwork system.

3.10 AIR AND WATERTIGHT DUCTWORK

- A. Where water and snow may accumulate on ductwork or where odors or corrosive gasses may collect, ductwork and plenums shall be made watertight by soldering, brazing or welding of joints. Grade ducts down toward waste points and/or toward louvers. Provide valve and drain piping from low point to waste point.
 - 1. Chemical fume hood exhaust.
- B. Test for Watertightness: Before concealment, apply water by hose to check for leaks, witnessed by Owner's Representative.

3.11 SMOKE DETECTION

- A. Smoke detectors shall be furnished by Division 28 " Electronic Safety and Security ". This Contractor shall install detectors located in ductwork. Clearly indicate locations of smoke detectors on the sheet metal shop drawings.
- B. Increase duct size at smoke detectors, where required for proper installation, per smoke detector manufacturer's recommendations. Coordinate minimum duct size required with Division 28 " Electronic Safety and Security".

3.12 DUCTWORK AT HUMIDIFIERS

- A. Provide type 304 stainless steel duct with solder duct seams and joints watertight within 5 ft. of humidifier. Pitch duct and provide 1-1/4 in. capped drain connection at low point.
- B. Where humidifiers are installed in ducts 8 in. and less in depth, increase duct size and provide expanded section in accordance with manufacturer's recommendations.

3.13 DUCT SEALING

- A. Preparation:
 - 1. Clean surfaces of dirt, oil, grease and loose of foreign matter that could impair adhesion, using soap and water or solvent.
 - 2. Allow surfaces to dry completely before proceeding.

B. Installation of Sealant System:

1. Apply sealant system to duct joints, fasteners, and seams in accordance with manufacturer's instructions.
2. Apply sealant by brush, putty knife or caulk gun, to full coverage. Remove excess adhesive immediately.
3. Completely seal duct joint, fasteners and seams without voids, to a minimum 20 mil thick wet film.
4. Apply and store at ambient temperature of 40°F to 100°F; and protect from freezing until dry.

C. Field Quality Control:

1. Allow duct sealant system to cure a minimum of 72 hours before operating the system.
2. Do not apply external duct insulation or coatings until the joints have been inspected by the Owner's Representative.

EXHIBIT I - DUCTWORK MATERIALS

<u>SERVICE</u>	<u>MATERIAL</u>	<u>SPECIAL REQUIREMENTS</u>
Supply, return, vent, relief, outside, general exhaust,	Lock forming quality, galvanized steel ASTM A653 and A924	Joints and features as called for
Accessories, dampers and air turns	Same material and gauge as parent duct	-----
Field constructed apparatus casings	Galvanized steel ASTM 525	Sealed airtight

END OF SECTION

SECTION 233313

FIRE AND SMOKE DAMPERS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services required for the complete installation, testing and certification as shown on the Contract Documents.
- B. Test and certify the existing fire dampers.
- C. Provide information in report form listing items required by specifications. Results shall be guaranteed. Contractor shall be subject to recall to site to verify report information before acceptance of the report by the Owner's Representative.

1.2 SUBMITTALS

- A. Examination Report: Provide a summary report of the examination review to the Engineer and Owner's Representative, documenting issues that may preclude the proper certification and testing of the dampers per the requirements in Section 3.2.A with information that may be considered in resolving deficiencies.
- B. Certified report format shall consist of the following:
 - 1. Title sheet with job name, contractor, engineer, date, testing contractor's name, address, telephone number and contact person's name and the testing technician's name.
 - 2. Location of the damper(s).
 - 3. Deficiencies discovered, if any
 - 4. Indication of when and how deficiencies were corrected, if applicable.

1.3 QUALIFICATIONS

- A. Provide work in compliance with the following Codes and Standards based on the current edition in effect at project location:
 - 1. Mechanical Code of New York State.
 - 2. UL 555, UL 555S and UL555C.
 - a. Fire dampers shall be Underwriter's Laboratories classified and labeled.
 - b. Smoke dampers and operator assemblies shall be Underwriter's Laboratories (UL) classified and labeled as an assembly.

PART 2 - PRODUCTS

2.1 COMBINATION FIRE/SMOKE DAMPERS

- A. Airfoil multiblade type damper of galvanized steel construction suitable for installation in high velocity duct systems up to 3000 fpm and 4 in. s.p. with 16 gauge hat channel frame with corner reinforcement and blades equivalent to 14 gauge, silicone rubber blade edge seals, stainless steel bearings and flexible stainless steel jamb seals. UL listed and labeled.
 - 1. UL listed 120 volt electric motor operator. Operator to be mounted outside of the air stream. Provide damper with two auxiliary contacts for monitoring by the BMS system.
 - 2. Square, rectangle, or round as required. Duct transitions for dampers in oval ducts.
 - 3. With factory fabricated sleeve with fixed and slip flanges.
 - 4. Class I leak rating of 4.0 cfm/ft² at 1 in. w.g. (8.0 cfm/ft² at 4 in. w.g.)
 - 5. 1-1/2 hour fire rated. Fusible link temperature rating of 165°F.
 - 6. Provide with damper test switch package and open/closed position light indicators.
- B. Design Equipment: Ruskin FSD60.
- C. Make: Ruskin, Air Balance, National Controlled Air, Greenheck, Nailor.

PART 3 - EXECUTION

3.1 LOCATIONS

- A. Provide fire dampers in all one, two and three hour rated wall and floor penetrations, as called for.
- B. Provide smoke dampers as called for in penetrations of smoke barriers.

3.2 INSTALLATION

- A. Dampers shall be installed in accordance with the manufacturer's written instructions and as required to meet specified listings.
- B. Provide sleeve, angles, and access doors for installation in accordance with the latest requirements of SMACNA, NFPA, UL and damper manufacturer.

- C. Provide sheet metal access doors with labels, as called for in Specification Section 233100 in ductwork for dampers and accessories.
- D. Install dampers square and free from racking.
- E. Do not compress or stretch the damper frame into the duct or opening.
- F. Provide bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Attach multiple damper section assemblies together in accordance with manufacturer's instructions. Install support mullions as reinforcement between assemblies as required.
- G. Division 26 "Electric" will provide signal wiring and power wiring for smoke dampers. Refer to "Building Management System" Section for additional requirements. Smoke detectors shall be furnished by Division 28 "Electronic Safety and Security". Install detectors located in ductwork within 5'-0" of the damper. Increase duct size at smoke detectors, where required for proper installation, per smoke detector manufacturer's recommendations. Coordinate minimum duct size and length for smoke detectors required with Division 28 "Electronic Safety and Security".

3.3 PREPARATION

- A. Examine existing construction and notify Owner's Representative and Engineer of issues related to the testing and certification of the existing fire/smoke damper, as part of "Examination Report" submittal. The summary shall include a list of items that do not meet testing requirements outlined in Section 3.4.B, with information that may be considered in resolving deficiencies.

3.4 TESTING AND CERTIFICATION OF EXISTING FIRE SMOKE DAMPER

- A. Testing shall be witnessed by Cornell University EH&S and the Ithaca Fire Department Present. Coordinate schedule with Cornell University Project Manager.
- B. Testing shall be in compliance with NFPA 80 requirements:
 - 1. Confirm that the damper is in the full-open or full-closed position as required by the system design.
 - 2. Visually confirm the damper moved to the full-closed or full-open position when commanded.
 - 3. Visually confirm that the damper returns to the original operating position as required by the system design.

3.5 CERTIFICATION

- A. Contractor shall certify that existing and new dampers are accessible for servicing, are installed properly, are operational and in compliance with NFPA 80. After acceptance by the Owner's Representative, submit three (3) physical copies of signed certification to the Owner for record.

3.6 IDENTIFICATION

- A. Provide damper tags and charts.
 - 1. Fasten tag to ductwork adjacent to the dampers.
 - 2. Number each damper and make chart listing.
 - a. Number.
 - b. Location.
 - c. Air system in which they are installed.
- B. Submit three (3) copies of chart to the Owner's Representative for review.

END OF SECTION

SECTION 233400

FANS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Drawings.

1.2 SUBMITTALS

- A. Submittals shall include all fans, motors, drives, and accessories. Include all fan curves fan operating point, and sound data.

1.3 QUALITY ASSURANCE

- A. Capacity, size and arrangement, static pressure, brake horsepower, component parts and accessories shall be provided as called for or scheduled. Guaranteed full capacity delivery through duct systems finally installed and under conditions listed. The manufacturer shall guarantee sound-power level ratings not exceeding those of the design equipment. All equipment shall be statically and dynamically balanced to acceptable tolerances with weights permanently fastened. Fan wheels shall be rebalanced in the field, if necessary.

- B. Pressure Classification:

<u>Maximum Total Sp</u>	<u>Class</u>
Up to 3-3/4 in. WG-STD	I
Up to 6-3/4 in. WG-STD	II
Up to 12-3/4 in. WG-STD	III

- C. Motors:

- 1. Motor sizes shall be as scheduled. Refer to Specification Section 230513 for motor types, efficiency requirements, and acceptable motor manufacturers. All belt-driven fan motors shall be mounted on either an adjustable slide base or a pivoting base. Motors shall contain permanently lubricated sealed ball bearings.

- D. Drive Systems:

- 1. Provide fans with belt or direct drive systems as scheduled. V-belt drives as recommended by drive manufacturer, unless otherwise specified or scheduled.
 - a. Size drive for 200% of motor rating when motor is 10 HP and larger. Size for 150% of motor rating when motor is less than 10 HP.

- b. Motors 5 HP and larger shall be provided with a minimum of two (2) belts. All belt sets shall be matched.
- c. Cast iron or cast steel pulleys.
- d. Provide belt and shaft guards for each driven device. Provide openings in both the motor and fan sections of the guard so that the motor and fan speeds can be checked without removing the belt guard.
- e. Belts shall be oil and heat resistant, non-static type.
- f. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts.
- g. All belt drive fan motor selections must include an allowance for medium drive losses as established by AMCA Publication 203.

E. Motor Pulleys:

- 1. 5 HP and Smaller: Adjustable type to produce 15% speed change above and below scheduled fan speed. 7-1/2 HP and Larger: Fixed type.
- 2. 5 HP and Smaller: "A" section, 2.6 in. minimum pitch diameter.
- 3. Drive ratio not over 4:1.

F. Bearings:

- 1. Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy-duty regreaseable ball type in a pillow block cast iron housing selected for a minimum L50 life in excess of 200,000 hours as maximum cataloged operating speed.

G. Wheels and Propellers:

- 1. All wheels and propellers shall be balanced in accordance with AMCA Standard 204-96, balance quality and vibration levels for fans. Wheel shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency.
- 2. Blades on all sizes shall be continuously welded to the backplate and deep spun inlet shroud.
- 3. All hubs shall be keyed and securely attached to the fan shaft.

H. Blower Shafts:

- 1. All blower shafts shall be AISI-C-1045 hot rolled and accurately turned, ground and polished. Shafting shall be sized for a critical speed of at least 125% of maximum cataloged operating speed.

- I. Vibration isolation for units shall be furnished by the fan manufacturer unless otherwise noted.
- J. Certifications:
 - 1. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (CUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.
 - 2. All units shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit-tested packaging.

PART 2 - PRODUCTS

1. ROOF FANS

- A. Manufacturers: Subject to compliance with requirements of this section, provide products by one of the following:
 - 1. Acme, Cook, Greenheck, Twin City, PennBarry.
- B. Spun Aluminum Downblast Centrifugal Exhaust Ventilator:
 - 1. Construction:
 - a. The fan shall be bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure.
 - b. The aluminum base shall have continuously welded curb cap corners for maximum leak protection, and shall be tall enough to cover the wood nailer on roof curb.
 - c. The discharge baffle shall have a rolled bead for added strength.
 - d. An integral conduit chase shall be provided through the curb cap and into the motor compartment to facilitate wiring connections.
 - e. Bearings and drives shall be mounted on a minimum 14 gauge steel power assembly, isolated from the unit structure with rubber vibration isolators. These components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream.
 - f. Hinged at curb so that entire fan can be tilted upward for maintenance, access to dampers, and access to damper motor.
 - g. 1/2 in. x 1/2 in. aluminum wire mesh bird screen.

2. Wheel:
 - a. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub.
3. Accessories:
 - a. Roof Curb Adapter Kit.
 - b. 0-10V Fan Speed Control (For Direct Drive Models Only)
4. Basis-of-Design: Product indicated in schedule.

PART 3 - EXECUTION

3.1 INSTALLATION OF EQUIPMENT

- A. Provide equipment in accordance with manufacturer's instructions. All fans shall meet the intent of the system performance requirements. Provide rubber in-shear vibration isolation for all fans unless otherwise called for. Provide necessary support steel for equipment. Provide guards for all exposed belts, shafts, and fan wheels. Change pulley sizes or adjust sheaves as required to make systems deliver specified quantities of air as listed on the Contract Drawings.

END OF SECTION

SECTION 233600

VARIABLE VOLUME TERMINAL UNITS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide labor, materials, equipment and services as required for the complete installation as shown on the Contract Drawings.

1.2 SUBMITTALS

- A. Submit product data for terminal units including room number, maximum and minimum CFM, accessories, pressure drops, discharge and sound power data by octave band. Clearly indicate box sizes being proposed. Submit separately the controller and control interface devices being utilized.

PART 2 - PRODUCTS

2.1 TERMINAL UNITS

- A. General Unit Construction:
 - 1. Unit casing shall be constructed of 22 gauge welded galvanized steel. Factory label each unit with size, location, minimum and maximum CFM, and calibration chart. Air terminal units shall be capable of operating at 10 in. w.g., pressure maximum without damage. Maximum casing leakage at 3 in. W.G. shall be 11 cfm.
 - 2. Unit insulation liner shall comply with the requirements of UL 181 (erosion, mold growth and humidity) and ASHRAE 62.1, and shall have a maximum flame/smoke spread of 25/50 for both the insulation and the adhesive when tested in accordance with ASTM E84. Insulation shall be secured with adhesive. Liner shall be:
 - a. Fiber-free foam insulation 1 in. thick (R4.0)
 - 3. Units to be certified under ARI Standard 880-94 Certification Program and carry ARI seal.
 - 4. Units to be provided with a factory control enclosure suitable for field installed controls.
 - 5. Units shall be provided with factory access door option.
 - 6. Units shall be provided with 3 ft. integral sound attenuators, where noted.

- B. Control and Volume Regulating Devices:
1. Internal unit damper shall be constructed of galvanized steel with blade-end seals for tight shut-off with a maximum damper leakage of 7 CFM against a maximum of 3 in. w.g. Damper shall be mounted on a galvanized steel shaft extending through the unit on torque free bearings. Terminal shall have normally open dampers. Minimum and maximum air quantities shall be factory set, but may be field adjustable. Neither the radiated or discharge sound power levels shall exceed the ratings of design equipment as scheduled on the Contract Drawings.
- C. Hydronic Reheat Coil:
1. Coil shall be factory installed on the terminal unit and shall be constructed of 1/2 in. copper tube with aluminum plate fins, non ferrous headers and connections. Tested at the factory to 250 PSI hydrostatic pressure. Control valves shall be provided by the temperature control subcontractor as described in Section 230923. Output capacity and rows as scheduled on the Contract Drawings.
- D. Terminal Volume Controller (Microprocessor Based):
1. Provide unit with airflow velocity and total pressure sensor suitable for up to 3000 fpm inlet velocity. Sensor shall be averaging type with multiple sampling points on cross grids. Pressure independent microprocessor based electronic controller shall modulate airflow to maintain space temperature.
 2. Provide a 24 volt electric damper actuator. The actuator shall be reversible with a switch and have a visual position indicator. The stroke time shall be 75 - 150 seconds at 0.53 in. lbs. Torque. The unit shall have a 3 foot long plenum rated cable. The housing shall be NEMA type 2 with a flammability rating conforming to UL94. The actuator shall be maintenance free and have a minimum life span of 60,000 cycles. Actuator shall be Bellimo NM24-1US, or equal.
 3. Provide factory mounted transformers for controller and actuator suitable for 120 volt, 1 phase-input power. Multiple boxes (approximately 6 to 8) shall be powered off of one terminal unit transformer through a low voltage power loop. Coordinate with the Control Contractor which terminal units require transformers.
 4. Wall mounted thermistor type electric space sensor provided by Control subcontractor.
 5. The VAV box manufacturer shall provide the box and the airflow sensor. The temperature control subcontractor shall field install the microprocessor based controller and damper motor calibration.
- E. Design Equipment: Titus DESV.
- F. Acceptable Makes: Anemostat, Envirotech, Price, Krueger, Titus.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Suspended terminal units from the building structural system independent of the ceiling system. If this cannot be accomplished, provide additional intermediate angle iron from which the units shall be suspended. Level each unit.
- B. Access to the terminal unit controls shall be accomplished by removal of ceiling panels or through an access door. Coordinate locations of access doors.

END OF SECTION

SECTION 233713

REGISTERS AND DIFFUSERS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

- A. Registers/Grilles/Diffusers: Submit product data including room schedule listing size, CFM, throw, direction of throw, accessories, finish, material type, color chart, pressure drop and noise criteria.

1.3 GENERAL REQUIREMENTS

- A. Each manufacturer shall check noise level ratings for registers and diffusers to ensure that the sizes selected will not produce noise to exceed N.C. - 24, measured at occupant level; notify Owner's Representative of problems prior to submittal.
- B. Pressure drop, airflow and noise criteria selection is based on design equipment. Manufacturers not submitting design makes must provide written certification in front of submittal that equipment submitted has been checked against and performs equal to the design make.
- C. Borders and frames shall be coordinated with materials and ceiling systems to integrate with architectural ceiling details and finishes scheduled.
- D. Locations of ceiling mounted air terminal devices shall be coordinated with locations shown on architectural reflected ceiling plans.
- E. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw and pressure drop. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- F. General:
 - 1. A register is defined as a grille plus a volume damper.
 - 2. Registers shall be installed "sight-proof" where possible, i.e.: High wall register with horizontal blades inclined up, or along a wall with blades facing the wall.
 - 3. Borders and frames shall be of the same material as register face unless specified otherwise.

G. Mounting Frames:

1. Provide with screw holes in register face punched and countersunk at factory, and mounting frame drilled and tapped to suit. Sponge rubber gasket between frame and wall or ceiling for all surface mounted frames.
2. Frame shall be overlap type and shall be suitable for type of ceiling where register is to be installed.

H. Finishes:

1. Baked enamel (of colors as selected from the manufacturer's standard color chart) as scheduled.

I. Design Equipment: Titus unless otherwise noted.

J. Manufacturers: Krueger, Titus, Price, Tuttle and Bailey, Nailor.

1.4 REQUIREMENTS FOR DIFFUSERS

A. General:

1. Provide four way blow unless otherwise noted.
2. Where manufacturer's size recommendations require duct sizes or connections differing from design, Contractor shall provide at no change in contract price.
3. Suitable for recessed mounting unless otherwise indicated.
4. Provide square to round neck transitions as required.
5. Provide sponge rubber gasket for all surface mounted frames.

B. Finishes:

1. Baked enamel (of colors as selected from the manufacturer's standard color chart), as scheduled.

C. Frame style shall be suitable for ceiling type in which diffuser is to be installed.

D. Design Equipment: Titus unless otherwise noted.

E. Manufacturers: Krueger, Titus, Price, Tuttle and Bailey, Nailor.

PART 2 - PRODUCTS

2.1 SUPPLY TYPES

A. Type 1 - (Smooth Face Type):

1. Steel construction with 22 gauge back pan and 22 gauge face panel with rolled edges that finishes flush with ceiling system.
2. Round neck - minimum 1-1/4 in. collar for duct connection.
3. Frame suitable for ceiling type.
4. Face panel shall be removed and securely held in place to the back pan without noise or vibration.
5. Horizontal airflow pattern.
6. Panel Size: 24 in. x 24 in. or 12 in. x 12 in., refer to plans.
7. Model: Titus OMNI.

B. Type 2 - (slot diffuser):

1. Extruded aluminum slot diffusers. Minimum material thickness of .062 inches.
2. (1) One Slot.
3. Dual patten controller.
4. Manufactured insulated plenums of active lengths, as indicated on drawings, and flat back blank-off panels for inactive sections.
5. Diffusers shall be curved where shown on plans. Coordinate radius of curve with Architect.
6. Length as specified on plans.
7. Border type 11 for hard ceiling applications. Border type 66 for acoustical ceiling applications.
8. End caps to match ceiling installation details. Coordinate with Architect.
9. Custom Color Finish to be selected by Architect.
10. Model: Titus Model FL-10-JT.

2.2 RETURN/EXHAUST TYPES

A. Type A - (Exhaust and Return Grilles):

1. Steel construction with 22 gauge frame and blades, with horizontal bars on a 1/2 in. spacing set at 35° fixed deflection.
2. 1-1/4 in. wide flange.
3. The blades shall be parallel to long dimension.
4. Model: Titus 355-RL.

B. Type B - (Slot Exhaust and Return Grilles):

1. Extruded aluminum slot diffusers. Minimum material thickness of .062 inches.
2. (1) One Slot.
3. Dual patten controller.
4. Manufactured plenums of active lengths, as indicated on drawings, and flat back blank-off panels for inactive sections. Return hood/light shield for sections without plenums.
5. Diffusers shall be curved where shown on plans. Coordinate radius of curve with Architect.
6. Length as specified on plans.
7. Border type 11 for hard ceiling applications. Border type 66 for acoustical ceiling applications.
8. End caps to match ceiling installation details. Coordinate with Architect.
9. Custom Color Finish to be selected by Architect.
10. Model: Titus Model FL-10-JT.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install equipment in strict accordance with manufacturer's instructions. Rough in or install per reflected ceiling plan or in location instructed by Owner's Representative.
- B. Provide approved air extractors behind all duct mounted supply registers in exposed ductwork.

- C. When the final connection to an exhaust or return grille is made, a 12 in. minimum height plenum box must be supplied to all grilles. Plenum dimensions shall match grille size. Paint inside of plenum box flat black. Provide 1 in. acoustical lining in plenum box. Oversize the plenum to account for the thickness of the lining.
- D. Seal all supply and return registers, grilles and diffusers during construction operations to limit dust entering HVAC systems and ductwork. Seals may be removed just prior to testing and balancing, but not without the approval of the Owner's Representative.

END OF SECTION

SECTION 238235

GRAVITY HEATING EQUIPMENT (HYDRONIC)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

- A. Submit product data on gravity heating equipment with color selection chart. Clearly indicate which equipment is being submitted.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. All equipment shall be free from expansion, noises and strains. Exposed parts to be cleaned and parkerized or phosphate coated before prime coating or baked enameling. Finish colors as selected from manufacturer's standard colors during the submittal process. Factory-boxed and tagged by room numbers. Access doors shall be provided in cabinet at locations of valves, flow balancers and air vents. Verify at site, the space available for each piece of equipment. Top of heating unit enclosures shall be at least 1 in. below top of windowsill. Bottom of heating unit enclosures, unless otherwise called for, approximately 6 in. above floor and above the base molding. Refer to Owner's Representative at once, any correction, discrepancy or suggested change in size or location. This Contractor responsible for proper location and size of recesses. Coordinate dimensions from floor to bottom of recess with other trades. Provide framing in recess and shims, if required.
- B. Ratings of elements shall be in accordance with approved I=B=R test methods.
- C. All capacities shall be IBR approved ratings. Units shall be IBR approved as a complete assembly including element and cover.
- D. Access doors shall be provided for adjustment of self-contained control valves, where applicable.

2.2 FIN RADIATION

- A. General Requirements:
 - 1. Complete enclosure, continuous supporting channel backplate, heating element, hangers and accessories, as specified and shown on the Contract Drawings.

2. Enclosures to run from wall-to-wall unless otherwise called. Provide necessary corner pieces, end caps, column enclosures, butt trims, wall sleeves, with access doors. Do not leave any enclosure installed without an end trim piece.
- B. Heating Element:
1. Hot Water System: Seamless copper tube with non ferrous fins, 125 lbs. minimum hydrostatic test pressure. .020 in. tube wall thickness, minimum. .020 in. fin thickness, minimum.
 2. Tube mechanically expanded to fin collars for permanent metal to metal contact.
 3. Properly support with pitch adjustment. Silent element and pipe support. Locate a maximum of 2 ft. 0 in. apart. Support shall allow for lateral movement for expansion and contraction of heating equipment.
- C. Enclosures:
1. Enclosure fronts, 14 gauge furniture steel.
 - a. Flat top partially perforated as scheduled on drawings.
 - b. Edges and corners rounded. Individual sections not over 6 ft. No exposed areas shall have sharp edges.
 - c. Mechanically fastened to wall bracket.
 - d. Continuous interlocking slip joint fit between adjoining covers. Finish shall match enclosure fronts along entire male and female sides.
 - e. Enclosure accessories shall fit tight to wall at sides, in back plate at top and extend back and mechanically screw to wall at bottom.
 2. Support channel full backplate and supports:
 - a. 14 gauge securely fasten to wall.
 - b. Enclosure front braced by internal channel braces. Minimum on either side of joint seam.
 - c. No sheet metal screws or other fastening devices shall be visible.
 - d. Provide wall brackets or stiffening supports adjacent to each joint and at least every 16 in., maximum 24 in. O.C.
 3. Top of cover rest on backplate only and not between wall and backplate.
 4. Accessories:
 - a. Pedestal brackets or bottom panel when required for style.

- b. With worm gear driven damper control and knurled aluminum knob, where automatic control is not specified.
- D. Design Equipment: Sterling.
- E. Make: Rosemex, Sterling, Rittling, Vulcan.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Each unit isolated with shut-off ball valves to permit servicing. Provide flow balancer for each unit as detailed. Provide trap for each unit as detailed. Contractor responsible for correct end connections and arrangements. Arrange piping accessories and valving fully accessible for servicing. Enclosures fastened to structure with screws or bolts, no nailing allowed. Fasten at 6 in. O.C. Provide manual vent on return end of each heating unit on all upfeed hot water installation.

END OF SECTION

SECTION 260500

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 ROUGHING

- A. The Contract Drawings have been prepared in order to convey design intent and are diagrammatic only. Drawings shall not be interpreted to be fully coordinated for construction.
- B. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, interferences, etc. Make necessary changes in contract work, equipment locations, etc., as part of a contract to accommodate work to avoid obstacles and interferences encountered. Before installing, verify exact location and elevations at work site. **DO NOT SCALE** plans. If field conditions, details, changes in equipment or shop drawing information require an important rearrangement, report same to Owner's Representative for review. Obtain written approval for all major changes before installing.
- C. Install work so that items both existing and new are operable and serviceable. Eliminate interference with removal of coils, motors, filters, belt guards and/or operation of doors. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation. Provide new materials, including new piping and insulation for relocated work.
- D. Coordinate work with other trades and determine exact route or location of each duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Obtain from Owner's Representative exact location of all equipment in finished areas, such as thermostat, fixture, and switch mounting heights, and equipment mounting heights. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers, and other items. Do not rough-in contract work without reflected ceiling location plans.
- E. Before roughing for equipment furnished by Owner or in other Divisions, obtain from Owner and other Divisions, approved roughing drawings giving exact location for each piece of equipment. Do not "rough in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment. For equipment and connections provided in this contract, prepare roughing drawing as follows:
 - 1. Existing Equipment: Measure the existing equipment and prepare for installation in new location.

2. New Equipment: Obtain equipment roughing drawings and dimensions, then prepare roughing-in-drawings. If such information is not available in time, obtain an acknowledgement in writing, then make space arrangements as required with Owner's Representative.

1.2 EQUIPMENT AND MATERIAL REQUIREMENTS

- A. Provide materials that meet the following minimum requirements:
 1. Materials shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, in accordance with NFPA 255.
 2. All equipment and material for which there is a listing service shall bear a UL label.
 3. Potable water systems and equipment shall be built according to AWWA Standards.
 4. Gas-fired equipment and system shall meet AGA Regulations and shall have AGA label.
 5. All electrical equipment and systems, as a whole, shall be tested and listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL) for the intended use in accordance with the applicable standards and have a physical label indicating such.

1.3 CONCEALMENT

- A. **Conceal all contract work** above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after their review. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

1.4 CHASES

- A. New Construction:
 1. Certain chases, recesses, openings, shafts, and wall pockets will be provided as part of General Construction Trade. Mechanical and Electrical trades shall provide all other openings required for their contract work.
 2. Check Architectural and Structural Design and Shop Drawings to verify correct size and location for all openings, recesses and chases in general building construction work.
 3. Assume responsibility for correct and final location and size of such openings.
 4. Rectify improperly sized, improperly located or omitted chases or openings due to faulty or late information or failure to check final location.

5. Provide 18 gauge galvanized sleeves and inserts. Extend all sleeves 2 in. above finished floor. Set sleeves and inserts in place ahead of new construction, securely fastened during concrete pouring. Correct, by drilling, omitted or improperly located sleeves. Assume responsibility for all work and equipment damaged during course of drilling. Firestop all unused sleeves.
 6. Provide angle iron frame where openings are required for contract work, unless provided by General Construction trade.
- B. In Existing Buildings:
1. Drill holes for floor and/or roof slab openings.
 2. Multiple pipes smaller than 1 in. properly spaced and supported may pass through one 6 in. or smaller diameter opening.
 3. Seal voids in fire rated assemblies with a fire-stopping seal system to maintain the fire resistance of the assembly. Provide 18 gauge galvanized sleeves at fire rated assemblies. Extend sleeves 2 in. above floors.
 4. In wall openings, drill or cut holes to suit. Provide 18 gauge galvanized sleeves at shafts and fire rated assemblies. Provide fire-stopping seal between sleeves and wall in drywall construction. Provide fire stopping similar to that for floor openings.

1.5 PENETRATION FIRESTOPPING

- A. Fire-Stopping for Openings Through Fire and Smoke Rated Wall and Floor Assemblies:
1. Provide materials and products listed or classified by an approved independent testing laboratory for "Penetration Fire-Stop Systems". The system shall meet the requirements of "Fire Tests of Penetrations Fire-Stops" designated ASTM E814.
 2. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, ductwork and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for drywall construction.
 3. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.
 4. The methods used shall incorporate qualities which permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion, and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.

5. Plastic pipe/conduit materials shall be installed utilizing intumescent collars.
 6. Provide a submittal including products intended for use, manufacturer's installation instructions, and the UL details for all applicable types of wall and floor penetrations.
 7. Fire-stopping products shall not be used for sealing of penetrations of non-rated walls or floors.
- B. Acceptable Manufacturers:
1. Dow Corning Fire-Stop System Foams and Sealants.
 2. Nelson Electric Fire-Stop System Putty, CLK and WRP.
 3. S-100 FS500/600, Thomas & Betts.
 4. Carborundum Fyre Putty.
 5. 3-M Fire Products.
 6. Hilti Corporation.

1.6 ACCESS PANELS

- A. Provide access panels for required access to respective trade's work. Location and size shall be the responsibility of each trade. Access panels provided for equipment shall provide an opening not smaller than 22 in. by 22 in. Panels shall be capable of opening a minimum of 90 degrees. Bear cost of construction changes necessary due to improper information or failure to provide proper information in ample time. Access panels over 324 square inches shall have two cam locks. Provide proper frame and door type for various wall or ceiling finishes. Access panels shall be equal to "Milcor" as manufactured by Inland Steel Products Co., Milwaukee, Wisconsin. Provide General Construction trade with a set of architectural plans with size and locations of access panels.

1.7 CONCRETE BASES

- A. Provide concrete bases for all floor mounted equipment. Provide 3,000 lb. concrete, chamfer edges, trowel finish, and securely bond to floor by roughening slab and coating with cement grout. Bases 4 in. high (unless otherwise indicated); shape and size to accommodate equipment. Provide anchor bolts in equipment bases for all equipment provided for the project, whether mounted on new concrete bases or existing concrete bases.

1.8 HVAC EQUIPMENT CONNECTIONS

- A. Contractor is responsible for draining, filling, venting, chemically treating and restarting any systems which are affected by work shown on the Contract Documents unless specifically noted otherwise.

- B. Provide final hot water connections to all equipment as required by the equipment. Provide final connections, including domestic water piping, wiring, controls, and devices from equipment to outlets left by other trades. Provide equipment waste, drip, overflow and drain connections extended to floor drains.
- C. Provide for Owner furnished and Contractor furnished equipment all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, insulation, sheet metal work, controls, dampers, as required.
- D. Refer to manufacturer drawings and specifications for requirements of special equipment. Verify connection requirements before bidding.

1.9 PLUMBING EQUIPMENT CONNECTIONS

- A. Contractor is responsible for draining, filling, venting, chemically treating and restarting any systems which are affected by work shown on the Contract Documents unless specifically noted otherwise.
- B. Provide roughing and final water, waste, vent connections to all equipment. Provide loose key stops, sanitary "P" traps, tailpiece, adapters, gas or air cocks, and all necessary piping and fittings from roughing point to equipment. Provide installation of sinks, faucets, traps, tailpiece furnished by others. Provide cold water line with gate valve and backflow prevention device at locations called for. Provide continuation of piping and connection to equipment that is furnished by others. Provide relief valve discharge piping from equipment relief valves.
- C. Provide valved water outlet adjacent to equipment requiring same. Provide equipment type floor drains, or drain hubs, adjacent to equipment.
- D. Install controls and devices furnished by others.
- E. Refer to Contract Documents for roughing schedules, and equipment and lists indicating scope of connections required.
- F. Provide for Owner furnished and Contractor furnished equipment all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, as required.
- G. Refer to Manufacturer drawings and specifications for requirements of kitchen equipment and special equipment. Verify connection requirements before bidding.

1.10 ELECTRICAL EQUIPMENT CONNECTIONS

- A. Provide complete power connections to all electrical equipment. Provide control connections to equipment. Heavy duty NEC rated disconnect ahead of each piece of equipment. Ground all equipment in accordance with NEC.
- B. Provide for Owner furnished and Contractor furnished equipment all power wiring, electric equipment, control wiring, switches, lights, receptacles, and connections as required.

- C. Refer to Manufacturer's drawings/specifications for requirements of kitchen equipment and special equipment. Verify connection requirements before bidding.

END OF SECTION

SECTION 260501

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The drawings are diagrammatic, unless detailed dimensioned drawings are included, and show only approximate locations of equipment, fixtures, panelboards, conduits, and wiring devices. Exact locations are subject to the approval of the Owner's Representative. The general run of electrical feeders, branch circuits, and conduits, indicated on the drawings, is not intended to be the exact routing. Exact routings of conduit shall suit the job conditions.
- B. Circuit designations, in the form of "Home Runs" on branches, indicate the designation of the branch circuit, the size and the quantity of branch circuit conductors, and the panel board or interconnection box from which the branch circuit is served.
- C. Make measurements at the site and in the building during construction for all systems installed as the work progresses in such a manner that the equipment, piping, vents, ducts, conduit, and boxes will fit in the space available. Maintain headroom and if in unfinished areas, be as neatly installed, as obscure and "out-of-the-way" as physically possible. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. In general, ductwork shall be given preference except where grading of piping becomes a problem, followed by piping then electrical wiring. If, after installation of any equipment, piping, ducts, conduit, and boxes, it is determined that ample maintenance and passage space has not been provided, rearrange work and /or furnish other equipment as required for ample maintenance space.
- D. Any changes in the size or location of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Owner's Representative and approval received before such alterations are made.

1.2 QUALITY ASSURANCE

- A. Electric equipment shall be installed in a neat and workmanlike manner. All methods of construction, details of workmanship, that are not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative.
- B. Equipment and materials shall be of the quality and manufacture indicated in their respective sections of the specifications. The equipment specified is based upon the acceptable manufacturers listed. Equipment types, device ratings, dimensions, etc., correspond to the nomenclature dictated by those manufacturers. Where "or equal" is stated, equipment shall be equal in every way to that of the equipment specified and subject to approval. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.

1.3 SUBMITTALS

- A. Submit product data for the following equipment, materials and products, including all fittings and accessories:
 - 1. Conduit
 - 2. Surface Raceway
 - 3. Expansion Fittings
 - 4. Cable Tray
 - 5. Channel Support Systems
 - 6. Conductors
 - 7. Cables
 - 8. Cable Termination and Splice Kits
 - 9. Poke-Through Service Fittings
 - 10. Terminal and Equipment Cabinets
 - 11. Floor Boxes
 - 12. Wiring Devices Including Dimmers
 - 13. Telephone/Data Communication Outlets
 - 14. Television Outlets
 - 15. Extension Cord Reels
 - 16. Clocks
 - 17. Flashing, Sealing, Firestopping Materials
 - 18. Salvageable Materials
 - 19. Testing reports prior to energizing equipment and materials.

1.4 SALVAGEABLE MATERIALS

- A. Salvageable materials will be reviewed and identified by the Owner. Items selected by the Owner shall be delivered to a selected location on the Owner's property by this contract in an equal condition to prior this work.
- B. Items normally accepted as salvage by the Owner:
 - 1. Transformers
 - 2. Meters, meter sockets and test switches
 - 3. Deadfront switchgear
 - 4. Panelboards and covers
 - 5. Circuit breakers
 - 6. Disconnects (100 AMP and up)
 - 7. Bus duct and apparatus
 - 8. Adjustable speed drives
 - 9. Motor starters
 - 10. Luminaires
 - 11. Fire alarm equipment
 - 12. Nurse call and intercom
 - 13. Motors above 1/2 HP and up
 - 14. Environmental and automation control equipment
 - 15. Telephones
 - 16. Central clock system

PART 2 - PRODUCTS

2.1 MATERIALS

A. Conduit, Raceway and Tubing:

1. Rigid Metal Conduit (RMC) shall be hot-dipped galvanized or electro-galvanized steel, UL listed "rigid metal conduit."
 - a. Acceptable Manufacturers:
 - 1) Republic Conduit
 - 2) Allied Tube and Conduit
 - 3) Wheatland Tube
 - 4) Approved equal
2. Electrical Metallic Tubing (EMT) shall be electro-galvanized steel with corrosion resistant zinc coating; UL listed.
 - a. Acceptable Manufacturers:
 - 1) Republic Conduit
 - 2) Allied Tube and Conduit
 - 3) Wheatland Tube
 - 4) Approved equal
3. Aluminum Conduit shall be rigid, heavy wall aluminum, UL listed "rigid metal conduit."
 - a. Acceptable Manufacturers:
 - 1) Republic Conduit
 - 2) Allied Tube and Conduit
4. Flexible Metal Conduit (FMC) shall be constructed of one continuous length of electro-galvanized, spirally wound steel strip with interlocking convolutions and interior surfaces free from burrs and sharp edges. Shall be UL listed "flexible metal conduit" or "liquidtight flexible metal conduit" as required.
 - a. Acceptable Manufacturers:
 - 1) Republic Conduit
 - 2) Allied Tube and Conduit
 - 3) Wheatland Tube
 - 4) AFC (American Flexible Conduit) Cable Systems

5. Rigid Non-Metallic Conduit (Schedule 40 for concrete encasement, Schedule 80 for direct burial or where exposed) shall be UL listed "rigid non-metallic conduit" for application in underground, encased, and exposed applications in accordance with the NEC". The conduit shall be made from polyvinyl chloride (PVC) and shall be rated for 90°C conductors. Conduit and fittings shall be tested in accordance with the testing requirements defined in NEMA TC-2, NEMA TC-3, UL-651, and UL-514
 - a. Acceptable Manufacturers:
 - 1) Carlon
 - 2) Heritage Plastics
 - 3) PW Eagle

6. PVC Coated Rigid Metal Conduit, prior to coating shall conform to the specifications for Rigid Metal Conduit, above. The conduit shall have hot dipped galvanized threads, and the threads and the inside of the conduit shall be urethane coated. The exterior of the conduit shall be PVC coated to a minimum thickness of 40 mils. All coated conduit shall conform to NEMA standard RN01. The conduit shall be bendable without damage to the interior or exterior coatings. All fittings and couplings shall be PVC coated to a minimum thickness of 40 mils on the exterior, and the interior and threads shall be urethane coated. All screws shall be stainless steel. The installed conduit system shall provide a continuous grounding path.
 - a. Acceptable Manufacturers:
 - 1) Robroy Industries
 - 2) Ocal Incorporated
 - 3) Perma-Cote
 - 4) Approved Equal

7. Surface Metal Raceway shall be .040 in. steel UL listed "Surface Metal Raceway". Use manufacturer's standard fittings designed to be used with the specific raceway.
 - a. One-Piece Raceway:
 - 1) Finish per architect.
 - 2) Acceptable Manufacturers:
 - a) Wiremold "700" Series (Design Make)
 - b) Mono Systems
 - c) Approved equal
 - b. Two-Piece Raceways:
 - 1) Finish per architect.

- 2) Duplex or special receptacles as specified in wiring devices.
 - 3) Corners, turns, tees and elbows shall have suitable turning radius for the intended cable.
 - 4) Provide divider in raceways utilized for power and communications. Utilize wire/cable clips 18 in. on center to hold in the conductors/cables.
 - 5) Utilize rounded head screws/bolts for mounting.
 - 6) Acceptable Manufacturers:
 - a) Wiremold 6000 (Design Make)
 - b) Mono Systems
 - c) Approved equal
8. Electrical Non-Metallic Tubing (ENT) for installation in accordance with the National Electrical Code, other applicable sections of the Code, and local codes.
- a. Any ENT used shall meet the requirements of NEMA TC-13 and shall be listed by Underwriters Laboratories, Inc., as suitable for its intended purpose.
 - b. ENT shall be recognized by a CABO National Evaluation Report for use in one (1) hour and two (2) hour rated construction.
 - c. Penetration of fire rated walls, floors, or ceilings, shall use classified Through-Penetration Firestop Systems described in the current Underwriters Laboratories Building Materials Directory.
 - d. Fittings and outlet boxes shall be designed for use with ENT and listed by Underwriters Laboratories. All fittings, boxes, and accessories shall be from one manufacturer.
 - e. Only cement recommended specifically for use with the brand of ENT used shall be used.
 - f. Unless indicated differently on drawings, ENT systems shall be color coded BLUE for brand and feeder circuit wiring, ORANGE and YELLOW for communications, and RED for fire alarm and emergency systems.
 - g. Acceptable Manufacturers:
 - 1) Carlon
 - 2) Heritage Plastics
 - 3) Approved equal

B. Conduit Fittings:

1. Fittings for rigid metal conduit shall be fully threaded and shall be of the same material as the respective raceway system. Fittings for electrical metallic tubing shall be single screw indenter fittings for conduits up to 2 in. and double screw indenter fittings for conduits 2 in. and larger. Connectors shall also have insulated throat or plastic insulating bushing up to and including 1 in. size. For sizes 1-1/4 in. and larger, provide plastic insulating bushing. Die-cast, pressure cast fittings shall not be used. Fittings for rigid non-metallic conduit shall be solvent cemented in accordance with the manufacturer's instructions.

a. Acceptable Manufacturers:

- 1) O.Z. Gedney
- 2) Steel City
- 3) Thomas & Betts
- 4) Crouse-Hinds
- 5) Carlon

2. Expansion Fittings shall be watertight, combination expansion and deflection type designed to compensate for movement in any direction. Fittings shall have flexible copper braid bonding jumpers, neoprene sleeve and stainless steel bands, use aluminum body fittings for rigid aluminum conduit.

a. Acceptable Manufacturers:

- 1) Crouse-Hinds, Type "XD"
- 2) O.Z./Gedney, Type "DX"
- 3) Approved equal

3. Explosion-proof conduit sealing fittings shall be threaded, cast iron alloy construction with integral bushings. Seal with "A" sealing compound after wiring installation. The fittings shall be UL Listed for Class I, Division 1 and 2, Groups B, C, D; Class II, Division 1 and 2, Groups E, F, G; Class III.

a. Acceptable Manufacturer's:

- 1) Crouse-Hinds EYS Series
- 2) Emerson/O.S./Gedney EYS Series
- 3) Emerson/Appleton EYS Series

C. Wireway, Wire Trough, and Auxiliary Gutters:

1. Wireway and Wire Trough shall be hinged cover type wireway with provisions for full lay-in along the entire length of run. Wireway shall be steel, enclosed with gray enamel finish. Provide NEMA 1 units for interior/dry/clean locations and NEMA 12 for interior dry maintenance/shop/utility locations. Size to meet NEC fill requirements or larger as noted on Contract Documents. Provide knockouts along runs. Recess in wall where required for flush mounted equipment.

Hinge shall be on the bottom of front face for horizontal mounting. Provide all covers, couplings, offsets, elbows, expansion joints, adapters, hold down straps, end caps, tees, pullboxes, hangers, reducers, supports, and other fittings to match and mate with wireways as required for complete system.

a. Acceptable Manufacturers:

- 1) Square D "Square Duct"
- 2) General Electric
- 3) Hoffman
- 4) Meco

D. Cable Trays:

1. Solid Bottom Cable Trays shall be aluminum construction, including accessories. One-piece construction bottom and side, sheet aluminum 080 ±5%. Aluminum alloy side rails and bottom channel with flanges in standard lengths 12 ft. - 0 in. long. Wrap around type bolted connector to connect tray sections. Cover required where indicated on Contract Documents and in all areas used as return air plenums. Use three-piece construction, consisting of a solid corrugated bottom welded to the side rails. Provide divider strip where noted on Contract Documents. Minimum inside radius of horizontal elbows shall be 12 in. Provide special radius elbows where required for field conditions. Horizontal and vertical bends for solid bottom trays shall have solid bottoms. Loading data:

Tray Width	Load Depth	Usable NEMA Depth	Standard	Span	Lbs. Per Feet	Deflection
12 in.	4 in.	3 in.	12B	10 ft.	115	0.15 in.
18 in.	4 in.	3 in.	12B	10 ft.	115	0.015 in.
18 in.	6 in.	3 in.	12C	10 ft.	144	0.15 in.

a. Provide a safety-loading factor of 1.5 for uniformly distributed loads when supported as a simple span in accordance with the NEMA standard listed.

b. Acceptable Manufacturers:

- 1) P-W
- 2) B-Line Systems
- 3) Chalfant
- 4) Globe

E. Strut-Type Channel Raceways and Fittings:

1. Strut-Type Channel Raceways and Fittings shall be provided for racking of conduit, trapeze suspensions, equipment support, cable racks and panel racks. Channel shall be steel with electroplated zinc finish for interior dry locations.

Provide necessary accessories such as bolts, screws, anchors, connection plates, and straps as required to perform the necessary functions. Wet location and exterior channel support systems shall be steel with hot dipped galvanized finish and stainless steel hardware as a minimum. Cut ends shall be touched up with suitable matching finish. Provide poured-in-place inserts for supporting channels at poured concrete walls and ceilings.

a. Acceptable Manufacturers:

- 1) Unistrut
- 2) Globe
- 3) Kindorf
- 4) B-Line

F. Low Voltage (600V or less) Conductors and Cables:

1. Conductors shall be insulated for 600 volts, unless otherwise noted, and shall be standard AWG and kcmil sizes. Conductors shall be 98% copper, thermal plastic or cross-linked polymer insulated, heat and moisture resistant. Conductors shall be stranded, except for conductors used for fire alarm system wiring. Conductor sizes No. 18 AWG and smaller shall be a solid single strand; No. 16 AWG and larger shall be multiple stranded. Minimum conductor size shall be #12 AWG except smaller sizes may be used for communications and special systems. Conductor sizes shall be as called for. Conductors shall be labeled with UL seal and be marked with the manufacturer's name, wire size and insulation type. Insulation for all 600 volt conductors shall be Type THHN/THWN-2 or Type XHHW-2, unless otherwise noted. All exterior and underground conductors shall be XHHW-2. Luminaire fixture wire shall conform to the latest Underwriters Laboratories requirements. Flexible cords and cables for general portable use shall be Type SO or SOOW or as noted. Cables for special use shall be of the type specified for the application.

a. Color Coding:

- 1) All circuits shall be color coded according to the following schedule.

	Three Phase 120/208V	Three Phase 277/480V
Ground	Green	Green
Neutral	White	Gray
A or L1	Black	Brown
B or L2	Red	Orange
C or L3	Blue	Yellow
Isolated EG	Green w/Yellow Tracer	Green w/Yellow Tracer

- b. Acceptable Manufacturers:
 - 1) General Cable (Brand of Prysmian Group)
 - 2) Prysmian
 - 3) South Wire
 - 4) Okonite
 - 5) Senator

2. Mineral Insulated (MI) Cable:

- a. Cable shall be a manufactured system rated for two (2) hour fire rating minimum and be NRTL tested for such. System shall be rated 600V, continuous 90°C minimum and have a main copper conductor, magnesium oxide insulating material and outer soft drawn copper sheath. Jacket of low smoke material with conductor size and rating markings labeled.
- b. Utilize manufacturer termination kits for entry into boxes, panelboards, etc. Maximum of 6 ft. distance between cable supports and secured to fire rated building structure. Manufacturer installation instructions/recommendations shall be strictly followed. Provide phasing color coding utilizing tape at each enclosure, box and junction.
- c. Acceptable Manufacturers:
 - 1) Pyrotenax
 - 2) Approved equal

3. Terminal Lugs and Connectors:

- a. The lug shall be capable of continuous operation at the current rating of the cable it is used on. The lug shall be UL listed per UL 486A, using industry standard crimping tools and dies. Terminal lugs shall be solderless, pressure type with UL label for "CU/AL" conductor terminations. The lug shall be a closed-end compression (crimp) type, constructed of seamless, alloy suitable for copper and/or aluminum conductors to match the conductor. The lug shall be made with a chamfered inside end, for ease of conductor insertion. Both one and two hole lugs shall be NEMA sized for standard stud sizes and spacing. The lug shall be designed for use at the system voltage.
 - 1) Acceptable Manufacturers:
 - a) 3M Scotchlok 30,000 and 31,000 Series
 - b) Burndy
 - c) O.Z./Gedney
 - d) Thomas and Betts

- b. The conductor connection shall be capable of continuous operation at the current rating of the cables it is used on. The connection shall be UL listed per UL 486A, using industry standard crimping tools and dies. The connector shall be an inline compression (crimp) type, constructed of seamless, tin-plated copper. The connector shall be constructed with chamfered inside-ends and with center cable stops. The connector shall be designed for use at the system voltage.
 - 1) Acceptable Manufacturers:
 - a) 3M Scotchlok 10,000 and 11,000 Series
 - b) Burndy
 - c) O.Z./Gedney
 - d) Thomas and Betts
- c. "Split-bolt" Connectors shall be solderless type.
 - 1) Acceptable Manufacturers:
 - a) Burndy
 - b) Kearney
 - c) O.Z./Gedney
 - d) Thomas and Betts
 - e) Anderson
- d. "TWIST ON" Connectors shall be spiral steel spring type and insulated with vinyl cap and skirt.
 - 1) Acceptable Manufacturers:
 - a) 3-M Company "Scotch-Lok"
 - b) Ideal "Wing-Nuts"
 - c) Approved equal
- e. Aluminum joints shall utilize oxide inhibitors as recommended by the conductor manufacturer. Utilize pin type terminations where possible and coordinated with the clearances available. Provide insulating tape or insulating sealed cover for connectors/terminations.

G. Outlet Boxes, Device Boxes, Rings, and Covers:

- 1. Outlet Boxes having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit or cable fittings, or cables, with provisions for mounting outlet box cover. Outlet boxes shall be galvanized steel, not less than 2-1/2 in. deep, unless restricted by the surroundings, 4 in. square or octagonal. Boxes and associated fittings, plates and devices shall be mechanically fastened (screwed), friction fitting is not acceptable. Outlet boxes exposed to moisture, surface mounted, exterior, wet or damp locations shall be cadmium cast alloy complete with external threaded hubs and gasketed screw fastened covers.

Minimum box size shall be as indicated in the NEC for the conductors and devices installed. Boxes shall be approved for the environmental condition where they will be installed.

2. Conduit bodies providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point and listed in accordance with outlet box requirements.
3. Extension ring intended to extend sides of outlet box or device box to increase box, volume, or both
 - a. Acceptable Manufacturers:
 - 1) Steel City
 - 2) Raco
 - 3) Appleton
 - 4) Crouse Hinds
4. Telephone/Data Communications Outlet Boxes:
 - a. 4 in. x 4 in. outlet box with single gang plaster ring with cover plate suitable for indicated communications outlet and conduit routed to accessible ceiling space / accessible corridor ceiling space cable tray. Cover plate shall match the receptacle cover type.
5. Pull and junction boxes shall be constructed of not less than 14 gauge galvanized steel with trim for flush or surface mounting in accordance with the location to be installed. Provide screw-on type covers. Boxes installed in damp or wet locations shall be of raintight construction with gasketed cover and threaded conduit hubs. In no case shall boxes be sized smaller than as indicated NEC for conduit and conductor sizes installed. Boxes shall be approved for the environmental condition of the location where they will be installed.
 - a. Acceptable Manufacturers:
 - 1) Hoffman
 - 2) Keystone
 - 3) Approved equal
6. Flush floor junction boxes shall be recessed cover boxes designed for flush mounting in masonry. Provide checkered plate gasketed cover suitable for foot traffic. Make: O.Z. Gedney Type YR or approved equal.
7. Corrosion Resistant Boxes:
 - a. Provide corrosion resistant boxes for sewage pump stations, natatoriums, etc. and where indicated.

- b. Plastic Coated Outlet Boxes: threaded hub type, malleable iron boxes coated with 40mils thick polyvinylchloride coating, Ocal/T&B Ocal Blue System, PCD Corp. KorKap XL or Robroy Industry Plastibond or Perma-Cote.
 - c. Nonmetallic Boxes: Glass fiber reinforced polyester, Carlon Himeline Series, Crouse-Hinds Krydon or Robroy Industry Stahlin.
8. Hazardous location conduit junction boxes shall be used in hazardous locations to provide for change in conduit direction, access to conductors, and as pull and splice boxes. They shall be copper free aluminum, with internally threaded bodies and cast in brackets on the cover. The boxes shall be UL Listed for Class I, Division 1 and 2, Groups B, C, D; Class II, Division 1 and 2, Groups E, F, G; Class III.
- a. Acceptable Manufacturers:
 - 1) Crouse-Hinds EGJ Series
 - 2) Emerson/O.Z./Gedney GUEB Series
 - 3) Emerson/Appleton DER/GUB and GUBM Series
9. Flush Floor Boxes: Boxes shall be cast in place with height adjustability prior to pour. Provide power, communication and/or audio/visual outlets as indicated. Installation shall be suitable for the intended floor finish: if carpet, then provide a carpet flange, if tile/terrazzo/concrete finish, then provide a collar flush with finished floor and no flange. Units shall meet UL scrub water protected requirements. To have integral ground terminal.
- a. Acceptable Manufacturers:
 - 1) Acceptable manufactures shall include those called for in the Contract Documents.
10. Flush Poke-Through Service Fitting (Power/Communication):
- a. Provide flush poke-through suitable for installation in a cored floor opening. Shall be complete with junction box, conduit and conduit adapter for transition from the floor box to movable partitions or with flush devices as indicated on plans. The complete assembly shall be suitable for two hour fire rated floors, be UL CEYY listed and have UL scrub water protected metallic color as selected by the Architect cover and trim ring. Cover shall be suitable for carpet, tile, wood and concrete. Unit protrusion above floor plane shall not exceed 0.2". Extend or reduce unit raceway length as needed to accommodate floor thickness and project conditions. Provide indicated devices in units.
 - b. Acceptable Manufacturers:
 - 1) Acceptable manufactures shall include those called for in the Contract Documents.

H. Terminal and Equipment Cabinets:

1. Terminal and equipment cabinets shall be code gauge galvanized steel with removable endwalls. Fronts shall be of code gauge steel, flush or surface type (as indicated) with concealed trim clamps, concealed hinges, flush lock, and grey baked enamel finish. Boxes and front shall be UL listed and shall be minimum 35 in. H x 24 in. W x 6 in. D.
Provide removable insulated plywood terminal board mounted on inside back wall of cabinet.
 - a. Acceptable Manufacturer:
 - 1) Square D "Mono-Flat"
 - 2) Approved equal

I. Wiring Devices:

1. Wiring Devices (toggle switches, key switches, receptacles, dimmers, occupancy sensors, etc.) shall be commercial grade as a minimum. Switch handle and receptacle face shall be as directed by the Architect. Receptacles connected to the emergency power system shall have a red colored face. Provide device cover plates of rounded nylon colored to match the device in finished areas and rounded raised (Steel City 450/460 series) only for surface mounted locations in unfinished areas. Provide neoprene gasketed cast aluminum/zinc box with hinged (for receptacle) rain tight cast aluminum/zinc lockable while in use cover with stainless steel hardware for devices designated "WP".
 - a. Acceptable Manufacturers:
 - 1) Pass and Seymour
 - 2) Hubbell
 - 3) Leviton
2. Toggle/Snap Switches:
 - a. Units shall be quiet operation, quick make/quick break, rated for 20A/120-277V/1hp at 120/277V, 90° rear plug in termination with pig tail, with nylon/polycarbonate toggle, self grounding mounting screw clip plate (not staple), ground terminal and silver alloy contacts. Units shall meet latest Federal Specification WS-896, NEMA WD-1 and UL Test 20. Single pole units shall be Hubbell HBL1221, P&S 20AC1 or Leviton 1221-2. Provide two pole, three way, four way, illuminated handle, keyed, etc. type of the same quality and model.
 - b. Momentary Contact: Units shall be as indicated above (20A, 277V, nylon handle, side/back wired), three position, two circuit/three wire with spring return to center position, provide where indicated and as needed for proper system operation. Hubbell HBL 1557, P&S 1250, Leviton 1256 or approved equal.

Provide keyed operation or pilot light where indicated. When used for lighting controls for vacancy sensor control, provide jumper across the circuit terminals.

3. Receptacles:

- a. Provide receptacles where indicated on the drawings and where called for. Provide type receptacle as indicated and if not indicated then utilize general receptacle.
- b. General Receptacle: Units shall be NEMA 5-20R, duplex, 20A, 125V, 90° rear plug in termination with pig tail with nylon face, indented brass contacts for three point connection, self grounding stainless steel mounting screw clip plate and green ground terminal. Shall meet requirements of Federal Specification W-C-596, NEMA WD-6 and UL 498.
 - 1) Units shall have 0.036" brass thick contacts, 0.05" thick brass mounting strap, and be: Hubbell HBL5362, P&S 5362A or Leviton 5362.
- c. Ground Fault Interrupting Receptacles: Units shall be as specified above for General Receptacle and have 5mA interrupting ground fault level, test/reset front buttons, full through feed capability, power off on reverse wired sensing, 10kA short circuit current rating, be tamper/weather resistant and in compliance with UL 943. Unit shall self-test function to periodically test the components automatically and indicate a failure condition utilizing an LED. Shall be Hubbell GFR5362, P&S 2096TR or Leviton S7599TR.
- d. Tamper Resistant Receptacles: Units shall be as specified above for General Receptacle and have protective shutters to prevent entry into the line or grounded front openings unless all plug prongs are present.
- e. Surge Protected Receptacles: Units shall be as specified above for General Receptacle and have 240 joule energy/15,000A capacity, three modes of protection (line to neutral, line to ground and neutral to ground), 500V maximum clamping, LED indicator (operational, failure), blue color and UL 1449 compliant. Shall be Hubbell HBL5360SA, P&S 5352XSP or Leviton 5280.
- f. Isolated Ground Receptacles: Units shall be as specified above for General Receptacle and have an orange color and electrically independent/isolated mounting strap and ground terminal. Shall be Hubbell IG5352, P&S IG5362 or Leviton 5362IG.
- g. Surge Protected and Isolated Ground Receptacles: Units shall be as specified above for General Receptacle and the Surge Protected and Isolated Ground units above. The unit shall have an orange color.

- h. Controlled Receptacle: To be utilized where a receptacle is automatically controlled. Units shall be as specified above for General Receptacle with suitable symbol on face. Shall be Hubbell DR20LA, P&S 26352CD or approved equal.
 - i. USB Power Receptacle: Units shall be as specified above for General Receptacle but have 0.040" zinc plated mounting strap, two 20A 125V outlets and two USB charging (5A minimum total, 5VDC, USB 2.0/3.0) outlets. Overall depth shall not exceed 1.7 in. Shall be Hubbell USB20 or approved equal.
 - j. Clock Receptacle: To be NEMA 5-15R single receptacle with hanger and stainless steel cover plate. Hubbell HBL 5235 or approved equal.
 - k. Special Receptacles: provide other type receptacles as indicated herein or on the drawings. Such receptacles shall be Hubbell, P&S or Leviton highest grade available.
4. Extension Cord Reels:
- a. Ceiling mounted. Positive stop action at any length, ratchet lock, and automatic rewind spring. Provide heavy duty type with 20 ft. of #12/3 SJEO minimum cord terminating in molded high impact outlet box with wire mesh cord grip and P&S #5362A or HBL 5362 receptacle (brown), and spring close cover plate. Provide rigid mounting support to building structure.
 - b. Acceptable Manufacturers:
 - 1) Hubbell HBL45123R20 (Design Make)
 - 2) Woodhead
 - 3) Appleton RL5000 Series
5. Time Switches:
- a. Electromechanical Controllers:
 - 1) DPST, 40A per pole at 277 volt: Tork 7202Z.
 - 2) 3PST, 40A per pole at 277 volt: Tork 7302Z.
 - 3) Two-circuit lighting control center: Tork T-920L.
 - 4) Three-circuit lighting control center: Tork T-903-L.
 - b. Digital Time Switch (for use with Contactor):
 - 1) SPDT, 7-day with 14 set points.
 - 2) Digital, AM/PM Clock with LCD display.

- 3) Battery backup to keep program in memory for approximately seven (7) days.
 - 4) 120V Make: Tork EW120 or equal.
 - 5) 277 Make: Tork EW120-3 or equal.
 - c. Time switches shall be provided with NEMA 1 general purpose, surface mount enclosures unless otherwise noted.
6. Elapsed Time Switches:
- a. Mechanical spring wound timer, which requires no electricity to operate the timing mechanism. Device shall fit a standard 2-1/2 in. deep wall box. Switch contacts shall break current carrying contacts at the end of the timed cycle.
 - 1) 0-30 Minutes: Tork A530M or equal.
 - 2) 0-4 Hours: Tork A504HH or equal.
 - 3) 0-12 Hours: Mark Time or equal.
7. Emergency Shutdown Pushbutton:
- a. Where called for provide emergency shutdown/emergency power off push button. Unit shall be Square D Class 9001 Type K NEMA 13 oil tight pushbutton with the following:
 - 1) Red mushroom head 1-1/2 in. button, hinged protective flip up cover, push to operate, pull to reset.
 - 2) Maintained contact operation with one normally open and one normally closed 10A 120V contacts. Provide relay for additional contacts.
 - 3) Red pilot light.
 - 4) Engraved legend plate indicating "XX - Emergency Stop" with XX = the system name.
8. Cable Rack Assembly: Non-metallic. Components fabricated from nonconductive, fiberglass-reinforced polymer.
- a. Support Stanchions: Normal 36 in. high by 4 in. wide, with minimum of nine (9) holes for arm attachment.
 - b. Arms: Arranged for secure, drop-in attachment in horizontal position at any location of cable stanchions, and capable of being locked in position. Arms shall be 12 in. minimum and rated for twice the intended weight as a minimum. Top of arm for cable support shall be nominally 4 in. wide, and arm shall have slots along full length for cable ties.

- c. Support shall have rounded corners and be securely fastened to the arm and cable fastened to it with tie wrap or other recommended method.
 - d. Hardware: All hardware shall be stainless steel.
- J. Flashing, Sealing, Fire-stopping:
- 1. Fire-Stopping for Openings Through Fire and Smoke Rated Wall and Floor Assemblies:
 - a. Provide materials and products listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems". The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.
 - b. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, ductwork and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for drywall construction.
 - c. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.
 - d. The methods used shall incorporate qualities, which permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.
 - 2. Acceptable Manufacturers:
 - a. Dow Corning Fire-Stop System Foams and Sealants
 - b. Nelson Electric Fire-Stop System Putty, CLK and WRP
 - c. S-100 FS500/600, Thomas & Betts
 - d. Carborundum Fyre Putty
 - e. 3-M Fire Products

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA NEIS (National Electrical Installation Standard) latest edition.
- B. Unless otherwise noted, wiring for all systems indicated in the contract documents shall consist of insulated conductors installed in raceways. Raceways shall be continuous from outlet box to outlet box and from outlet box to cabinet, junction or pull box.

Secure and bond raceways to all boxes and cabinets so that each system of raceways is electrically continuous throughout. Unless otherwise indicated on the drawings, install all wiring in the following raceway system:

1. Wiring 600 Volts or Less in Dry Locations: EMT.
2. Wiring 600 Volts or Less in Dry Locations and Subject to Physical Damage: RMC.
3. Wiring 600 Volts or Less in Outdoors, Above Grade Locations: RMC.
4. Wiring 600 Volts or Less Installed Below Grade, in Concrete Floor Slabs or Below Ground Floor Slab: PVC-40 encased in concrete with rigid metal conduit bends and penetrations through building floors and walls.
5. Wiring Installed in Hazardous Locations: Galvanized Rigid Metal Conduit.
6. Wiring Installed in Corrosive Locations: PVC-80, RMC-PVC.
7. Flexible metal conduit shall be used for final connection to all motors, final connection to rotating or vibrating equipment, final connections to dry type transformers and final connections to recessed lighting fixtures. Liquidtight flexible conduit shall be used in all wet or damp locations. Maximum length of flexible conduit shall be 36 in., except that from outlet boxes to lighting fixture maximum length shall be 6 ft. Provide green insulated equipment grounding conductor in all flexible metal conduit.
8. Surface metal raceway shall be used for surface runs in finished area where concealed conduit cannot be run or where specifically indicated on drawings.

C. Raceways:

1. Sized as indicated on the drawings. Where sizes are not indicated, raceways shall be sized as required by the National Electrical Code in accordance with the quantity, size, and type of the insulation conductors to be installed. Raceways shall be minimum 3/4 in. trade size for branch circuit wiring and minimum 1 in. trade size for all telephone, data, intercommunications, instrumentation, fire alarm, television and computer systems and for all branch circuit "Home Runs" to panelboards. Installed to provide adequate grounding between all outlets and the established electrical system ground.
2. Arranged in a neat manner for access and allow for access to work installed by other trades.
3. Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts handtight, plus one-quarter turn more.

4. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4 inch trade size and insulated throat metal ground bushings on 1-1/2 inch trade size and larger conduits terminated with locknuts. Install throat metal grounding bushings on service conduit.
5. Complete raceway installation before starting conductor installation.
6. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 feet above finished floor. Wherever a cluster of four (4) or more raceways rise out of floor exposed, provide neatly formed 6 in. high concrete envelop, with chamfered edges, around raceways.
7. Installed with a minimum of bends and offsets. All bends shall be made without kinking or destroying the cross section contour of the raceway. Factory made bends are acceptable and should be considered for raceways larger than 2 in.
8. Make bends in raceway using large-radius performed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
9. Conceal conduit within finished walls, ceilings, and floors unless otherwise noted, or where permitted by the Owner's Representative. All exposed raceways shall be painted to match existing adjacent surface as directed by the Architect. Install conduit parallel or perpendicular to building lines.
10. Support conduit within 12 inches of enclosure to which attached.
11. Seal raceway opening that penetrate rooms or walls with acoustical requirements on both sides of rooms or walls with acoustically rated putty or firestopping.
12. Differing Temperatures: For raceways routed between areas with differing temperatures (interior to exterior, walk in coolers/freezers, environmental chambers, etc.) install raceway as follows:
 - a. Provide a thermal break, 4 in. minimum of stainless steel [or Schedule 40 PVC] conduit within space wall/separation.
 - b. Seal raceway penetration through the wall/separation.
 - c. Provide a box on each side of the space wall/separation.
 - d. Provide raceway interior sealant (duct seal or suitable foam) to provide a complete air barrier after conductors are installed.
 - e. Mounting of raceway and boxes on equipment shall be coordinated and approved by the equipment manufacturer.

- f. Installed with exterior surfaces not less than 6 in. from any surface with normal operating temperature of 200°F or higher.
13. Expansion-Joint Fittings:
- a. Install in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg. F and that have straight-run length that exceeds 25 feet. Install in runs of aboveground RMC and EMT conduit that are located where environmental temperature change may exceed 100 deg. F and that have straight-run length that exceeds 100 feet.
 - b. Install expansion fittings at locations where conduits cross building or structure expansion joints.
 - c. Install with position, mounting, and piston setting selected in accordance with manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
 - d. Installed such that no undue stress is placed on any electrical raceway due to the proper functioning of expansion joints.
14. Raceway installed in wet/damp locations or on exterior walls shall have a spacer manufactured for this purpose provided to maintain a space/void between the mounting surface and the raceway.
15. Do not install conduits within 2 inches of the bottom side of a metal deck roof.
16. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
17. Cut conduit perpendicular to the length. For conduits 2 inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs. Bush where necessary.
18. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
19. Plugged at the ends of each roughed-in raceway with an approved cap or disc to prevent the entrance of foreign materials during construction.
20. Installed with UL approved rain-tight and concrete-tight couplings and connectors.
21. Raceways shall not be attached to or supported by wooden plug anchors or supported from mechanical work such as ductwork, piping, etc.

22. Raceways installed in concrete slabs shall be located so as not to affect structural integrity of slab, and such that conduit shall have a minimum of 1 in. of concrete cover on all sides. Obtain approval from the Owner's Representative prior to installing conduit larger than 1 in. trade size in concrete slabs. Raceways in slabs shall be for floor box use only, or routing vertically through.
23. Raceways installed below ground floor slab shall be encased in concrete with 3 in. minimum coverage on all sides. Where possible, install conduit directly below slab with concrete envelope poured monolithic with slab. Where this is not possible, support raceways and envelop maximum 5 ft. - 0 in. on centers from underside of structural slab by means of galvanized pipe hangers. Pipe hangers shall be coated with asphalt mastic. Installation shall maintain integrity of waterproofing membrane.
24. If it is necessary to burn holes through webs of beams or girders, call such points to the attention of the Owner's Representative and receive written approval both as to location and size of hole before proceeding with work. All holes shall be burned no larger than absolutely necessary.
25. Become familiar with the general construction of the building and place sleeves, inserts, etc., as required. All penetrations through existing floors shall be core drilled and sleeved.
26. All raceways shall be supported adequately by malleable iron pipe clamps or other approved methods. In exterior or wet locations, supports shall allow not less than 1/4 in. air space between raceway and wall. Firmly fasten raceway within 3 ft. of each outlet box, junction box, cabinet or fitting. The following table lists maximum spacing between conditions, strength of supporting members, etc.
27. Furnish and install such supports at no additional cost to owner.

Conduit Trade Size	Type of Run	Horizontal Spacing in Feet	Vertical Spacing in Feet
1/2 in., 3/4 in.	Concealed	7	10
1 in., 1-1/4 in.	Concealed	8	10
1-1/2 in. and larger	Concealed	10	10
1/2 in., 3/4 in.	Exposed	5	7
1 in., 1-1/4 in.	Exposed	7	8
1-1/2 in. and larger	Exposed	10	10

28. Where raceways puncture roof, install pitch pockets as required in order that the roof warranty is maintained. Coordinate with representative of roofing material manufacturer.
29. At each flush mounted panelboard, terminal cabinet, control cabinet, etc., provide four (4) spare 3/4 in. raceways from panelboard, etc., to an area above the nearest accessible ceiling space. Make 90° turn above the ceiling, arranged for further continuation of raceway, and cap.

30. All interior conduit used for the following systems shall be color coded as follows:
- a. Red - Fire Alarm System
 - b. Metallic (silver/grey) - Normal utility power
 - c. Yellow - Emergency Life Safety Branch
 - d. Purple - Emergency Optional Standby

D. Cable Trays:

- 1. Tray supports shall be hung using threaded, galvanized rod hangers, with rods extended through support steel and double nutted. Size support member within load rating of member section; and without visible deflection. Install cable tray level and straight.
- 2. Provide aluminum body expansion connectors at building expansion joints. Minimum 4 in. movements, greater if expansion movement conditions warrant. Provide aluminum body expansion connectors every 100 ft. for outdoor installations. Minimum 4 in. movement, greater if expansion movement conditions warrant.
- 3. Provide external grounding strap at expansion joints, crossovers and at other locations where tray continuity is interrupted.
- 4. Provide necessary elbows, tees, crosses, risers, offsets, fittings, reducers, connectors, clamps, rod suspension, trapeze hangers, etc., as required to make a complete job, coordinate with the manufacturer.
- 5. Provide conduit to tray fitting at each conduit entrance to tray.
- 6. Install divider in trays as called for.
- 7. Install fire stop wall frames around cable tray at penetrations through fire rated walls, and where called for. Seal these openings with pliable fire resistant sealant.

E. Outlet Boxes:

- 1. Consider location of outlets shown on drawings as approximate only. Study architectural, process piping, mechanical, plumbing, structural, roughing-in, etc., drawings and note surrounding areas in which each outlet is to be located. Locate outlet so that when fixtures, motors, cabinets, equipment, etc., are placed in position, outlet will serve its desired purpose. Where conflicts are noted between drawings, contact Owner's Representative for decision prior to installation. Comply with the NEC relative to position of outlet boxes in finished ceilings and walls.

2. Prior to installation, relocate any outlet location a distance of 5 ft. in any direction from location indicated on drawings if so directed by the Owner's Representative. Prior to completion of wall construction, adjust vertical height of any outlet from height indicated if so directed by Owner's Representative. The above modifications shall be made at no additional cost to the Owner.
3. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Outlet boxes shall be sized to accommodate the wiring, splices and device(s) to be installed in accordance with the NEC.
4. Saw-cut opening for boxes recessed in masonry walls in center of cell of masonry block and install box flush with surface of wall. Box shall have extra-deep type raised tile covers or shall be 3-1/2 in. deep boxes with square corners and dimensions to accommodate conductors installed. Prepare block surfaces to provide a flat surface for a raintight connection between box and coverplate or supported equipment and box, whether installed indoors or outdoors.
5. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
6. Locate boxes so that cover or plate will not span different building finishes. Install a device cover plate over each and every outlet indicated on drawings. Do not install plates until painting, cleaning and finishing of surfaces surrounding the outlet are complete. Install single one-piece multi-gang covers over multi-gang devices.
7. Where outlets at different mounting heights are indicated on drawings adjacent to each other (due to lack of physical space to show symbol on drawings), install outlets on a common vertical line.
8. Where switch outlets are shown adjacent to strike side of door, locate edge of outlet box approximately 3 in. from door frame.
9. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
10. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
11. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
12. Floor outlet boxes shall be installed flush with finished floor, adjust level and tile as required. Where finished floor is terrazzo, provide boxes specifically designed for installation in terrazzo. Where floors are to receive carpet or flooring material, coordinate with appropriate trade and provide insert. Rectangular covers shall be parallel and perpendicular with the building or, if used, floor tile/floor joints/pattern. Coordinate cover type with the flooring and device type.

13. Outlet boxes installed in plaster, gypsum board or wood paneled hollow cavity walls shall be installed flush with raised plaster covers or raised tile covers. Boxes shall be mechanically fastened and supported by two (2) adjacent structural members (studs) with cross brackets (Garvin Industries Model BMB or approved equal).
14. Surface ceiling mounted outlet boxes shall be minimum 4 in. square, 1-1/2 in. deep, galvanized sheet metal.
15. Surface wall mounted outlet boxes shall be cast type boxes.
16. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.
17. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
18. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty for boxes and enclosures in areas of walls with acoustical requirements. Provide gaskets for wallplates and covers.
19. Seal openings and knockouts in back and sides of boxes and enclosures in areas of walls with lead shielding requirements.

F. Wiring Methods:

1. Conductors shall not be installed until raceway system, including all outlets, cabinets, bushings and fittings, is completed. Verify that all work of other trades which may cause conductor damage is completed. Use only U.L. approved cable lubricants when necessary. Do not use mechanical means to pull conductors No. 8 or smaller.
2. In general, conductors shall be the same size from the last protective device to the load.
3. Wiring systems shall be properly grounded and continuously polarized throughout, following the color-coding specified. Connect branch circuit wiring at panelboards, as required, in order to provide a "balanced" three-phase load on feeders.
4. Provide insulated green ground conductor in each branch circuit.
5. All feeder connections shall be made to bus and other equipment using solderless, pressure type terminal lugs.

6. Branch circuits connected to a 20A circuit breaker shall be sized as indicated except for lengths exceeding 75 ft. For circuits longer than 75 ft. to 100 ft. utilize No. 10 AWG conductors (line, neutral and ground) and for circuits from 100 ft. to 150 ft. utilize No. 8 AWG (line, neutral and ground) unless otherwise indicated. Conduit size shall be modified in accordance with the NEC.
7. For splices and taps, No. 10 AWG and smaller, use solderless "twist on" connectors having spiral steel spring and insulated with a vinyl cap and skirt.
8. For splices and taps, No. 8 and larger, use insulated solderless set screw AL/CU or hydraulically compressed sleeve fittings suitable for the intended use.
9. Use cast connections for ground conductors.
10. Provide minimum 6 in. of spare/slack of each conductor in each junction or pull box and termination.
11. Make all splices and connections in accessible boxes and cabinets only.
12. Cover uninsulated splices, joints, and free ends of conductor with rubber and friction tape of PVC electrical tape. Plastic insulating caps may serve as insulation. Heat shrink sleeves shall be acceptable for crimp type splices.
13. On termination at branch circuit outlets, leave a minimum of 8 in. free conductor for installation of devices and fixtures.
14. Feeder conductors shall be continuous from point of origin to load termination without splice. If this is not practical, contact the Owner's Representative and receive written approval for splicing prior to installation of feeder(s). Where feeder conductors pass through junction and pull boxes, bind and lace conductors of each feeder together. For parallel sets of conductors, match lengths of conductors as near equal as possible.
15. Branch circuit conductors installed in panelboards, and control conductors installed in control cabinets and panels shall be neatly bound together using "Ty-Raps" or equal.
16. Provide conduit seals and explosion proof devices as indicated on the plans and as dictated by the NEC for all hazardous locations indicated on the drawings.
17. Lighting fixtures, detectors, etc., in mechanical equipment, boiler and pump rooms shall be installed with exposed wiring after equipment, ductwork, piping, etc., are in place. In general, lighting shall be as located on the drawings; where conflicts exist, locate lights for best distribution.
18. Fire proof tape all medium voltage cables in handholes, man holes, building entrance and junction/pull boxes.

19. Medium voltage cables shall be installed, terminated and tested by trained and qualified personnel with a minimum of 5 years' experience. Training shall be for all types of installations and for the specific types of splices/terminations. Installation shall be in accordance with the cable manufacturer and IEEE. Provide circuit tagging with engraved phenolic plate attached with UV resistant tie wrap indicating source, circuit # and date installed with 3/16 in. test.
 20. Provide cable/conductor vertical support in accordance with the NEC.
 21. The following systems are permitted to be installed in cable tray in compliance with the NEC:
 - a. Communication cable.
 - b. Security cable.
- G. Receptacles:
1. Ground opening shall be up for vertical installation and on the left for horizontal installation.
- H. Toggle Switches:
1. Switches shall be installed in accessible locations near room/space entryway(s).
 2. Provide lighted handle switches in mechanical rooms, elevator pits, electric rooms, etc.
 3. Switches shall have neutral pulled through the box even if not used.
- I. Junction and Pull Boxes:
1. Install junction and pull boxes in readily accessible locations. Access to boxes shall not be blocked by equipment, piping, ducts and the like. Provide all necessary junction or pull boxes required due to field conditions and size as require by the National Electrical Code.
- J. Equipment Mounting Heights: Coordinate with architectural interior and exterior elevations.
1. Unless otherwise noted, mount devices and equipment at heights measured from finished floor to device/equipment centerline as follows:
 - a. Toggle switches (up position "on") 46 in.
 - b. Wall lighting controls (dimmer, digital switch, etc.) 46 in.

c.	Receptacle outlets (long dimension vertical, ground" pole farthest from floor)	18 in.
d.	Receptacle outlets above counters	8 in. above counters
e.	Receptacle outlets, above hot water or steam baseboard heaters. Do not install receptacle outlets above electric baseboard heaters	30 in.
f.	Receptacle outlets, hazardous areas; also for refrigerators	48 in.
g.	Receptacle outlets, weatherproof, above-grade	24 in.
h.	Clock outlets (104 in. AFF or 10 in. below ceiling, whichever is lower) For large, high spaces, coordinate with Architect.	104 in.
i.	Telephone outlets	18 in.
j.	Telephone outlets, wall mounted	46 in.
k.	T.V. outlet	18 in.
l.	Fire alarm manual stations	46 in.
m.	Fire alarm combination audio/visual and standalone visual device (entire strobe lens at heights indicated)	80 in. to bottom of the notification device
n.	Standalone fire alarm audio device	90 in. (min) to 96 in. (max)
o.	Distribution panelboards, to top of backbox	72 in.
p.	Terminal cabinets, control cabinets, to top of backbox	72 in.
q.	Disconnect switches, motor starters, enclosed circuit breakers.	48 in.

2. Where structural or other interferences prevent compliance with mounting heights listed above, consult Owner's Representative for approval to change location before installation.

K. Hangers and Supports:

1. Provide steel angles, channels and other materials necessary for the proper support and erection of motor starters, distribution panelboards, large disconnect switches, large circuit breakers, pendant mounted lighting fixtures, etc.
2. Panelboards, disconnect switches, circuit breakers, cabinets, large pull boxes, adjustable speed drives, cable support boxes and starters shall be secured to the building structure and not supported from conduits. Small panelboards, etc., as approved by Owner's Representative, may be supported on walls. Racks for support of conduits and heavy electrical equipment shall be secured to building construction by substantial structural supports.

L. Identification:

1. Provide engraved lamincoid identification nameplates on switchboards, main service disconnects, transfer switches, motor control centers and on all panelboards using designation shown in panelboard schedule. Include voltage, phase, equipment served, voltage source to panel or equipment.
2. Provide engraved lamincoid identification nameplates for each circuit breaker in the main distribution panel listing the panelboard or equipment connected to each device.
3. Provide engraved lamincoid identification nameplates on all items of equipment including individual circuit breaker enclosures and disconnect switches, listing the equipment connected to the particular device provided under Specification Section 262000, including, but not limited to: starters, disconnect switches, adjustable speed drives, circuit breakers, etc. Include voltage, phase, equipment served, voltage source to panel or equipment.
4. Provide complete type written directory for each panelboard listing room number, function, etc., for each circuit breaker. Directory shall be placed in a plastic clear sleeve in the interior of the panelboard door. Provide type written updated panelboard directories for existing panelboards affected by this work.
5. Nameplates shall be engraved black, with white core, with Helvetica medium 3/16 in. lettering. 1/8 in. lettering is acceptable where space of 3/16 in. is not available.
6. Identify junction and pullboxes for particular service and circuit such as power, emergency power, lighting, fire alarm, telephone, interphone, public address, nurse call, etc. using stencil lettering on cover.
7. Where voltage exceeds 600V provide permanent signage indicating "DANGER - HIGH VOLTAGE - KEEP OUT". Provide signage at each electrical room indicating "DANGER - ELECTRICAL ROOM". Utilize adhesive backed, yellow background, block lettering signage at door.

8. Using adhesive backed printed tape label (white background, black lettering) all receptacle and switch coverplates, power poles, etc. listing panel designation and circuit number. Tape shall be attached to outside of receptacle or switch coverplates.

M. Spare Parts:

1. Deliver to Owner and obtain receipt for spare parts including key switches, fuses, etc.

3.2 TESTS

- A. Branch circuits shall be tested during installation for continuity and identification and shall pass operational tests to determine that all circuits perform the function for which they are designed. For all feeder and exterior branch circuit wiring rated 600 volts or less, provide 1,000 volt "Megger" insulation test prior to energizing feeders. Use a 1,000-volt motor driven megger for all tests. Test voltage shall be applied until readings reach a constant value, and until three (3) equal readings, each one (1) minute apart, are obtained. Minimum megger reading shall be 45 megohms for feeder conductors. Document test results and submit for approval prior to energizing conductors.

END OF SECTION

SECTION 260526

GROUNDING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide grounding system equal to or exceeding the requirements of NEC and as indicated in the contract documents. Raceway system which includes metal conduit, wireways, pull boxes, junction boxes, busway, wire ways, cable trays, enclosures, motor frames, etc., shall be made to form a continuous, conducting permanent ground circuit of the lowest practical impedance to enhance the safe conduction of ground fault currents and to prevent objectionable differences in voltage between metal non load current carrying parts of the electrical system.
- B. Provide solid grounding of building structures and electrical and communications systems and equipment. It includes basic requirements for grounding for protection of life, equipment, circuits and systems. Types of grounding systems include the following:
 - 1. Electrical Service and Transformer Grounding
 - 2. Building Grounding
 - 3. Equipment Room Ground Terminal Bar
 - 4. Electrical Equipment Grounding
 - 5. Surge Protection Device (SPD) Grounding
 - 6. Telecommunications Grounding
 - 7. Equipotential Grounding Systems
 - 8. Underground Distribution Grounding
 - 9. Common Ground Bonding with Lightning Protection System

1.2 QUALITY ASSURANCE

- A. All methods of construction, details of workmanship, that are not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated in their respective sections of the specifications. The equipment specified is based upon the acceptable manufacturers listed. Equipment types, device ratings, dimensions, etc., correspond to the nomenclature dictated by those manufacturers. Where "or equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.
- B. Electrical Components, Devices and Accessories: Listed and labeled as defined in the NEC by Nationally Recognized Testing Laboratory (NRTL) and marked for intended use.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

1.3 REQUIREMENTS

- A. Grounding conductors, bonding conductors, jumpers, grounded conductors, etc. shall be sized in accordance with the NEC.
- B. Equipment and materials shall be installed in accordance with the manufacturer's recommendations.

1.4 SUBMITTALS

- A. Provide submittals for the following:
 - 1. Ground rods and connectors.
 - 2. Ground bars.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Conductors:
 - 1. Exposed grounding components such as bars, straps, cables, flexible jumpers, braids, shunts, etc., shall be bare copper unless otherwise indicated.
 - 2. Grounding conductors in raceway with 600V circuiting shall be insulated to match the circuit conductors with green color.
 - 3. Grounding conductors used with system voltage greater than 1000V shall be bare unless otherwise indicated.
 - 4. Grounding conductor size shall be as indicated or as required by the NEC whichever is larger, stranded, soft drawn or soft annealed copper, unless otherwise indicated. Sizing shall take into account circuit voltage drop.
 - 5. Acceptable Manufacturers:
 - a. Same make as for 600 volt conductors.
- B. Ground Rods:
 - 1. Provide solid copper or copper clad steel cylindrical rods, 3/4 in. minimum diameter and minimum 10 ft. long with pointed end. Provide units suitable for extension connection when ground rods longer than 10 ft. are indicated.
 - 2. Acceptable Manufacturers:
 - a. Copperweld
 - b. Erico
 - c. Burndy
 - d. Approved equal.

C. Connectors, Clamps and Terminals:

1. Mechanical connectors and clamps shall be made of copper alloy or silicon bronze. Solderless compression terminals shall be copper, long-barrel, NEMA two bolt. Bolts and washers (Belleville) shall be of comparable material or stainless steel.
 - a. Acceptable Manufacturers:
 - 1) Burndy
 - 2) Hubbell Anderson Corp.
 - 3) Thomas & Betts
 - 4) Approved equal
2. Exothermic Welds:
 - a. Provide exothermic welds designed for size and type of intended cable, rods, structure, etc. Solder prohibited for connections, except for medium and high voltage cable metallic tape shields (utilize mechanical and solder).
 - b. Acceptable Manufacturers:
 - 1) Erico "Cadweld"
 - 2) Burndy "ThermOweld"
 - 3) Approved equal
3. Pipe Clamp:
 - a. Pipe clamp for bonding to pipe type electrode (water pipe, etc.) shall be a suitably sized copper alloy clamp.
 - b. Acceptable Manufacturers:
 - 1) Burndy GAR-BU
 - 2) O-Z Gedney Type CG
 - 3) Burndy "Durium"
 - 4) AFL Global "Everdur"
 - 5) Approved equal
4. Flexible Strap:
 - a. Flexible grounding straps shall be of braided high conductivity copper with two hole connector. Strap shall have equal to or greater than ampacity of the system it is bonding to. Strap shall provide flexibility in all directions when installed properly.
 - b. Acceptable Manufacturers:
 - 1) Burndy

- 2) OZ Gedney
- 3) Approved equal

5. Electrostatic Floor Bonding:

- a. Listed grounding kit for bonding ESD carpet, vinyl, rubber and epoxy floor coverings and coatings to ground with the following components:
 - 1) 1 in. wide copper grounding tape.
 - 2) Heavy gauge stainless steel ground termination plates with double sided conductive tape and 20 in. long lead wire with a #10 terminal ring at the end.
 - 3) Acceptable Manufacturers:
 - a) Ground Zero Electrostatics Inc. "Zerostat" Floor Termination and Grounding Kits.

D. Ground Bars

1. Provide ground bars where indicated. Ground bars shall be:
 - a. 98% conductive copper, minimum.
 - b. 4 in. x 1/4 in. thick minimum with length as indicated with minimum 36 in. for electric room/MDF and all other minimum of 24 in.
 - c. Standard NEMA bolt hole patterns with maximum quantity of lug locations. Spacing of 1-1/8 in. apart.
2. Bar shall be mounted to an accessible wall location with galvanized steel hardware and 2000V rated insulators. Mounting shall be suitable for full complement of cabling.
3. Unit shall conform to EIA/TIA standards.
4. Acceptable Manufacturers:
 - a. Erico
 - b. Newton Instrument
 - c. Burndy
 - d. Harger

PART 3 - EXECUTION

3.1 INSTALLATION

A. Grounding Conductors:

1. Provide grounding conductor(s) with all power circuits. Conductor shall be sized as indicated or as required by the NEC as a minimum and shall be terminated on the equipment, device, enclosure, etc. grounding terminal.
Conductor size shall be for the entire length unless approved by the Engineer where oversized for voltage drop.
2. Conductors above grade to ground electrodes (water piping, structural column, etc.) and to equipment (service entrance, ground bars, ground halos, etc.) shall be installed in metallic conduit with ends bonded to the conduit.
3. Grounding conductors shall be installed to have a minimum radius of 3 in.
4. Grounding conductors in a raceway system shall be terminated/bonded to each box, cabinet, enclosure, etc. through which it passes or terminates.
5. Grounding conductors routed with underground circuits shall be bonded to each ground electrode and metallic cable support system within the raceway system including pull and access locations.
6. Stranded conductors penetrating vapor barriers, foundations, slab on grade and water stop membranes shall have the interstitial spaces between strands filled with solder 4 in. beyond the membrane each side. The conductor shall be sealed to the membrane with a manufacturer approved method.

B. Raceway Systems:

1. All metal supports, cable trays, messenger cables, frames, sleeves, brackets, braces, etc. for the raceway system, panels, switches, boxes, starters controls, etc., which are not rigidly secured to and in contact with the raceway system, or which are subject to vibration and loosening, shall be bonded to the raceway system.
2. Termination of rigid conduit at all boxes, cabinets, and enclosures shall be made up tightly with a double locknut arrangement and a bushing, bushings being of the insulated type. Utilize grounding bushings as specified elsewhere in these specifications.
3. Conduit which runs to or from boxes, cabinets, or enclosures having concentric or eccentric knockouts which partially perforate the metal around the conduit and hence impair the continuity of system ground circuits shall be provided with bonding jumpers connected between a grounding type bushing/locknut on the conduit and a ground bus or stud inside the box, cabinet, or enclosure and attached thereto.

4. Conduit expansion joints and telescoping sections of metal raceways shall be provided with bonding jumpers sized in accordance with the NEC.
- C. Ground Rods:
1. Ground rods shall be driven vertically the full length plus 24 in., minimum.
 2. Ground rods shall be located in virgin soil or loamy compacted soil.
- D. Connectors Clamps and Terminals:
1. Connectors utilized above grade in dry accessible locations shall be mechanical or exothermic type.
 2. Connectors in damp locations, below grade or if not indicated shall be exothermic type.
 3. Clean the area near the connecting surfaces prior to any connection to ensure effective contact. Cleaning shall be to the bare metal. Wire brush area if needed to remove rust scale paint, dirt, etc. to expose bare metal.
 4. Exothermic connections shall be installed in accordance with the manufacturer's recommendations and tested with heavy blow of a five pound sledge.
- E. Flexible Strap:
1. Flexible straps shall be used when bonding vibrating/moveable equipment, with expansion fittings and where recommended by the manufacturer.
 2. Sufficient slack shall be provided to compensate for the anticipated vibration, movement and expansion.
- F. Primary Electrical Equipment/Systems:
1. Transformers:
 - a. Primary voltages including those above 600 volts.
 - b. Provide a minimum of two #4/0 bare ground conductors from the transformer pad electrodes or building main ground bar to the transformer enclosure ground stud/pad/terminals.
 - c. Provide a #4/0 bare ground conductor from each lightning arrester to the transformer enclosure ground stud/pad/terminals.
 - d. For exterior pad mounted transformers, provide a bonding conductor sized in accordance with the NEC from the transformer neutral terminal to the ground stud/pad/terminals.

- e. Connect system primary and secondary circuit grounding conductors to the transformer enclosure ground stud/pad/terminals.

2. Metal Enclosed/Metal Clad Switchgear:

- a. Equipment includes metal enclosed/metal clad switch units, switch and fuse units, auxiliary units, metering units, air circuit breaker units, etc. these shall be effectively grounded in accordance with requirements described herein and the manufacturers recommendations.
- b. Provide two (2) #4/0 ground conductors from the equipment ground bus to the ground bar or one (1) #4/0 ground conductor from the equipment ground bus to the building ground bar for every two (2) compartments in a continuous line-up equipment, whichever is the greater number.
- c. Connect system circuit grounding conductors to the equipment ground bus.

3. Cabling:

- a. All medium and high voltage cable shielding shall be bonded to the local ground system in all buildings, switchgear, transformers, manholes containing splicing/connectors, etc. Suitable terminations, connectors, splices, etc. should be used to expose the cable shield for grounding.
- b. The grounding conductors contained in the interstices of interlocked armor cable shall be connected to the ground bus at every equipment termination point and to each other and to system ground; ground at every splice location.
- c. The grounding conductor contained in raceway systems shall be connected to the ground bus at every equipment termination point and to each other and to system ground; ground at every splice location.

G. Secondary Electrical Systems:

- 1. The neutral (grounded) conductor of each low voltage, single and/or polyphase system or distribution system, except special isolated double insulated systems, shall be solidly connected to ground at the transformer neutral bushing, or at the main secondary switchgear to the system ground, and shall be sized for current carrying capacity, not to be less than as required by the NEC. Ground connection shall be to the building grounding system, building steel, building water service, building concrete reinforcement and as indicated.
- 2. Provide equipment grounding conductor, green colored insulation, with phase conductors, to primary side of all transformers rated 600 volts or less circuited to the enclosure and secondary neutral bushing, to all electrical utilization and distribution equipment; insulation shall be same type as phase conductors. Transformer enclosures shall be bonded to the primary and secondary circuit grounding conductor.

3. Equipment grounding conductors shall extend from the point of termination back to the ground bus of the source panelboard, switchboard, transformer, or switchgear.
- H. Equipment Grounding:
1. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch circuit conductors.
 2. Surge Protection Device (SPD) Ground Conductor Installations: Extend SPD dissipation ground conductors to local equipment ground bus and to common grounding electrode conductors. Size conductors per SPD manufacturer recommendations and the NEC.
- I. Communications Rooms:
1. For each building communications room or closet provide one (1) wall mounted ground bar bonded to the main building ground bar or electrical service ground with insulated ~~2~~ ~~0~~ AWG conductor.
 2. Local cable trays, equipment racks, etc. shall be bonded to the ground bar with insulated #6AWG minimum.
- J. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors in conduit from building's main service equipment or grounding bus to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes using a bolted clamp connector or by bolting a lug-type connector to a pipe flange using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor or sleeve to conductor at each end.
 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- K. Underground Distribution:
1. Manholes and Handholes: Provide a driven ground rod through opening in the floor/bottom with 4 in. exposed. If necessary due to the site conditions, install the ground rod prior to manhole/handhole installation and provide a #1/0AWG bare conductor from the ground rod with an exothermic connection in the manhole/handhole. Seal the opening with waterproof nonshrinking grout.

2. Bond exposed parts within manhole/handhole such as inserts, pulling rings, cable racks, ladders and cable shields to the ground rod with #2AWG bare conductor minimum. Conductors shall be neatly installed around the perimeter of the unit and support 3 ft. on center with non-corrosive support and hardware.

3.2 GROUND TERMINAL BUS INSTALLATION

- A. Install ground terminal bar in rooms where shown on the drawings. Mount bar 18 in. above finished floor by anchors and bolts using 1-1/2 in. long insulated spacer between bar and wall. Use a minimum of two (2) supports 18 in. on center. Connect all grounding electrode system conductors, system enclosure ground bus, and other indicated electrode systems to the terminal bar.
- B. Label grounding conductors terminated to bus for equipment, location, electrode, etc served.

3.3 TESTS

- A. Test the building ground system before backfilling to ensure continuity and determine system resistance value.
- B. Testing procedure shall be a fall of potential type with a moving auxiliary electrode in accordance with IEEE Standard 142 and reviewed/approved by the Engineer. Sufficient test points shall be taken for accurate resistance value.
- C. Make resistance measurements in dry weather, no earlier than 48 hours after rainfall. Provide tabulated test results indicating distance between rods and resistance readings on a plotted graph.
- D. Test each ground electrode system separately prior to connection to the system or main building ground bar. Test each system ground electrode system a second time after backfilling has occurred and all final connections (building steel, water service, etc.) have been made.
- E. Soil type, date, time, meter manufacturer/model number, person performing the test, test witnesses and most recent rainfall shall be noted in test submittal.

END OF SECTION

SECTION 262000

ELECTRIC DISTRIBUTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide a complete distribution system as indicated on the Contract Documents and as specified herein.

1.2 QUALITY ASSURANCE

- A. All methods of construction, details of workmanship, that are not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated in their respective sections of the specifications. The equipment specified is based upon the acceptable manufacturers listed. Equipment types, device ratings, dimensions, etc., correspond to the nomenclature dictated by those manufacturers. Where "or equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.
- B. Installation shall be in accordance with NFPA-70 (National Electrical Code), National Electrical Safety Code (NESC), state codes, local codes, and requirements of authority having jurisdiction.
- C. Equipment shall be designed, manufactured, assembled, and tested in accordance with the latest revisions of applicable published ANSI, NEMA, UL and IEEE Standards.

1.3 SUBMITTALS

- A. Submit the following product data/information:
 - 1. Manufacturer and equipment type.
 - 2. Standard catalog information sheet.
 - 3. Detailed shop drawings indicating plan, elevation, end and isometric views. Top and bottom conduit areas shall be clearly shown and dimensioned on the drawings.
 - 4. Single-line diagram.
 - 5. Complete Bill of Materials.
 - 6. All relevant ratings including, but not limited to, voltage, current, interrupting and withstand.

7. Overcurrent Device Information. Model number, available settings, setting ranges, capabilities, etc.
 8. Submit available and final settings, programming and adjustments.
- B. Submit product data and information for the following equipment, materials, products, etc.:
1. Dry type transformer(s) including shielded and linear load transformer(s).
 2. Distribution and branch circuit panelboards.
 3. Enclosed circuit breakers.
 4. Disconnect switches.
 5. Surge Protective Devices.

1.4 WARRANTY

- A. Provide full system warranty (labor, travel, equipment, etc.) in accordance with Division 1 and a minimum of one (1) year from acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Distribution Panelboards (Nominal 600 Volt):
1. Provide distribution panelboards as indicated in the "Panelboard Schedule" and as located on the drawings. Panelboards shall be equipped with quick make/quick break thermal magnetic, molded case circuit breakers as scheduled.
 2. Panelboard bussing and lugs shall be copper. Provide grounding bus in each panelboard, securely bonded to the box. Panelboard bus structure, main lugs, and main breaker shall have current ratings as indicated. Such ratings shall be established by heat rise tests with maximum hot spot temperature on any connector or bus bar not to exceed 50°C rise above ambient.
 3. Circuit breakers shall be equipped with individually insulated, braced and protected connectors. Large permanent, individual circuit numbers shall be affixed to each breaker in a uniform position. Tripped indication shall be clearly shown by the breaker handle taking a position between "ON" and "OFF". Provisions for additional breakers shall be such that no additional connectors will be required to add breakers.
 4. Each panelboard, as a complete unit shall have a short circuit rating equal to or greater than the rating shown on the Panelboard Schedule. All panelboards shall be fully rated. "Series Ratings" are NOT acceptable. The use of series rating of panelboards for short circuit rating is not acceptable.

5. Panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel to be as specified in UL Standard 50 for cabinets. The size of wiring gutters shall be in accordance with UL Standard 67. Cabinets shall be equipped with locks and all locks shall be keyed alike. End walls shall be removable. Fronts shall be of code gauge, full-finished steel with rust-inhibiting primer and baked enamel finish.
 6. The panelboard interior assembly shall be dead front with panelboard front removed. Panelboard front shall be door in door construction with full length piano-hinge. Main lugs or main breakers shall be barriered on five (5) sides. The end of the bus structure opposite the mains shall be barriered.
 7. Panelboards shall be UL listed for use intended.
 8. Ratings shall be as indicated in the contract documents.
 9. Manufacturers: Subject to compliance with contract documents, the following manufacturers are acceptable:
 - a. Square D "I-Line" - Design Make.
 - b. Eaton Corporation "PRL3"
 - c. General Electric by ABB
- B. Branch Circuit Panelboards (480Y/277 volt, 208Y/120 volt):
1. Provide branch circuit panelboard as indicated in the "Panelboard Schedule" and as located on the drawings. Panelboards shall be equipped with quick make/quick break thermal-magnetic, molded case circuit breakers as scheduled.
 2. Panelboard bussing and lugs shall be copper. Provide grounding bus in each panelboard, securely bonded to the box. Panelboard bus structure and main lugs or main circuit breaker shall have current ratings as indicated. Such ratings shall be established by heat rise tests, conducted in accordance with UL Standard 67.
 3. Provisions for additional circuit breakers shall be such that field addition of connectors or mounting hardware will not be required to add circuit breakers to the panelboard. Bus connections shall be bolt-on.
 4. Each panelboard, as a complete unit, shall have a short circuit current rating equal to or greater than the rating shown on the Panelboard Schedule or on the plans. All panelboards shall be fully rated. "Series Ratings" are NOT acceptable. Reducing breaker ratings on the basis of series rating is not acceptable.
 5. The panelboard bus assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel to be specified in UL Standard 50 cabinets. Wiring gutter space shall be in accordance with UL Standard 67 for panelboards. Each front shall include a door and have a flush, stainless steel, cylinder type lock with catch and spring-loaded door pull. All panelboard locks shall be keyed alike. Doors shall be mounted by completely concealed steel hinges.

A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. Fronts shall be of code gauge, full-finished steel with rust inhibiting iron phosphate sealer and baked enamel finish. Minimum box width shall be 20 in. Provide door-in-door construction. Panelboard to be keyed to match the Owner's existing system.

6. Ratings shall be as indicted on the Panelboard Schedule.
7. Manufacturers: Subject to compliance with Contract Documents, the following manufacturers are acceptable:
 - a. 480Y/277 Volt:
 - 1) Square D "NF" - Design Make.
 - 2) Eaton Corporation "PRL2"
 - 3) General Electric by ABB
 - b. 208Y/120 Volt:
 - 1) Square D "NQ" - Design Make.
 - 2) Eaton Corporation "PRL1"
 - 3) General Electric by ABB

C. Circuit Breakers:

1. Circuit breakers below 200 amp frame shall be molded case with inverse time and instantaneous tripping functions, unless indicated otherwise in contract documents.
2. Listed combination of coordinated circuit breakers shall be verified by the equipment manufacturer utilizing published data sheets. Confirm listings shall be submitted.
3. Lugs shall be mechanical, rated for 60/75° AL/Cu.
4. Branch circuit breakers shall be quick-make, quick-break, thermal-magnetic and trip indicating, and multipole breakers shall have common trip. Single pole 15 and 20 ampere circuit breakers shall be UL listed as "Switching Breakers" at 120V ac or 277 V ac and carry the SWD marking.
5. Ratings shall be as indicated in the Contract Documents.
6. Manufacturers: Subject to compliance with contract documents, the following manufacturers are acceptable:
 - a. Square D Micrologic trip unit - Design Make.
 - b. Eaton Corporation Optim 550 trip units for circuit breakers 400 - 1600 amp frame or RMS 610 trip units for 2000 amp frame to 6000 amp frame

c. General Electric Spectra RMS or MicroVersa trip unit.

7. Enclosed circuit breakers shall be molded case, thermal-magnetic type, ratings as noted, with overcenter, trip-free, toggle-type operating mechanism, quick make/quick break action and positive handle indication. Multiple pole breakers shall be common trip type. Each circuit breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole. Provide provisions for padlocking in the "off" position. Breakers shall be calibrated for operation in an ambient temperature of 40°C and shall be suitable for mounting and operating in any position. Breakers shall have removable lugs, UL listed for copper and aluminum conductors. Breakers shall be installed in NEMA 1 general purpose, surface enclosures, unless otherwise noted.

a. Manufacturers: Subject to compliance with Contract Documents, the following manufacturers are acceptable:

- 1) Square D
- 2) Cutler Hammer
- 3) General Electric by ABB

D. Disconnect Switches:

1. Shall be heavy-duty type three-pole, with "Quick Make/Quick Break" operating handle mechanically interlocked with the cover, horsepower and voltage rated to match equipment served. Where indicated switches shall be provided with dual-element, time delay, rejection type fuses. Switches shall be installed in NEMA 1 for indoor use, NEMA 4X for outdoor use. Provide provisions for padlocking in the "off" position. Provide neutral bar in single phase or three phase, four wire circuits, and ground bar in all switches. Provide auxiliary contacts where called for.

2. All disconnects connected downstream of ASD's shall have a normally open and normally closed auxiliary contacts which shall be wired to the ASD to indicate disconnect is open.

3. Manufacturers: Subject to compliance with Contract Documents, the following manufacturers are acceptable:

- a. Square-D - Design Make.
- b. Cutler Hammer.
- c. General Electric by ABB

E. Fuses:

1. All fuses rated 600 volts and below shall be rejection type dual-element, time-delay type. Provide two (2) complete sets of fuses for all fusible devices. Deliver spare fuses to the Owner and obtain receipt.

2. Manufacturers: Subject to compliance with Contract Documents, the following manufacturers are acceptable:
 - a. Fuses 600 Amperes and Below: Bussman Type FRS-R (600 volts), Bussman Type FRN-R (300 volts) or equivalent.
 - b. Fuses Rated Above 600 Amperes: Bussman Type KRP-C or equivalent.

2.2 SHORT CIRCUIT PROTECTION, COORDINATION AND ARC FLASH STUDY

- A. The contractor shall provide an electrical power systems study as described below and submitted for approval prior to final equipment submission. Submit documents/drawings of complete short circuit, coordination and arc flash study for the electric distribution system for this project including the service entrance to all branch circuit panelboards and branch circuits 50A and over. Documents shall be prepared by a licensed Professional Engineer in New York State with at least 5 years' experience in similar studies, using the most current software version of SKM Power Tools. Study documentation shall include:
 1. Software used to prepare study with a description of the software philosophy.
 2. Quantities, ratings and characteristics of all system components.
 3. Impedance data for each piece of equipment.
 4. Calculation methods and tabulations.
 5. One-line diagrams and impedance diagrams.
 6. Service entrance characteristics (available short circuit, X/R ratio, voltage, etc).
 7. Available short circuit at each node in the system with associated required equipment ratings.
 8. Coordination verification with equipment settings and time current graphs.
 9. Arc flash energy level at each piece of equipment with adhesive labels.
 10. Conclusions and recommendations.
- B. Short Circuit Current:
 1. Perform short circuit current calculations to determine the available short circuit current at each piece of distribution equipment.
 2. Calculations shall take into account the following:
 - a. Available utility short circuit current.
 - b. System impedances (transformers, conductors, etc.).
 - c. Conduit types.

d. Motor contribution for motors.

C. Coordination:

1. Electrical distribution system shall be fully coordinated from the service entrance to branch circuit over current protection.
2. Emergency electric distribution system shall be fully coordinated from the service entrance to the branch circuit over current protection.
3. The coordination shall meet the current edition of ANSI/IEEE Standard 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems. The study shall indicate that this standard was used as the basis for the study.
4. Field settings, adjustments and minor modifications necessary for conformance with the recommendations shall be accomplished without additional expense to Owner. Provide documentation that all applicable over current protective devices have the recommended settings and have been suitably calibrated.
5. Coordination graphs shall indicate coordination proposed for systems indicated on log-log graph forms. Coordination graphs shall include:
 - a. Complete descriptive titles.
 - b. Graph for all over current devices.
 - c. Thermal damage curves (conductors, transformers, etc.), available short circuit current limits, rated current levels and over current protective device operation bands. Over current protective device operation bands shall be for the recommended settings.
 - d. Indication that applicable devices are inherently selectively coordinated with associated back up list from the manufacturer.
 - e. Listing of all project over current devices with manufacturer and model number.
 - f. Recommended settings for all adjustable over current protective devices.
6. Equipment design discrepancies and proposed corrective modifications if required shall be submitted with studies with variations clearly note.

D. Arc Flash:

1. Arc flash evaluation shall be provided to determine the arc flash energy at each piece of distribution equipment. Calculation shall be in accordance with IEEE 1584 and NFPA 70E.

2. Two separate arc flash energy levels shall be calculated and displayed on separate labels in locations that an arc flash energy reduction maintenance switch is utilized to indicate the energy with and without the switch engaged.
 3. Arc flash calculations shall utilize finalized and approved over current protective device settings.
 4. Arc Flash labels shall be furnished and installed on the appropriate equipment after the Short Circuit, Coordination and Arc Flash Study has been completed and approved. Layout and information on the label shall be approved by the engineer of record.
- E. Once completed and approved, provide the Owner and Engineer an electronic copy of the full calculations, inputs and outputs.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All equipment shall be grounded per the NEC.
- B. Electrical distribution equipment shall have lugs/terminations suitable for the indicated conductor size. Where conductors have been oversized for voltage drop and where approved by the Engineer it shall be allowed to reduce the conductor size using hydraulically crimped splice in a box next to the distribution equipment to allow for standard lug termination.
- C. Install dry-type transformers with adequate clearances for proper ventilation. Bolt floor mounted transformer to pad.
- D. Distribution switchboards, motor control centers and floor mounted dry-type transformers shall be mounted on 4 in. high concrete pads which shall extend 3 in. on all sides. Securely bolt the unit to the pads for proper horizontal and vertical alignment.
- E. Coordinate transformer pad dimensions with transformer manufacturer's requirements. Coordinate transformer pad locations, dimensions and details with General Contractor.
- F. Provide pad lockable branch circuit breaker device to hold circuit breaker in the closed position, but not prevent overcurrent protection, for all branch circuits serving fire alarm controls panels, emergency lighting and life safety branch circuits.
- G. Identification:
 1. Identify all items of equipment as described in Section 260501-3.1, Identification. Identification shall be provided for switchboards, panelboards, transformers, ASD's, motor starters, disconnect switches, enclosed circuit breakers, switchboard main/distribution breakers, MCC's automatic transfer switches, UPS's, generators, surge suppression devices, control panels, switchgear, etc.

2. Switchboards, panelboards, MCC's, switchgear, etc. shall have a label indicating name/tag ID, feeder source, conductor color convention and for service entrance locations the available short circuit current.

3.2 ELECTRICAL LOAD TEST

- A. Conduct a load test prior to request for final payment and comply with the following:
 1. Energize maximum normal light and power load for a period of two hours when scheduled.
 2. Record voltage at service and at each panel.
 3. Measure current in each phase of all feeders.
 4. Adjust transformer taps as directed by engineer after review of report.
 5. Provide and install all necessary metering equipment.
 6. Owner's Representative or Site Representative shall witness the test.
 7. Before final acceptance specified test shall be completed to the satisfaction of the Owner's Representative who shall be sole judge of the acceptability of such tests and who may direct the performance of such additional tests as deemed necessary in order to determine the acceptability of the systems, equipment, material and workmanship. Additional tests required by the Owner's Representative shall be provided at no additional cost. Protective equipment shall be actuated in a manner that clearly demonstrated their workability and operation.

3.3 CLEANING

- A. At the completion of the project, while equipment is de-energized, it shall be thoroughly cleaned to a shipped condition using methods in accordance with the manufacturer's recommendations. Utilize vacuum for cleaning and not compressed gas.

3.4 SPARE PARTS

- A. Deliver loose equipment to the Owner and obtain receipt for fuses, keys to panelboards, etc.

3.5 DISCONNECT DEVICES

- A. All disconnect devices downstream of ASD's: Provide wiring, conduit and connections between ASD and disconnect auxiliary switch to ASD.

END OF SECTION

SECTION 262913

MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide labor, materials, equipment and services as required for the complete installation and full operation of separately enclosed, preassembled, motor controls, rated 600V and less.

1.2 DEFINITIONS

- A. ASD: Adjustable speed drive motor controller.
- B. CPT: Control power transformer.
- C. DDC: Direct digital control. Building management/control system.
- D. EMI: Electromagnetic interference.
- E. PWM: Pulse width modulated.
- F. RFI: Radio-frequency interference.

1.3 SUBMITTALS

- A. Submit manufacturer's product data for each type and rating of motor controller indicated.
 - 1. Include dimensions, weights, enclosure types, rating capacities, operating characteristics, electrical characteristics, furnished specialties and accessories, mounting and attachment details, method of field assembly, components, and location / size of each field connection.
 - 2. Include diagrams for power, signal, and control wiring.
- B. As part of Operation and Maintenance Data, provide manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules, setting field-adjustable timers, controls, and status and alarm points, and setting field-adjustable overload relays.

1.4 QUALITY ASSURANCE

- A. All methods of construction, details of workmanship, that are not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated in their respective sections of the specifications. The equipment specified is based upon the acceptable manufacturers listed.

Equipment types, device ratings, dimensions, etc., correspond to the nomenclature dictated by those manufacturers. Where "or equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.

- B. Installation shall be in accordance with the manufacturer's recommendations, NFPA-70 (National Electrical Code), National Electrical Safety Code (NESC), state codes, local codes, and requirements of authority having jurisdiction.
- C. Equipment shall be designed, manufactured, assembled, and tested in accordance with the latest revisions of applicable published ANSI, NEMA, UL and IEEE Standards.
- D. Equipment and systems shall be NRTL tested and labeled.

1.5 WARRANTY

- A. Provide full system warranty (labor, travel, equipment, etc.) in accordance with Division 1 with a minimum of one (1) year from acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable manufacturers include:
- B. Adjustable Speed Drives (ASDs):
 - 1. ABB (Design Make - ACH580)
 - 2. Yaskawa
 - 3. Eaton Corporation
- C. Manual and Magnetic Motor Controllers:
 - 1. Square-D - Design Make
 - 2. Cutler Hammer
 - 3. General Electric
 - 4. Allen-Bradley
 - 5. Siemens

2.2 ADJUSTABLE SPEED DRIVE MOTOR CONTROLLER

A. General Requirements for ASDs:

1. ASD Description: adjustable speed drive, consisting of power converter that employs pulse-width-modulated inverter, factory built and tested in an enclosure, with integral disconnecting means and overcurrent and overload protection; arranged to provide self-protection, motor protection, and variable-speed control of one or more induction motors by adjusting output voltage and frequency. Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508. Suitable for operation of NEMA MG 1, Design A and Design B motors, as defined by NEMA MG 1.

B. Unit Operating Requirements:

1. ASD shall provide full rated output from a line voltage of plus 10% and minus 10% of nominal voltage. ASD shall continue to operate without faulting from a +30% to -35% of nominal line voltage.
2. Input AC Voltage Unbalance: Not exceeding 5 percent.
3. Input Frequency Tolerance: Plus or minus 5 percent of ASD frequency rating.
4. Minimum Efficiency: 98 percent at 60 Hz, full load.
5. Minimum Primary-Side Power Factor: 98 percent under any load or speed condition.
6. Minimum Short-Circuit Current (Withstand) Rating: 100kA.
7. Ambient Operating Temperature Rating: 5 deg F (-15 deg C) to 104 deg F (40 deg C) minimum.
8. Humidity Rating: To 95 percent (noncondensing) minimum.
9. Altitude Rating: Suitable for intended location with 3300 feet minimum.
10. Vibration Withstand: Comply with NEMA ICS 61800-2.
11. Overload Capability: 1.1 times the base load current for 60 seconds; minimum of 1.3 times the base load current for two seconds.
12. Starting Torque: Minimum 140 percent of rated torque from 3 to 60 Hz.
13. Output Carrier Frequency: Selectable; 1 to 12.5 kHz.
14. Stop Modes: Programmable including fast, free-wheel, and dc injection braking.

- C. Inverter: ASD shall employ a 6 PWM power electronic system, consisting of:
1. Input Section:
 - a. ASD input power stage shall convert three-phase AC line power into a fixed DC voltage via a solid state full wave diode rectifier.
 2. Intermediate Section:
 - a. DC bus as a supply to the ASD output Section shall maintain a fixed voltage with filtering and short circuit protection.
 - b. DC bus shall be interfaced with the ASD diagnostic logic circuit, for continuous monitoring and protection of the power components.
 3. Output Section:
 - a. Insulated Gate Bipolar Transistors (IGBTs) shall convert DC bus voltage to variable frequency and voltage.
 - b. The ASD shall employ pulse width modulated output technology to power the motor.
- D. Isolated Control Interface: ASDs control input to follow remote-control signal (selectable 0-10VDC, 4-20mA, 0-20mA, and network) over a minimum 40:1 speed range with electrical signal.
- E. Internal Adjustability Capabilities:
1. Minimum Speed: 5 to 25 percent of maximum rpm.
 2. Maximum Speed: 80 to 100 percent of maximum rpm.
 3. Acceleration: 0.1 to 6000 seconds.
 4. Deceleration: 0.1 to 6000 seconds.
 5. Current Limit: 30 to minimum of 150 percent of maximum rating.
- F. Self-Protection and Reliability Features:
1. Surge Suppression: Factory installed as an integral part of the ASD, complying with UL 1449 SPD, Type 1 or Type 2.
 2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
 3. Under and overvoltage protection.
 4. Inverter overcurrent protection.

5. ASD and Motor-Overload/Over temperature Protection: Microprocessor-based thermal protection system for monitoring ASDs and motor thermal characteristics, and for providing ASD over temperature and motor-overload alarm and trip. The settings shall be selectable utilizing the keypad.
 6. Critical frequency rejection, with three selectable, adjustable dead bands.
 7. Instantaneous line-to-line and line-to-ground overcurrent trips.
 8. Loss-of-phase protection.
 9. Reverse-phase protection.
 10. Short-circuit protection.
 11. Motor over-temperature fault.
 12. Shut down on indication of motor local disconnect switch open position.
- G. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts. Field adjustable for manual restart.
- H. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.
- I. Bidirectional Autospeed Search: Capable of starting ASD into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.
- J. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.
- K. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.
- L. Integral Input Disconnecting Means: magnetic circuit breaker with pad-lockable, door-mounted handle mechanism.
- M. The ASD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise.
- N. The ASD shall provide a programmable loss-of-load (broken belt / broken coupling) Form-C relay output. The drive shall be programmable to signal the loss-of-load condition via keypad warning, Form-C relay output, or over serial communication bus.

- O. Unit Mounted Operator Station: front-accessible, sealed keypad and plain-English-language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.
1. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.
 2. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: View only; view and operate; and view, operate, and service. Coordinate the access codes with the Owner.
- P. Status indicators displaying the following conditions:
1. Power on.
 2. Run.
 3. Overvoltage.
 4. Line fault.
 5. Overcurrent.
 6. External fault.
- Q. Indicating Devices: Digital display mounted flush in ASD door and connected to display ASD parameters including, but not limited to:
1. Output frequency (Hz).
 2. Motor speed (rpm).
 3. Motor status (running, stop, fault).
 4. Motor current (amperes).
 5. Motor torque (percent).
 6. Fault or alarming status (code).
 7. PID feedback signal (percent).
 8. DC-link voltage (V dc).
 9. Set point frequency (Hz).
 10. Motor output voltage (V ac).

R. Control Signal Interfaces:

1. Electric Input Signal Interface:
 - a. A minimum of two programmable analog inputs field selectable for 0- to 10-V dc or 4- to 20-mA dc.
 - b. A minimum of six multifunction programmable digital inputs.
2. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the DDC system for HVAC or other control systems:
 - a. 0- to 10-V dc.
 - b. 4- to 20-mA dc.
 - c. Potentiometer using up/down digital inputs.
 - d. Fixed frequencies using digital inputs.
3. Output Signal Interface: A minimum of one programmable analog output signal (0- to 10-V dc or 4- to 20-mA dc), which can be configured for any of the following:
 - a. Output frequency (Hz).
 - b. Output current (load).
 - c. DC-link voltage (V dc).
 - d. Motor torque (percent).
 - e. Motor speed (rpm).
 - f. Set point frequency (Hz).
 - g. Any aux contacts.
4. Remote Indication Interface: A minimum of three programmable dry-circuit relay outputs (120-VAC, 1 A) for remote indication of the following:
 - a. Motor running.
 - b. Set point speed reached.
 - c. Fault and warning indication (overtemperature or overcurrent)

- S. Interface with DDC System for HVAC: Factory-installed hardware and software shall interface with DDC system for HVAC to monitor, control, display, and record data for use in processing reports. ASD settings shall be retained within ASD's nonvolatile memory.
 - 1. Provide EIA-485 port as standard. The standard protocols shall be BACnet MS/TP, Modbus RTU and N2. Provide additional ports for any other protocols that are utilized in the project.
- T. Interface so ASD has indication of downstream disconnect switch(es) status (open-closed) and operates accordingly.
- U. ASDs shall have an input inductive reactance either via 5% impedance AC line reactor or a pair of balanced DC chokes, one on the positive and one on the negative side of the DC bus, with an effective input impedance equivalent to a 5% AC line reactor. Any ASDs that do not meet this requirement must have a 5% AC line reactor added, with the reactor mounted in the same enclosure as the ASD.
- V. EMI/RFI Filtering: Onboard filters shall allow ASD assembly to be CE marked; certify compliance with IEC 61800-3 for Category C2.
- W. Additional Features:
 - 1. Remote digital operator kit.
 - 2. Communication Port: RS-232 port, USB 2.0 port, or equivalent connection capable of connecting a printer and a notebook computer.
- X. Accessories:
 - 1. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in ASD enclosure cover unless otherwise indicated.
 - 2. Reversible NC/NO bypass contactor auxiliary contact(s).
 - 3. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

2.3 MOTOR STARTERS

- A. Provide motor starters as listed on the Electric Equipment and Control Schedule on the drawings.
- B. Starters, contactors and controllers shall comply with NEMA standards having general purpose NEMA 1 or 1B enclosure unless otherwise called for. Provide explosion proof, weather resistant or watertight construction as required. Starters shall be minimum NEMA size 0 with solid state overloads in each phase sized per NEC, motor full load amperage, service factor, and motor operating conditions.

- C. Pad lock arrangements shall be provided to lock the disconnect device in the "off" position. Magnetic starters shall be provided with a control power transformer with 120V secondary and primary and secondary fusing and be sized to accept the loads imposed there on. Starters shall have LED type pilot lights. Each starter subject to electrical interlock and/or automatic control shall have necessary auxiliary contacts.
- D. Auxiliary Devices: Provide pushbutton stations, pilot lights, devices, relays, transformers, selector switches, electric thermostats, auxiliary starter contacts as required for functions called for. Provide separate relay for each speed to operate electric dampers or other devices as required for multispeed motor circuit.
- E. Manual Motor Starter:
 - 1. Provide all starters with thermal overload(s); and pilot light(s) and handle lock-out provisions. Gang starter with selector switch for multispeed applications. Provide single or 2-pole as required:
 - a. 120 volt, single-pole, surface mounted: Square-D FG-5P and handle guard.
 - b. 120 volt, single-pole, flush mounted: Square-D FS-1P and handle guard.
 - c. 240 volt, two-pole, surface mounted: Square-D FG-6P and handle guard.
 - d. 240 volt, two-pole, flush mounted: Square-D FS-2P and handle guard.
 - e. 120 volt, single-pole, two speed, surface mounted: Square-D FG-11P and handle guards.
 - f. 120 volt, single-pole, two speed, flush mounted: Square-D FF-11P and handle guards.
 - g. 240 volt, two-pole, two-speed, surface mounted: Square-D FG-22P and handle guards.
 - h. 240 volt, two-pole, two-speed, flush mounted: Square-D FF-22P and handle guards.
 - i. 120 volt, single-pole, H-O-A selector, surface mounted: Square-D FG-71P and handle guard.
 - j. 120 volt, single-pole, H-O-A selector, flush mounted: Square-D FS-71P and handle guard.
 - k. 240 volt, two-pole, H-O-A selector, surface mounted: Square-D FG-72P and handle guard.
 - l. 240 volt, two-pole, H-O-A selector, flush mounted: Square-D FS-72P and handle guard.

- m. 120 volt, single-pole, surface mounted, explosion proof: Square-D FR-1.
 - n. 240 volt, two-pole, surface mounted, explosion proof: Square-D FR-2.
- F. Manual Motor Starter - Speed Controller: Shall be similar to "Manual Motor Starter," above, except two-gang with motor speed control sized to handle motor indicated, with positive full on and full off bypass of speed control unit.
- G. Manual Starter with Relay: Shall be similar to "Manual Motor Starter," above, except to include a two-gang box with relay sized for load indicated, and hand-off-automatic switch. Connect relay for 120V operation on load side of starter in "automatic" mode. Coordinate connection of Form C maintained contact for control with Mechanical Contractor.
- H. Magnetic Starter: Shall be single-speed, across-the-line type rated in accordance with NEMA standards, sizes and horsepower ratings. Starters shall be mounted in NEMA 1 enclosures unless otherwise indicated. Magnetic starters shall be equipped with fused control power transformer for 120V control power and double break silver alloy contacts; all contacts shall be replaceable without removing starter or disconnecting power wiring. Starter shall have straight-through wiring. Coils shall be of molded construction and shall be replaceable from the front without removing starter. Overload relays shall be solid state type with replaceable control circuit module. Thermal units shall be of one-piece construction and interchangeable. Starter shall be inoperative if thermal unit is removed. Provide hand-off-auto selector switch and start-up pushbuttons and "run" pilot light in cover. Wire for maintained contact unless otherwise noted.
- I. Combination Magnetic Starter: Shall be similar to "Magnetic Starter," above, except shall include fusible disconnect switch connected ahead of starter. The disconnect handle shall be in control of the disconnect device with the door open or closed. Disconnect handle shall be clearly marked as to whether the disconnect device is "on" or "off".
- J. Combination Two-Speed Magnetic Starter: Shall be similar to "Combination Magnetic Starter", above, except with two starters, and six thermal overload units coordinated to match torque and horsepower characteristics of the motor. Starter shall be designed for variable torque operation, and shall be provided with high-low-off-auto selector switch and high and low pilot lights mounted in the cover. Wire for maintained contact unless otherwise noted.
- K. Combination Reduced Voltage Magnetic Starter: Shall be similar to "Combination Magnetic Starter," above, except autotransformer closed transition reduced voltage type with autotransformer protection by winding over-temperature device.
- L. Packaged Control Unit: Shall be furnished and mounted by others, and installed and connected by Electrical Contractor. This can consist of one or more starters, overloads and additional control devices prewired.
- M. Contactor: Shall be similar to "Magnetic Starter", above, except without thermal overload units.

2.4 ENCLOSURES

- A. Enclosures: NEMA 250, to comply with environmental conditions at installed location. Provide Type 1 for dry and clean indoor locations, Type 3R for outdoor locations, Type 4X stainless steel for kitchen and wash-down areas, and Type 12 for areas subject to dust, falling dirt, and dripping non corrosive liquids.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, surfaces, and substrates to receive motor controllers, with installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.
- B. Examine motor controllers before installation. Reject motor controllers that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for conduit systems to verify actual locations of conduit connections before motor controller installation.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Wall-Mounted ASDs: Install with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished floor, unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks.
- B. Wall-Mounted Manual and Magnetic Controllers: Install on walls with tops at uniform height, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks.
- C. Floor-Mounting Controllers: Install ASDs on 4-inch nominal thickness concrete base.
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Roof-Mounting Controllers: Install ASD on roofs with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished roof surface unless otherwise indicated, and by bolting units to curbs or mounting on freestanding, lightweight, structural-steel channels bolted to curbs. Seal roof penetrations after raceways are installed.
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- F. Install fuses, heaters in thermal-overload relays (based on actual nameplate full-load amperes) after motors are installed, and install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.
- G. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.
- H. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- I. Setting of Overload Relays: Select and set overloads on the basis of full-load current rating as shown on motor nameplate. Adjust setting value for special motors as required by NFPA 70 for motors that are high-torque, high-efficiency, and so on.
- J. Comply with NECA 1.

3.3 CONTROL WIRING INSTALLATION

- A. Install wiring between ASDs and remote devices and facility's central-control system.
- B. Bundle, train, and support wiring in enclosures.
- C. Connect selector switches and other automatic-control devices where applicable.
- D. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switches are in manual-control position.
- E. Connect selector switches with control circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor-overload protectors.

3.4 IDENTIFICATION

- A. Identify motor controllers, components, and control wiring. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs. Label each ASD with engraved nameplate. Label each enclosure-mounted control and pilot device. Identify all items as described in Section 260501

3.5 FIELD QUALITY CONTROL

- A. Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Tests and Inspections for ASDs:
 - 1. Inspect ASDs, wiring, components, connections, and equipment installation.
 - 2. Test insulation resistance for each ASD element, component, connecting motor supply, feeder, and control circuits.
 - 3. Test continuity of each circuit.
 - 4. Verify that voltages at ASD locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Construction Manager & Owner's Representative before starting the motor(s).
 - 5. Test each motor for proper phase rotation.
 - 6. Perform tests according to the Inspection and Test Procedures for Adjustable Speed Drives stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Tests and Inspections for Manual and Magnetic Motor Controllers:
 - 1. Comply with the provisions of NFPA 70B, "Testing and Test Methods" Chapter.
 - 2. Visual and Mechanical Inspection:
 - a. Compare equipment nameplate data with drawings and specifications.
 - b. Inspect physical and mechanical condition, anchorage, alignment, and grounding, and that the controller is clean.
 - c. Inspect contactors: Verify mechanical operation and contact gap, wipe, alignment, and pressure are according to manufacturer's published data.
 - d. Motor-Running Protection: Verify overload element rating is correct for its application and if protection is provided by fuses, verify correct fuse rating.

- e. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter. Compare bolted connection resistance values with values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or NETA ATS Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
 - f. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- D. Motor controllers will be considered defective if they do not pass tests and inspections.
 - E. Prepare test and inspection reports, including a certified report that identifies the ASD and describes results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.6 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service. Complete installation and startup checks according to manufacturer's written instructions.

3.7 ADJUSTING

- A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.
- B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.
- C. Adjust carrier frequency for optimal operation with load and conditions.
- D. Adjust the trip settings of instantaneous-only circuit breakers and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to 6 times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed 8 times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Construction Manager & Owner's Representative before increasing settings.

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, reprogram, and maintain motor controllers.

END OF SECTION

SECTION 265000

LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

- A. Provide interior and exterior lighting systems, including luminaires, hangers, supports, fittings, wiring, connections and controls, as indicated in the Contract Documents for complete and operational systems. The lighting layouts on the drawings are diagrammatic only. Refer to architectural "Reflected Ceiling Plans" for exact location of interior luminaires. Luminaires, in general, have been specified for the particular type of ceiling in which they are to be installed. Verify the ceiling construction details and provide luminaires suitable for the respective ceiling types and room finish schedule.

1.3 REFERENCES

- A. The following standards, criteria, codes, etc. shall be followed in the manufacture and installation of the lighting systems.

1. NFPA
2. NEC
3. IESNA
4. NEMA
5. ANSI
6. UL

1.4 ENERGY CONSERVATION WORK

- A. Work installed as part of this Contract will be eligible for energy rebates/incentives available. The energy rebate shall be paid directly to the Owner. The Division 26 contractor shall cooperate with the Owner and the funding source to provide proof of purchase information, quantities involved, fill out forms, etc., to accommodate all required paperwork. Include all costs associated with this requirement.

1.5 QUALITY ASSURANCE

- A. Luminaires shall be as specified in the "Luminaire Schedule". Luminaire types, appearance, characteristics, photometrics, finishes, etc., correspond to the specified manufacturer and associated series or catalog number listed in the "Luminaire Schedule". Products of other listed acceptable manufacturers shall be equivalent in every way to that of the luminaire specified. The Engineer reserves the right to disapprove any luminaire type submitted which they feel is not equal in quality, appearance or performance to the luminaire specified.

- B. Manufacturer's luminaire series or catalog numbers listed in the "Luminaire Schedule" indicate quality, type, and style, but may not cover required special design details. Provide luminaires having such special details as noted in the "Luminaire Schedule", as indicated by the specified luminaire model number and as required for proper installation.
- C. All luminaires shall be new and bear a Nationally Recognized Testing Laboratories (NRTL) label for the service intended.
- D. Luminaires shall be products of manufacturers regularly engaged in the manufacture of the type of luminaires specified and shall be the manufacturer's latest standard design that complies with specification requirements.
- E. Verify the availability of all luminaires proposed to be used in the execution of the work prior to submitting same for approval. The discontinuance of production of any luminaire after such approval has been granted shall not relieve the Contractor from furnishing an approved luminaire of comparable quality and design at no additional cost.
- F. Photometric and operational data shall be provided only by qualified and certified organizations. Certification documentation shall be submitted with the luminaire information.
- G. Should there be any difference between drawings and schedules, secure from Architect/Engineer such information as necessary prior to providing proposal. When finishes are not definitely specified, they shall be as selected by the Architect and not be limited to standard finishes.
- H. Locations indicated for luminaires are approximate. Field coordinate exact locations as near as possible to the location indicated. Coordinate with the Engineer for any major location changes.

1.6 SUBMITTALS

- A. Product Data: For each luminaire type, include in a single submittal, in order of luminaire designation, the catalog "cut" sheet with complete manufacturer and model number. Product data should include the following:
 - 1. Manufacturer and Catalog Number.
 - 2. Features, accessories, materials and finishes.
 - 3. Physical description and dimensions of luminaires.
 - 4. Life, power input, output (lumens, distribution, CCT, and CRI) and energy-efficiency data.
 - 5. Photometric data and adjustment factors based on laboratory tests (space to mounting height ratio, coefficient of utilization complete values, IES distribution, candlepower distribution by angle and luminaire efficiency). Format shall be in accordance with IES TM-27.

6. Power, signal, and control wiring diagrams between luminaires and controllers.
 7. Lens/Louver Type.
 8. Driver with each type luminaire as applicable (type, sound rating, overload protection, voltage, input/fixture wattage, ballast factor, power factor, etc.).
 9. Certification of IES LM-79, IES LM-80 and TM-21 testing for LED luminaires. Luminaires shall be tested in accordance with IES LM and TM standards.
 10. Proof of Energy Star listing.
 11. Warranty.
- B. Coordination Drawings: Provide coordination drawings in accordance with Section 260500. Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Luminaires.
 2. Suspended ceiling components.
 3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
 4. Structure members to which equipment and or luminaires will be attached.
 5. Initial access modules for acoustical tile, including size and locations.
 6. Items penetrating finished ceiling, including other luminaires, air outlets and inlets, speakers, sprinklers, access panels, ceiling mounted projectors, etc.
 7. Coordination of ceiling types and ceiling grids/structure to account for luminaire mounting and space requirements and luminaire lengths.
- C. Color Chips: Provide color chips of available finishes for luminaires upon request of Architect/Engineer.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Luminaires and equipment shall be delivered with NRTL and manufacturer's labels intact and legible. Broken, cracked and damaged materials and equipment shall be removed from the site immediately and be replaced with new materials and equipment. Luminaires and accessories shall be stored in protected dry locations in their original unbroken package or container. Luminaires shall be protected from dust and dampness both before and after installation. Luminaires shall be protected from paint and cleaning solvents during all phases of construction.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division hazard by a NRTL.
- C. UL Compliance: Comply with UL 1598 and UL 8750.
- D. Recessed Luminaires: Comply with NEMA LE 4.

2.2 LIGHT-EMITTING DIODE (LED) LUMINAIRES

- A. Luminaires shall be identical in construction features, options and appearance to the luminaires specified in the Luminaire Schedule. LED luminaires include white and RGBW systems as indicated on the luminaire schedule.
- B. Luminaires shall be provided with all cables, controllers, power supplies, drivers, connectors, terminators and accessories required for a complete installation. LED system shall utilize pulse width modulation, non-linear scaling techniques and reverse polarity protection.
- C. Provide dimming down to 10% as a minimum, or to percentage indicated or called for on the drawings. Unless otherwise indicated, the dimming control shall be a 0-10VDC signal
- D. RGBW LED systems where indicated shall be capable of at least 8-bit control of red, green, blue and white module. RGBW LED system shall be capable of setting each module with a unique and individual address. Each address shall be controlled independently by DMX or alternate method protocol. All RGB LED fixtures shall undergo a minimum of eight-hour burn-in testing during manufacturing.
- E. LED luminaires shall be high brightness and binned for forward voltage, luminous flux and wavelength.
- F. LED luminaires shall be tested in accordance with IESNA LM-79 (luminous output, power input, luminaire efficacy (lumens/watt), color temperature and color rendering index), IESNA LM-80 (L70, output luminous maintenance, 10,000 hour minimum test, calculation method is not acceptable) and IESNA TM-21/28. Luminaire output shall be a minimum of 100 lumens/watt. Rated life shall be a minimum of 50,000 hours at 70% output. Testing shall be performed by a US Department of Energy (DOE) accredited laboratory.
- G. Drivers shall be solid state Class 1 power supply/driver with universal input (120-277V). The system shall have a minimum 90% power factor, 3.5 maximum crest factor, minimum efficiency of 90%, a maximum of 20% THD and overload protection.

Adequate heat sink capability shall be provided to ensure the rated life. Unit shall meet FCC rules and regulations.

H. Where indicated luminaires shall have color tuning capability and control. System to have separate dimming (5-100%) and color (3000K to 5000K, or as indicated on drawings) adjustability. Control shall be Dali or DMX512 for controllability as indicated. The system shall utilize the most recent settings when energized.

I. The luminaire (to include LED sources and drivers) shall have a full five (5) year minimum warranty for replacement and labor.

1. Acceptable LED Manufacturers:

- a. Philips
- b. Osram
- c. Cree
- d. Nichea
- e. Lumiled

J. LED Emergency Drivers:

1. LED emergency drivers shall have the following minimum requirements:

- a. Operate indicated fixtures at full illumination for 90 minutes minimum.
- b. Universal voltage input (120 to 277V).
- c. Upon loss of normal power, fixtures shall automatically switch to battery power.
- d. Upon restoration of normal power, fixture shall return to normal mode and charge battery.
- e. Battery shall be maintenance free, nickel cadmium type with a minimum life expectancy of seven (7) years.
- f. Driver shall be suitable for the environment installed.
- g. Driver shall be Class 2 and enclosed entirely in the fixture (except for down lights and exterior locations).
- h. Units shall be listed for UL924 -Emergency Lighting and Power Equipment.
- i. Minimum five (5) year non-prorated full warranty.
- j. [Factory installed.]
- k. Shall include an emergency system test switch above ceiling adjacent to fixture.

- l. Unit shall be self-testing and provide indication of unit failure.
- m. Design Make: Iota, ILB-CP series or approved equal.

2.3 EXIT LUMINAIRES:

- A. Electrical Characteristics:
 1. LED type for 120/277 volt supply.
 2. Meet or exceed illumination requirements of NFPA 101 and all of the requirements of UL924.
 3. Maximum input power of 5 watts per illuminated face.
 4. Provide Universal mount unit.
 5. Provide single or double face and arrows as indicated on Contract Documents.
 6. Acceptable Manufacturers:
 - a. Per Contract Documents luminaire schedule

2.4 EMERGENCY LIGHTING UNIT WITH BATTERY BACK-UP:

- A. Completely self-contained in compact, low profile injection molded UL 94V-0 flame rated thermoplastic housing, damp location rated with universal mounting plate.
- B. Premium grade, pure lead maintenance free battery with sufficient capacity to operate the light sources for 90 minute to an end voltage of 87-1/2% of nominal battery voltage. Three stage charger (constant current, equalize and float charge), relay, low voltage battery disconnect and brownout protection circuits.
- C. Glare-free LED type lighting source. Test switch and charge rate indicator.
- D. Universal 120/277 volt supply.
- E. Photometric output: for a location with 8' unit mounting height, 9' ceiling, 8' wide corridor and 80/50/20% reflectance, multiple unit spacing shall be:
 1. Standard unit - 30' on center.
 2. High output (HO) unit - 60' on center.
- F. Acceptable Manufacturers:
 1. Standard unit: Dual-Lite EV Series (Design make)
 2. High output unit: Dual-Lite EVHC Series (Design make).
 3. Approved equal.

2.5 LUMINAIRE CONSTRUCTION

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during maintenance and when secured in operating position.

C. Lenses:

1. Shall be listed materials tested in accordance with ASTM D-635, "Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position" and burns less than 2/5 inches per minute.
2. The products shall have a smoke density of less than 75 when tested in accordance with ASTM D-2843, standard test method for "Density of Smoke from the Burning or Decomposition of Plastics".
3. The flame spread rating shall not exceed 0-25 and smoke developed rating shall not exceed 450 in accordance with ASTM E-84, standard test method for "Surface Burning Characteristics of Building Materials".
4. Self-ignition shall not occur below 600°F, in accordance with ASTM D-1929, standard test method for "Ignition Properties of Plastics".
5. Materials shall remain in place 15 minutes at 175°F and fall from frame at 200° below ignition temperature in accordance with ASTM D-648, "Deflection Temperature of Plastics Under Flexural Load".

2.6 LUMINAIRE SCHEDULE

A. Luminaire schedule is found on the contract drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 GENERAL INSTALLATION

- A. Comply with NECA NEIS (National Electrical Installation Standard) latest edition.
- B. All luminaires shall be installed as per manufacturer furnished installation instructions.
- C. Provide for every luminaire as shown on the plans, or as scheduled on the drawings.
- D. Location of all ceiling and wall mounted luminaires shall be as indicated on the Architectural and Electrical drawings. The contractor shall verify ceiling type, construction, and material prior to ordering.
- E. Provide luminaires with an IC rating for luminaires installed in direct contact with insulation.
- F. Provide plaster frames for plaster ceilings and flanged frames for drywall ceilings.
- G. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- H. Luminaires shall be suitable and as recommended by the manufacturer for the actual intended mounting method and materials.
- I. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and maintenance.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- J. Flush-Mounted Luminaires:
 - 1. Secured to outlet box.
 - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 - 3. Trim ring flush with finished surface.
- K. Wall-Mounted Luminaires:
 - 1. Attached to structural members in walls, to a minimum 20 gauge backing plate attached to wall structural members, or using through bolts and backing plates on either side of wall.

2. Do not attach luminaires directly to gypsum board.
- L. Suspended Luminaires:
1. Pendant and Rods:
 - a. Pendant mount luminaires from 1/4 in. threaded rods of required length.
 - b. Sleeve threaded rods with 1/2 in. EMT painted with color as directed by Architect/Engineer.
 - c. Brace pendants and rods longer than 48 inches to limit swinging.
 2. Aircraft Cable:
 - a. Cables shall be 1/16 in. aircraft cable with end safety fittings. Cable shall be provided with 2 in. diameter mini-canopy and threaded coupler for attachment to a 1/4 in.-20 threaded stud extending 3/4 in. below ceiling.
 - b. Cable assembly shall include a spring-loaded adjustment device mounted in the fixture.
 - c. The Contractor shall be responsible for providing required supports for cable attachment.
 - d. For cord feed to the luminaire provide continuous cord clip of matching color to attach the cord to the cable.
 - e. Support per manufacturer's recommendations.
 3. Support stem mounted, single unit luminaires with approved outlet box and accessories that hold them and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
 4. Use tubing or stem for wiring at one point of continuous rows of luminaires and tubing, rod, or wire support for suspension for each unit of length of luminaire chassis, including one at each end.
- M. Ceiling-Grid-Mounted Luminaires:
1. Secure to any required outlet box.
 2. Use approved devices and support components to connect luminaire to building structure in a minimum of four locations, spaced near corners of luminaire. Utilize #10 steel wire; similar to that used to support the ceiling grid.
 3. Provide UL listed seismic hold-down clips and fasten to luminaires and to ceiling grid members at or near each luminaire corner.

4. Install luminaires of sizes less than ceiling grid as indicated on reflected ceiling plans or center in acoustical panel and support luminaire independently with at least two metal channels spanning and secured to ceiling tees.
 5. Contractor to verify luminaire mounting and supports are compatible with the ceiling grid type and mounting/support requirements.
 6. Contractor to coordinate recessed linear luminaire run lengths with the ceiling grid layout and required mains supports. All continuous run lengths to be verified and coordinated prior to determining the final housing lengths.
- N. Cove Lighting:
1. Installed so as to produce a continuous and unbroken band of light with no shadows or light gaps.
- O. Provide all necessary accessories for "end-to-end" mounting where continuous rows of luminaires are indicated. All luminaire assemblies shall be grounded.
- P. Luminaires installed in continuous rows may be fed by a single outlet if luminaires are UL approved and suitable for through wiring in luminaire raceway.
- Q. New luminaires may be provided to replace existing luminaires indicated to remain or be reused, subject to shop drawing approval.

3.3 REMOTE DRIVERS

- A. Remote drivers shall be mounted in an approved NEMA 1 enclosure and shall be located in areas easily accessible to maintenance personnel.
- B. Wiring from luminaire to remote driver shall not exceed the driver manufacturer's recommendations for distance.
- C. Remote driver shall be clearly labeled indicating fixture served, voltage, panelboard and circuit number served from.

3.4 GROUNDING

- A. Ground all non-current carrying parts of all lighting luminaires.
- B. All grounding shall be accomplished with NRTL tested grounding connectors suitable for this purpose.

3.5 LABELING

- A. Attach a self-adhesive red dot label, 1/2 in. in diameter, to all luminaires with an integral battery backup and/or those tied into an emergency generator. Labels shall be attached to these fixtures or to adjacent ceiling tiles so that they are readily discernible for testing and maintenance purposes.

3.6 FINAL CLEANING

- A. Immediately prior to acceptance, damp clean diffusers, luminaire trim, reflectors, louvers, lens, and similar objects of all luminaires. Remove all dirt, corrosion, foreign material, finger marks, and blemishes. Replace all burned out LEDs and failed components.

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Test of Emergency Lighting: Under supervision of Engineer, interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.
- D. Replace luminaires damaged during shipment, construction, or installation.

3.8 STARTUP SERVICE

- A. Comply with requirements for startup specified in Section 260936 "Lighting Controls."

3.9 ADJUSTING

- A. Provide adjusting the direction of aim of luminaires to suit occupied conditions. Adjustment may be required during hours of darkness.
- B. Final distribution shall be acceptable to the Owner and may take several attempts.

3.10 REMOVAL OF BALLASTS IN EXISTING LUMINAIRES

- A. Assume ballasts contain PCB material unless labeled otherwise or test samples show materials are not PCB; submit a test report. Remove all ballasts from existing luminaires indicated on contract documents. Dispose of all ballasts which do not have non PCB labels in PCB containers and pay all costs to have containers taken to EPA approved incinerators and disposed of all EPA regulations. Follow all EPA regulations for transporting material. If ballast has leaked in existing luminaires, remove material deposited in luminaire and dispose of those materials as indicated above. Provide documentation verifying disposal of PCB contaminated ballasts.

3.11 REMOVAL OF LAMPS IN EXISTING LUMINAIRES

- A. The Contractor shall employ the service of a certified disposal/recycling service company to dispose of all removed fluorescent and/or HID lamps. All disposal procedures shall be performed in accordance with EPA Requirements and Subtitle C for the disposal of mercury contaminated lamps.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Work of this Section consists of Architectural Lighting, and includes but is not limited to the following:
 - 1. Interior lighting fixtures with LED source and gear.
 - 2. Luminaire Schedule and supporting cut sheet documentation.
- B. Related Documents and Sections: Examine Contract Documents for requirements that directly affect or are affected by Work of this Section. A list of those Documents and Sections includes, but is not limited to the following:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary conditions and General Requirements, Division 01 Specification Sections, apply to this Section.
 - 2. Division 26 Section "Emergency Lighting"
 - 3. Division 26 Section "Exit signs"
 - 4. Division 26 Section "Lighting Controls" for manual or programmable control systems employing low-voltage control wiring or data communication circuits.
 - 5. Division 26 Section "Wiring Devices" for manual wall-box dimmers.
 - 6. Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multiple lighting relays and contactors.
 - 7. Division 26 Section "Dimming Controls" for architectural dimming systems.
 - 8. Division 26 Section "Wire and Cables"
 - 9. Division 26 Section "Basic Electrical Materials and Methods."

1.2 DEFINITIONS

- A. Fixture: The elements of a luminaire that are designed to distribute the light, and to position and protect the lamps.
- B. Luminaire: A complete lighting unit consisting of an LED source, driver, and separate transformer where applicable, together with the parts designed to distribute the light, to position and protect the LED source and to connect the luminaire to the power supply.
- C. Gear: Another term for the drivers and/or transformers required for luminaires. This term is most widely used outside of the United States.
- D. Lighting Unit: A fixture or an assembly of fixtures with a common support, including a pole or bracket plus mounting and support accessories.
- E. Average Rated Life: For solid state LED sources, average rated life is defined by the IESNA as L_{70} , which is the point in time when the source output in lumens reaches 70% of its initial rated value. Because LED sources do not burn out when they reach the end of their rated life, there will come a point in time after which the sources continue to provide light, but at a lower level than designed. At that time, an Owner may choose to replace the LED sources to restore the light level back to the designed amount. Average rated life for LEDs does not take into account the possibility of catastrophic failure.
- F. CRI: Color rendering index. A quantitative measure of the ability of a light source to reveal the colors of various objects faithfully in comparison to an ideal blackbody reference source. Light sources with a high CRI are preferred.

1. CRI equal to or greater than 80 may be acceptable and provides the more energy-efficient, higher light output option; however, a higher CRI provides better color rendering.
 2. CRI equal to or greater than 90 is preferred and provides the most vibrant and accurate color rendering, but with less efficacy (lumens per watt) and, in some cases, lower light output.
 3. CRI less than 80 is not acceptable.
- G. CQS: Color Quality Scale. An alternative quantitative measure of the ability of a light source to reproduce colors of illuminated objects, developed by researchers at NIST with the intent of improving on the shortcomings of the widely used color rendering index (CRI). CQS adds additional colors to those included in CRI, and therefore can provide a better prediction of color rendering for bright (primary) colors and skin tones.
1. R9 indicates the value for how the color red is rendered. The higher the R9 value, the better, as it improves how colors at the warmer end of the spectrum will appear. LED sources with a CRI of 90+ typically have better R9 values and are therefore preferred.
 2. R13 and R15 indicate the values for how skin tones are rendered. The higher the R13 and R15 values, the better, as it improves how people are rendered within the space. LED sources with a CRI of 90+ typically have better R13 and R15 values and are therefore preferred.
- H. TM-30: IES TM-30-18 is a document approved by the Illuminating Engineering Society (IES) that describes a method for evaluating source color rendition. The method encompasses several individual measures and graphic representations that complement one another and provide a comprehensive characterization of how the light will affect the color appearance of objects. The three pertinent components of the system are the Fidelity Index (R_f), Gamut Index (R_g), and Color Vector Graphic.
1. Color Fidelity (R_f): R_f is the TM-30 measure for average color fidelity. It is analogous to the CRI but uses different color science and increased color samples. R_f calculations are based on a comparison of how 99 color samples are rendered by the test source and the reference illuminant, which for TM-30 is a blackbody radiator, a model of daylight, or a blend of the two.
 - a. R_f values of 90+ means that the source is most like incandescent or daylight and is preferred.
 - b. R_f values below 60 are not acceptable.
 2. R_g : Gamut Index. R_g is the TM-30 measure for average relative gamut. In lighting, gamut is the area enclosed by the chromaticity of a set of color samples. The range of values for R_g does not have specific limits and is dependent on the R_f value. Typically, gamut measures are thought of as average measure of chroma level (saturation). Values greater than 100 indicate an average increase in gamut, whereas values less than 100 indicate an average decrease in gamut.
 3. CVG: Color Vector Graphic: The CVG is a visual representation of hue and chroma shifts for all colors. It is based on the average chromaticity coordinates calculated for the color evaluation samples. The CVG of a source may be required by the Lighting Designer to fully evaluate color rendition, hue shift, and chroma.
 4. Hue-Angle Bin. Subdivisions of color space which groups the 99 referent values into 16 "bins" of like colors.
- I. CCT: Correlated Color Temperature. CCT is a measure of light source color appearance defined by the proximity of the light source's chromaticity coordinates to the blackbody locus, as a single number. For LED sources, CCT specified within this section shall be delivered CCT, not source CCT.

- J. Duv: A Duv value provides information on the distance and direction of color shift from the Planckian (blackbody) locus on the CIE 1976 u-v coordinates. When Duv value is closer to zero, the light source is more like the ideal blackbody source.
1. A Duv value of less than or equal to +/-0.015 at all CCTs is preferred.
- K. MacAdam Ellipse: In the study of color perception, MacAdam Ellipses refer to the region on a chromaticity diagram which contains all the colors which are perceptually indistinguishable to the average human eye, from the center of the ellipse. The contour of the ellipse therefore represents the noticeable differences in chromaticity. MacAdam Ellipses may be used to determine how close in color one light source will appear compared to the same light source used in adjacent fixtures.
1. A color variation range of three MacAdam Ellipses is acceptable.
 2. A color variation range of two MacAdam Ellipses is preferred.
 3. A color variation range of greater than three MacAdam ellipses is not acceptable.
- L. Flicker: Flicker is the amplitude modulation of light at frequencies that have effect of human physiology. Flicker may be perceptible to the human eye or imperceptible to the human eye.
1. All LED sources shall (be compliant with CEC JA8.4.6-2016 and exhibit "reduced flicker operation" which is defined as having percent flicker less than 30% at frequencies less than 200Hz, when tested at 100% and 20% of light output) provide visually flicker free operation throughout the dimming range specified on the specified control equipment.
- M. Audible Noise: Fixtures shall not emit audible noise above 24dBA measured at 1 meter from the light source when tested at 100% and 20% of full light output.

1.3 QUALITY ASSURANCE

- A. Fixture Materials: Provide fixture parts and components that are constructed of materials most appropriate to their use or function, and that are resistant to corrosion in a marine environment and mechanical stresses encountered in the normal application and function of the fixtures.
- B. Manufacturers: Provide fixtures from manufacturers making like products for not less than five years prior to bid.
- C. Listing and Labeling: Provide fixtures and accessory components specified in this Section that are listed and labeled for their indicated use and installation conditions on Project.
1. Special Listing and Labeling: Provide fixtures for use in damp or wet locations, and recessed in combustible construction, that are specifically listed and labeled for such use. Provide fixtures for use in hazardous (classified) locations that are listed and labeled for the specific hazard.
 2. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 3. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- D. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL, ETL, CSA-US or other Nationally Recognized Testing Laboratory.
- E. Applicable Codes: Fixtures shall be made and installed in accordance with the current version of the National Electric Code, the Uniform Building Code, the Federal Occupational Safety & Health Act, local codes, and other applicable regulations.

- F. Measuring and Testing Equipment: Instruments for the measurement of voltage, luminaire temperature, lighting level and fixture brightness level shall be available at all times on the site.

1.4 BIDS & SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, unless noted otherwise.
 - 1. Bids and submittals shall include itemized unit pricing by fixture type, as labeled in the Luminaire Schedule and Drawings. Unit pricing shall describe any special conditions, such as an adder for custom colors, quantity discount, special warranties, etc.
 - 2. The Lighting Designer will review up to two rounds of submittals for each fixture type. If fixture submittals are still not correct after the second review, then the Contractor shall reimburse the Lighting Designer for the time associated with additional reviews. Payment will be required prior to the additional review(s).
- B. Substitutions:
 - 1. Where multiple manufacturers are included in the specification, provide one of the specified manufacturers.
 - 2. When only a single manufacturer is listed in the specification, Contractor-offered substitutions must meet or exceed the aesthetic, dimensional and performance characteristics of the specified products. The lighting designer reserves the right to reject substitution submittals that do not meet the requirements of the application. In that event one of the specified products would have to be resubmitted.
 - 3. Some luminaires included in this specification are unique designs, available only from the specified manufacturer. No attempt shall be made to solicit bids from other manufacturers to copy or "knock-off" these luminaires.
 - 4. Some luminaires included in this specification are listed as having no alternate manufacturers. Where this is the case, it is because the lighting designer was unable to find a product for specification that met the requirements of the application. In these cases, the Contractor shall submit the specified product.
- C. Product Data: Fixtures, LED sources, drivers, transformers, and mounting components. Arrange Product Data for fixtures in order of fixture type, as labeled in the Luminaire Schedule. Include data on features and accessories and the following:
 - 1. Outline drawings indicating dimensions and principal features of fixtures.
 - 2. Electrical Ratings and Photometric Data: Certified results of independent laboratory tests for fixtures and lamps. Provide data for the specified lamp or lamp/ballast combination.
 - 3. LED Data: Manufacturer, ordering code and technical information.
 - 4. Driver Data: Manufacturer, ordering code, and technical information.
 - a. Where dimming is specified, technical data must specify dimming range provided by the driver.
 - b. Where multiple dimming curves are available, the dimming curve type shall be clearly indicated.
 - c. Dimming typology shall be clearly indicated.
 - d. If the driver is dimmable by means of 0-10v control, the low voltage control source current as defined in IEC 60929 Annex E shall not exceed 2ma. The Contractor shall provide this information for each driver type to the dimming system manufacturer for confirmation that the sinking capacity of the dimming control will not be exceeded.
 - e. Prior to release of the fixture package and lighting control package, electrical distributor

and controls manufacturer must review driver load information to confirm control system is appropriately ordered to accommodate approved fixtures. This exercise must include confirming loading of both high voltage and low voltage attributes ensuring compatibility of any control system current or voltage limitations.

- D. Provide data as required to demonstrate that the submitted product meets or exceeds the performance of the specified fixture.
 - 1. Include photometric data charts: candlepower distribution and/or luminance information, as necessary.
 - 2. Where technical charts alone cannot substantiate compliance, the submitting manufacturer may be required to provide a full photometric study of a specific project application for verification.
 - 3. Provide chromaticity information on fixture including, but not limited to, CCT and Duv for comparison across submitted fixtures and to original specification.
- E. Scaled shop drawings detailing nonstandard fixtures and indicating dimensions, weights, method of field assembly, components, features, and accessories. Details shall be scaled at not less than half full size.
 - 1. Scaled shop drawings of continuous run fixtures shall indicate overall length of each run, LED combinations used to achieve the length and any accessory components required.
 - a. Track and illuminated handrails are considered continuous run fixtures.
- F. Wiring diagrams detailing wiring for control system coordination showing both factory-installed and field-installed wiring for specific system of this Project and differentiating between factory-installed and field-installed wiring.
- G. Coordination Drawings showing fixtures mounted on, in, or above ceiling. Indicate coordination with ceiling grids and other equipment installed in vicinity.
- H. Product certificates signed by manufacturers of lighting fixtures certifying that their products comply with specified requirements.
- I. Field test reports indicating and interpreting test results specified in Part 3 of this Section.
- J. Maintenance data for fixtures, LED sources and drivers, to include in the operation and maintenance manual specified in Division 1.
 - 1. Data shall include warranty information, LED source and driver life and replacement costs, as well as other fixture information required in Division 1.

1.5 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall be in addition to, and run concurrent with, other warranties made under requirements of the Contract Documents.
- B. Special Warranty for Exterior Luminaire Finish: Submit a written warranty signed by manufacturer and Installer agreeing to replace external parts of lighting fixtures exhibiting a failure of finish as specified below. This warranty is in addition to, and not a limitation of, other rights and remedies specified elsewhere within the Contract Documents.
 - 1. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish due to weathering.

2. Color Retention: Warranty against fading, staining, and chalking due to effects of weather and solar radiation.
 3. Special Warranty Period: 5 years from date of Substantial Completion.
- C. LED Luminaire Warranties: Warrant complete LED systems, including LEDs, drivers, and all other system components for 5 years minimum against failure, variation in color temperature beyond plus/minus 200K, and depreciation of output below 70%. The manufacturer's warranty period starts on the product's shipment date.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Luminaires and lighting equipment shall be delivered to the project complete, including mounting devices, LED sources and components necessary for the proper operation of the equipment.
- B. Marking: All equipment must be clearly and boldly identified as to the fixture type and, where practicable, the fixture location.
1. Voltage identification: Fixtures designed for voltages other than 110-125 volt circuits shall be clearly marked.
 2. LED source and gear coordination: Fixtures equipped with drivers, transformers, or other components requiring use of specific types of LEDs shall be plainly marked. Markings must be clear and shall be located to be readily visible to service personnel but invisible from normal viewing angles when the LED source is in place.
- C. Timely Purchase: Luminaires and other allied equipment shall be ordered in a timely fashion and securely stored to be available to meet the project schedule.
- D. Storage: Contractor shall store all luminaires and associated gear in locations where they will be protected against damage due to moisture, dust, extreme temperatures and/or the work of other project construction trades.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
1. Lamps: 10 lamps for every 100 of each type and rating installed. Furnish at least one of each type.
 2. Diffusers and Lenses: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
 3. Transformers and Drivers: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
 4. Lenses, Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.
 5. Louvers and Reflector Cones: 1 for every 100 of each type. Furnish at least one of each type.
 6. Custom Luminaires: When 10 identical custom fixtures are furnished, furnish one complete spare custom fixture as attic stock.
 7. LED Modules and Boards: 1 for every 50 of the same type, from the same production run as the installed products.
 8. Tools: Furnish manufacturer's recommended number of each tool required to service and maintain the fixtures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: For lighting fixtures to be incorporated into the Work, see the products specified in the Luminaire Schedule at the end of this Section.

2.2 FIXTURE COMPATIBILITY WITH PREVIOUS VERSIONS

- A. If this project is bid and/or built out in multiple phases or fixtures are supplied in multiple batches, then the products approved for the first phase of construction and/or first batch of fixtures to be supplied shall become the project standards.
- B. Fixtures also used in subsequent phases or supplied in later batches shall be of the same make and model as the project standards, ensuring uniformity in appearance, performance, and maintenance procedures.
- C. All component parts must remain consistent through fixture redesigns and technology upgrades and must be cross compatible with the same fixtures provided for previous phases of construction and/or batches provided previously. Component parts for attic stock must fit and work/operate within the same fixture type regardless of phase of installation or batch supplied.
- D. The intent of this requirement is that the Owner will be required to store only one type of component for each fixture type and that replacement parts will fit in the fixture regardless of when the fixture was installed or supplied to the project.

2.3 FIXTURES AND FIXTURE COMPONENTS, GENERAL

- A. Sheet Metal Components: Provide the required dimensional thickness of metal, plastic, and composite materials so that all fixtures are rigid, stable and will resist deflection, twisting and warping under normal installation or during replacement of the LED source or driver.
 - 1. All luminaire housings shall be minimum 0.84mm cold rolled steel unless a heavier gauge is specified or required by code.
 - 2. All aluminum extrusion housings shall be minimum 5mm thick.
 - 3. All spun, hydro-formed or sheet aluminum reflectors shall be fabricated from #12 aluminum sheets minimum, 1.45mm or heavier. Material shall be 3002 alloy, 99.5% pure aluminum with uniform grain structure.
 - 4. All spun aluminum housings shall be of an alloy of the 5000 series (ANSI/ASTM-B209-1977) or of an alloy that is found to have equal corrosion resistance.
- B. Joints: Provide positive, durable, means of connection at all joints as required. No hollow rivets, unless specifically approved.
- C. Gaskets: Provide neoprene, silicone, rubber, or other appropriate gaskets, stops, and barriers where required to prevent light leak, control sound and vibration, prevent water leaks and, if pertinent, water vapor penetration.

- D. Edges: Provide finished product with the following minimum qualities:
1. Ground and/or burr free metal edges.
 2. Tight fitting connections, hinges, and closures.
 3. Clean neat corners, edges, trims, and frames.
- E. Castings: All cast parts, including die-cast members, shall be of uniform quality; free from blow holes, pores, hard spots, shrinkage defects, cracks and or other imperfections that affect strength and appearance, or are indicative of inferior metals or alloys.
- F. Reflecting Surfaces: Minimum reflectance as follows, except as otherwise indicated:
1. White Surfaces: 85 percent.
 2. Specular Surfaces: 83 percent.
 3. Diffusing Specular Surfaces: 75 percent.
 4. Laminated Silver Metallic Film: 90 percent.
- G. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or water-white, annealed crystal glass, except as otherwise indicated. Soda-lime glass lenses are not acceptable. Heat resistant where required: borosilicate or Pyrex glass.
1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 2. Lens Thickness: 0.125-inch (3 mm) minimum; except where greater thickness is indicated.
- H. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit replacement of the LED source and integral drivers with a minimum of fasteners. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during LED replacement and when secured in operating position.
- I. Exposed Hardware Material: Stainless steel.
- J. Fixture Support Components: Comply with Specification Section on "Basic Electrical Materials and Methods."
1. Single-Stem Hangers: 1/2-inch (12-mm) steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.
 2. Twin-Stem Hangers: Two, 1/2-inch (12-mm) steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.
 3. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
 4. Hook Hanger: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
 5. Aircraft cable: Minimum 1/16" diameter aircraft cable, 48" length, field adjustable, with canopy size to match at feed and non-feed locations, and 18/3, 18/4 or 18/5 straight flexible cord, U.O.N. Canopy finish to match ceiling.
- K. Track-Lighting Systems: Provide components, including track, fittings, and fixtures, from same manufacturer and as recommended by manufacturer for intended use.
1. Maintain a continuity of conductors through feeds, splices, and boxes. The relative positions of live and neutral conductors must always be maintained along a continuous run so that track fittings connect into the track in a consistent manner.
 2. Install surface mounted track straight and true regardless of the ceiling contour.

- L. Cast-in Fixtures: Housings installed directly in concrete shall be fabricated of hot dip galvanized steel or cast aluminum. Where cast aluminum housings are used, give two coats of asphaltum paint prior to installation. To prevent direct contact of housings to concrete, 3 mm thick x 51 mm diameter solid neoprene grommets shall be furnished at every point light fixture surfaces are mounted to concrete structure.

2.4 FINISHES

- A. Manufacturer's standard, except as otherwise indicated, applied over corrosion-resistant treatment or primer, free of streaks, runs, holidays, stains, blisters, and similar defects.
 1. Prior to finishing, all surfaces must be free from foreign materials such as dirt, rust, oil, polishing compounds and mold release agents.
 2. Where necessary, surface cleaned by accepted chemical means shall receive corrosion inhibiting phosphating treatment assuring positive paint adhesion.
 3. All castings and extrusions shall be machined, sanded, or similarly treated, and given minimum one coat of baked-on clear methacrylate lacquer, unless a painted finish is specified.
 4. Aluminum surfaces exposed to weather (other than anodized reflectors covered elsewhere) receive a duronodic or polyester powder paint finish as specified for corrosion resistance.
 5. Sheet steel fixture housings, iron and steel parts, which have not received phosphating treatment ("Bonderizing" or similar process) or are to be utilized in exterior applications, are to be made corrosion resistant by zinc or cadmium plating or hot-dip galvanizing. All plating or hot dipping shall be performed after parts are fabricated.
 6. Anodized aluminum reflectors required for exterior use shall have a minimum of 0.2 mils anodizing thickness.
 7. Anodized reflectors for interior use shall have a minimum of .006mm (.25mils) anodizing thickness for clear reflectors. Specular reflectors shall have 86% to 91% reflectivity. All reflectors shall be double sealed, first in Nickel Acetate and then in Sandoz Andal sealant at a minimum of 208 deg. All Specular reflectors shall meet or exceed the specification for the Alzak process.

2.5 LED SOURCES

- A. Available Products: LED sources within a fixture family of the same type shall be supplied from the same manufacturer to ensure color consistency. All individual LEDs used within a luminaire must be manufactured by a reputable LED manufacturer, such as: Cree, Osram Sylvania, Nichia, Philips (Lumileds) or approved equal. LED modules shall be manufactured by a reputable LED manufacturer such as: Bridgelux, Philips (Fortimo) or Xicato. Where a specific LED manufacturer has been indicated in the Luminaire Schedule within this Section, lamps shall be supplied from the named manufacturer only, unless approval for specific substitutions is requested by the Contractor and granted by the Lighting Designer.
- B. Testing: All products shall be tested by a Nationally Recognized Testing Laboratory (NRTL) in accordance with IES LM-79 testing methods and shall carry a UL, ETL or CSA label. Fixture manufacturer shall confirm in writing that the LEDs within the fixture will not exceed the maximum temperature to which the LED die was tested using IES LM-80 testing methods.
- C. Drive Current, Thermal Management and LED rated Life: Drivers must not over-drive the LEDs beyond LED manufacturer's recommendations and shall adhere to device manufacturer guidelines, certification programs, and test procedures for thermal management of LEDs within their fixtures. Drive current and luminaire thermal design must ensure minimum 50,000 hour rated life for the LEDs.
- D. Color Temperature and CRI: 3000K, 90 CRI, unless otherwise noted.

- E. Color Consistency: All LEDs from the same manufacturer, both within each luminaire and from luminaire to luminaire, must be batch-sorted for visual color and brightness consistency. All luminaires of the same type shall be supplied at the same time and shall come from the same batch. Spare luminaires shall be provided from the same batch.
- F. Dimming: Luminaire manufacturer must provide specific data on the means of dimming for coordination of the proper control device (specified elsewhere). Dimming must provide uniform, smooth, flicker free, full-range dimming. LEDs must maintain consistent brightness and color throughout the dimming range.
- G. Flicker (Also noted under Definitions, Part 1.2, L., 1.): All LED sources shall (be compliant with CEC JA8.4.6-2016 and exhibit "reduced flicker operation" which is defined as having percent flicker less than 30% at frequencies less than 200Hz, when tested at 100% and 20% of light output) provide visually flicker free operation throughout the dimming range specified on the specified control equipment.
- H. LED Retrofit Lamps: CCT of 2700K or 3000K and minimum 80 CRI except as otherwise indicated. Lamps to be flicker free within dimming range specified. Lamps shall be dimmable unless otherwise noted. Lamps must be rated for the application where being used.
- I. Technology Upgrades: Supply the newest LED technologies that are available for the specified products when the orders are released, as long as there are no increases in input watts or cost.
- J. Burn-in Period: LED sources in hard to access locations shall be burned in for a 300-hour (2-week) period prior to removal of scaffolding or other access methods.
- K. Warranty: See Part 1.5 C. above for the warranty requirement for LED luminaire systems.

2.6 LAMP HOLDERS

- A. Where required for retrofit LED lamps, screw base sockets shall be of heavy-duty heat-resistant porcelain with spring center contacts and plated screw shells.

2.7 LED DRIVERS

- A. Drivers shall meet the following requirements:
 1. Minimum efficiency of 85%.
 2. Starting Temperature: -40° C.
 3. Input Voltage: capable of 120 to 480 (±10%) volt, single phase or as required by the site.
 4. Power supplies can be UL Class I or II output.
 5. Surge Protection: The system must survive 250 repetitive strikes of "C Low" (C Low – 6kV/1.2 x 50 µs, 10kA/8 x 20 µs) waveforms at 1-minute intervals with less than 10% degradation in clamping voltage. "C Low" waveforms are as defined in IEEE/ASNI C62.41.2-2002, Scenario 1 Location Category C.
 6. Power Factor (PF) of: ≥ 0.90.
 7. Total Harmonic Distortion (THD) of: ≤ 20%.
 8. Comply with NEMA 410-2015 standards for inrush current.
 9. Comply with FCC 47 cfr part 18 non-consumer RFI/EMI standards.
 10. Where dimming is specified, drivers shall provide smooth, flicker free dimming within the range specified.
 11. Drivers shall be Reduction of Hazardous Substances (RoHS) compliant (see <http://www.rohs.eu/english/index.html>).

2.8 TRANSFORMERS

- A. Suitability: Transformers shall be of the best quality and meet the following requirements:
1. Where possible transformers shall have an integral line voltage switch.
 2. All transformers shall be locally fused or have secondary side breakers.
 3. Provide adequate ventilation to meet code and manufacturers requirements concerning temperature rise.
 4. Remote transformer quantities and sizes for low voltage lighting shall be coordinated/ determined according to final loads based on final lighting fixtures and control zones specified for the project. Each fixture shall require a separate feed from the transformer to the lighting fixture. Feed lengths to lighting fixtures within a zone shall be uniform in length, or each run sized accordingly to provide a uniform voltage to all fixtures; excess wiring shall not be coiled. Acceptable voltage supplied at the fixture shall not exceed the rated lamp voltage nor drop more than 5% below that rated voltage. All wiring from transformers to low voltage lighting fixtures shall be sized to compensate for voltage drop, which will be determined by the load, voltage, and length of run, based on the final coordinated accessible location of the remote transformer. All transformers shall be suitable for dimming their primary side, via a remote lighting control system.
 5. A remotely located transformer must be coordinated with its manufacturer based on, but not limited to, the following factors:
 - a. Steady state operating current of the sources controlled must not exceed the rating of the transformer's overcurrent protection.
 - b. Inrush current of the sources controlled must not exceed the rating of the transformer's overcurrent protection.
 - c. Transformer shall have multiple secondary-side voltage taps to allow field adjustment of under-voltage or over-voltage conditions to meet the source's secondary-side voltage rating.
 - d. Transformers shall be sized up in capacity so that the load does not reduce the source's full range dimming performance. Do not load to capacity. Consult the transformer manufacturer for recommendations on loading based on the sources and dimmer being used.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's written instructions and approved Shop Drawings. Support fixtures according to requirements of Specification Section on "Basic Electrical Materials and Methods."
1. Install square aperture fixtures parallel to walls; UON. Verify that fixture is parallel prior to completion of ceiling installation.
 2. Verify that wall washer housings have been properly installed to allow for reflector orientation to wash the intended wall.
- B. Support for Recessed and Semi-recessed Grid-Type Fixtures: Units may be supported from suspended ceiling support system, unless prohibited by local codes. No movement permitted after installation. Install ceiling support system rods or wires at a minimum of 4 rods or wired for each fixture, located not more than 6 inches (150 mm) from fixture corner.
1. Install support clips for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture corner.

2. Fixtures Smaller than Ceiling Grid: For fixtures that normally mount at the ceiling grid on at least one side, install a minimum of 4 rods or wires for each fixture and locate at corner of ceiling grid where fixture is located. Provide additional ceiling grid to frame out fixture. Do not support fixtures by ceiling acoustical panels. Example: 1x4 fixture in 2x4 panel.
 3. Fixtures of Sizes Less than Ceiling Grid: Center in acoustical panel. Support fixtures independently with at least two ¾ inch (20 mm) metal channels spanning and secured to ceiling tees. Example: Recessed 6" aperture downlight in 2x2 panel.
- C. Support for Suspended Fixtures: Brace pendants and rods over 48 inches (1200 mm) long to limit swinging. Support stem-mounted, single-unit, suspended fluorescent fixtures with twin-stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod or aircraft cable for suspension for each unit length of chassis, including one at each end.
1. Provide all mounting components required for installation, including hickies, stud-extensions, ball-aligners, canopies and stems.
 2. Provide stems on pendant fixtures of the correct length to uniformly maintain the fixture heights shown on the drawings or established in the field.
- D. Fixture Attachment with Adjustable Features or Aiming: Attach fixtures and supports to allow aiming for indicated light distribution. Do not screw through housings in a manner that will restrict lamp adjustability. Confirm requirements based on manufacturers' cut sheets or contact manufacturer if necessary to verify mounting method.
1. Recessed fixtures shall be mounted within standard depth ceiling thicknesses, typically ¾" to 1" maximum, depending on fixture. Align the bottom of the collar with the bottom of the ceiling. Contractor shall confirm all ceiling conditions with fixtures being installed based on manufacturers' cut sheets. Note that although some manufacturers may offer an extra-deep collar as an option, those collars may compromise the light distribution and/or output and are not acceptable. For locations where thick ceilings are being used, consult the Lighting Designer for direction.
- E. Retrofit LED Lamping: Where specific lamp designations are not indicated, lamp units according to manufacturer's instructions. Lamps used in enclosed fixtures shall be rated for that application.
- F. Recessed Light Fixtures or Other Components Mounted within Special Ceiling Conditions:
1. Fixtures or components being mounted within plenum ceilings require housing rated for this purpose. All associated wiring must be plenum rated or enclosed within conduit. Where a rated housing is not available, the housing must be fully enclosed within an architectural box or plenum rated metal enclosure above the ceiling. See Part 3.1 I. below regarding requirements for fixture enclosures.
 2. Fixtures being mounted within fire-rated ceilings must be rated for this purpose.
 3. Fixtures being mounted in direct contact with insulation shall be provided with an IC-rated housing.
 4. Fixtures being mounted in ceilings that abut unconditioned attic space or the exterior roof shall be supplied with an IC/air-tight housing.
- G. Architectural Enclosures for Light Fixtures: Any construction surrounding a light fixture that is not part of the fixture itself.
1. Cavity not to exceed maximum operating temperature range of fixture as reported by fixture manufacturer. Consult fixture manufacturer for minimum space required around fixtures.
 2. Cavity to be light tight with no light leaks.

- H. Installation Sequence: Install fixture mounting frames, plaster rings, etc. prior to the trim assembly, which shall not be installed until the project is "broom clean". Where the fixture location or construction does not permit sequential installation, all reflectors, lenses, flanges and other visible surfaces shall be carefully protected.

3.2 WIRING

- A. Minimum standards: All wiring shall comply with the following standards:
 1. All wiring within lighting fixtures or from the splice with the building wiring shall be as specified under Division 26 "Wire and Cables".
 2. Wiring within fixture construction is to be concealed, except where the fixture design or mounting dictates otherwise.
 3. Joints in wiring within lighting fixtures and connections of the fixture wiring to the wiring of the building shall be as specified under "WIRE AND CABLES" with special attention to paragraphs relating to high amperage, low voltage conditions.
 4. Wiring channels and wireways shall be free from projections and rough or sharp edges throughout, and at all points or edges over which conductors must pass and may be subject to injury or wear.
 5. Insulated bushings shall be installed at points of entrance and exit of flexible wiring.

3.3 CLEARANCES

- A. Install fixtures to be compliant with NEC Article 410 regarding minimum clearances to insulation and other combustible materials.

3.4 GROUNDING

- A. Ground fixtures according to Specification Section on "Grounding." Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values.

3.5 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components, prior to scheduling punchlist review.
- B. Give advance notice of dates and times for field tests.
- C. Provide instruments to make and record test results.
- D. Tests: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source.
- E. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.
- F. Report results of tests.
- G. Replace fixtures that show evidence of corrosion during Project warranty period.

3.6 CLEANING AND ADJUSTING

- A. Clean fixtures after installation: Remove all protective strippable coatings, dust, finger marks, paint spots and any materials deleterious to the appearance or functioning of the fixtures. Use methods and materials recommended by manufacturer. Abrasive cleaners are not permitted.
- B. Focusing and adjustment: After installation of all lighting fixtures, finishes and furnishings has been completed, the Contractor shall provide personnel, ladders and/or lifts, spare lamps, where applicable, and any other equipment necessary to expeditiously focus (aim) all adjustable lighting. Some preparation work may begin during daylight hours. However, primary focusing work shall be performed after dark, unless all visible daylight can be screened out of the focusing area, and the work shall take place under supervision of the Lighting Designer. All work shall be performed in accordance with union rules, should they be in force, and applicable codes. Where pre-aiming diagrams or angles have been provided by the Lighting Designer, this information shall be considered preliminary aiming, which is being provided to help expedite the night focusing. Pre-aiming by the Contractor does not eliminate the requirement for final focusing after dark. Prior to the final focusing trip(s), the Consultant will provide to the Contractor with a memo outlining the number of electricians, ladders and/or lifts necessary to complete the work within the Consultant's site visit timeframe. Contractor's personnel on site during focusing must be able to turn specific lighting zones on/off and adjust/program light levels.
- C. Lighting interface with dimming control systems: Where lighting is being controlled on a dimming system (not specified within this Section), the system shall be up and running at the time of final focusing so that the Lighting Designer may provide input on dimmed preset levels.
 - 1. The Electrical Contractor and technical representative from the dimming manufacturer shall test the dimming system to ensure that all zones are as indicated in the Contract Documents.
 - a. Zones shall be labeled within the dimming control system according to the Lighting Designer's zoning diagrams. When a single control zone as noted by the Lighting Designer's zoning diagram is powered by multiple circuits, the dimming system manufacturer's technician shall group these circuits together into one control zone for programming purposes in advance of the programming session with the Lighting Designer.
 - b. A single room/space shall have a single interface point, whether for physical or wireless communication, for setting light levels so that the entire room/space may be evaluated at one time.
 - 2. The Electrical Contractor and technical representative from the dimming manufacturer shall test every zone to ensure smooth, flicker free dimming from 100% maximum to the minimum extent specified. Where dimming range in the field does not conform to the maximum and minimum levels set forth in the specification, the Electrical Contractor must make any necessary adjustments to the dimming system to achieve the target dimming range.
 - 3. These items shall be confirmed in writing by the Electrical Contractor prior to the final focusing site visit by the Lighting Designer.
 - 4. Technical personnel from the dimming manufacturer shall be on hand at final focusing to adjust the light levels and coordinate with the Lighting Designer. Note that nighttime work hours may be required per Part 3.6, B. above.
 - 5. If the dimming system is not fully operational and working properly at the time of final focusing, and the Lighting Designer cannot perform the required focusing and punch listing work and/or set-up the preset light levels during their contracted site visit(s) where required, then the Contractor shall be responsible for covering the Lighting Designer's fee and expenses for a follow-up site visit for this purpose.

3.7 FINAL INSPECTION

- A. Upon completion of the installation, lighting equipment must be in first class operating order and free from defects in condition and finish.
- B. “Final Inspection” and the “Focusing and Adjustment” site visit by the Lighting Designer are one and the same.
 - 1. At time of final inspection by the Lighting Designer, all fixtures and equipment must be installed and operational and be complete with all lenses, diffusers, reflectors, side panels, louvers, or other necessary components. LED sources that have already burned out must be replaced prior to final completion.
 - 2. Fixtures shall be completely clean and free from finger marks, dust, plaster, or paint spots.
 - 3. Any reflectors, lenses, diffusers, side panels or other parts damaged prior to the final inspection shall be replaced.
 - 4. Where finish has been scratched or damaged on exterior fixtures, repair finish to match factory color.
 - 5. Housings shall be rigidly installed and adjusted to a neat flush fit with the ceiling.
 - 6. No light leaks shall be permitted at the ceiling line or from any visible part or joint.
- C. LED sources shall have been burned-in as required in Parts 2.4, J.
- D. After issuance of the Lighting Designer’s final punch list, it is the responsibility of the Contractor to make all adjustments and corrections as noted in the punch list.

PART 4 - LUMINAIRE SCHEDULE

Types not included in base bid (OFCI): L8,L9, L10, L11, L12, L13, L14, L21, L21A, L23, L23A, L26

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L1	Recessed 5 7/8" L X 1 3/4" W 5-cell downlight <u>Location:</u> ILR Hub 200	<u>CCT:</u> 3500K <u>CRI:</u> 90 <u>Lumens:</u> 851lm/ft <u>Watts:</u> 12.6W <u>Voltage:</u> 120-277V <u>Driver:</u> Integral <u>Dimming Range:</u> 100-15% <u>Dimming Type:</u> 0-10V, 4-wire	IGUZZINI "Laser Blade Original" ILB05-(mounting)-IC-035-WF-UNV-(finish)-D10 <ul style="list-style-type: none"> ▪ Architect to verify trim or trimless mounting and flange finish if trim detail is used ▪ Electrical Engineer to coordinate emergency lighting & control options as required ▪ Contractor to coordinate mounting with ceiling type ▪ Housing with hanger bars system for new construction installation ▪ Contractor to coordinate ceiling thickness per manufacturer's requirements Or equal by <ul style="list-style-type: none"> ▪ LUMENWERX - "Cluster Downlight" ▪ ACULUX – "Lini 1" Linear Downlight"

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than 3/4" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L2	<p>Recessed 3" diameter aperture downlight</p> <p><u>Location:</u> Multiple</p>	<p>White LED</p> <p><u>CCT:</u> 3500</p> <p><u>CRI:</u> 90</p> <p><u>Beam:</u> 60°</p> <p><u>Lumens:</u> 1360lm</p> <p><u>Watts:</u> 15W</p> <p><u>Voltage:</u> 120-277</p> <p><u>Driver:</u> Integral</p> <p><u>Dimming Range:</u> 100-1%</p> <p><u>Dimming Type:</u> 0-10V, 4-wire</p>	<p>LUCIFER LIGHTING</p> <p>"FRAXION 3 SLIM FIXED"</p> <p>F3R-M-1-F-(flange finish-baffle finish)-90S15A-35-60-Y-(ceiling thickness)-SG/SN-04</p> <ul style="list-style-type: none"> ▪ Architect to specify flange and baffle finishes ▪ Electrical Engineer to coordinate driver option (SG or SN) ▪ Contractor to coordinate ceiling thickness and mounting with ceiling type <p>Or equal by</p> <ul style="list-style-type: none"> ▪ USAI - "BeveLED Mini" ▪ Visual Comfort – "Element 3 LED"
L2A	<p>Recessed 3" diameter aperture high output downlight</p> <p><u>Location:</u> Multiple</p>	<p>White LED</p> <p><u>CCT:</u> 3500</p> <p><u>CRI:</u> 90</p> <p><u>Beam:</u> 60°</p> <p><u>Lumens:</u> 1850lm</p> <p><u>Watts:</u> 21W</p> <p><u>Voltage:</u> 120-277</p> <p><u>Driver:</u> Integral</p> <p><u>Dimming Range:</u> 100-1%</p> <p><u>Dimming Type:</u> 0-10V, 4-wire</p>	<p>LUCIFER LIGHTING</p> <p>"FRAXION 3 SLIM FIXED"</p> <p>F3R-M-1-F-(flange finish-baffle finish)-90S21A-35-60-Y-(ceiling thickness)-SG/SN-04</p> <ul style="list-style-type: none"> ▪ Architect to specify flange and baffle finishes ▪ Electrical Engineer to coordinate driver option (SG or SN) ▪ Contractor to coordinate ceiling thickness and mounting with ceiling type <p>Or equal by</p> <ul style="list-style-type: none"> ▪ USAI - "BeveLED Mini" ▪ Visual Comfort – "Element 3 LED"

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than ¾" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L2B	<p>Recessed 3" diameter aperture high output downlight</p> <p><u>Location:</u> Café Seating Area , Café Servery</p>	<p>White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Beam:</u> 60° <u>Lumens:</u> 1850lm <u>Watts:</u> 21W <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire</p>	<p>LUCIFER LIGHTING "FRAXION 3 SLIM FIXED" F3R-M-1-F-(flange finish-baffle finish)-90S21A-35-60-Y-(ceiling thickness)-SG/SN-04</p> <ul style="list-style-type: none"> ▪ Architect to specify flange and baffle finishes ▪ Electrical Engineer to coordinate driver option (SG or SN) ▪ Contractor to coordinate ceiling thickness and mounting with ceiling type <p>Or equal by</p> <ul style="list-style-type: none"> ▪ USAI - "BeveLED Mini" ▪ Visual Comfort – "Element 3 LED"
L2C	<p>Recessed 3" diameter aperture high output downlight at wood ceiling</p> <p><u>Location:</u> Dean's Assis 403</p>	<p>White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Beam:</u> 60° <u>Lumens:</u> 1850lm <u>Watts:</u> 21W <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire</p>	<p>LUCIFER LIGHTING "FRAXION 3 SLIM FIXED" F3R-M-1-F-(flange finish-baffle finish)-90S21A-35-60-Y-(ceiling thickness)-SG/SN-04</p> <ul style="list-style-type: none"> ▪ Architect to specify flange and baffle finishes ▪ Electrical Engineer to coordinate driver option (SG or SN) ▪ Contractor to coordinate ceiling thickness and mounting with ceiling type <p>Or equal by</p> <ul style="list-style-type: none"> ▪ USAI - "BeveLED Mini" ▪ Visual Comfort – "Element 3 LED"

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than ¾" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L3	Recessed 3" diameter aperture wallwasher <u>Location:</u> Multiple	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Beam:</u> Wallwash <u>Lumens:</u> 1589 lm <u>Watts:</u> 21W <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	LUCIFER LIGHTING "FRAXION 3 SLIM WALLWASH" F3R-M-1-W-(flange finish-baffle finish)-90S21A-35-WW-Y-(ceiling thickness)-SG/SN <ul style="list-style-type: none"> ▪ Architect to specify flange and baffle finishes ▪ Electrical Engineer to coordinate driver option (SG or SN) ▪ Contractor to coordinate ceiling thickness and mounting with ceiling type Or equal by <ul style="list-style-type: none"> ▪ USAI - "BeveLED Mini" ▪ Visual Comfort – "Element 3 LED"
L3A	NOT USED		
L3B	NOT USED		

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than ¾" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L4	<p>Recessed 2" dia. aperture downlight</p> <p><u>Location:</u> Reception 202</p>	<p>White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Beam:</u> 50° <u>Lumens:</u> 779 lm <u>Watts:</u> 10W <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire</p>	<p>LUCIFER LIGHTING "ATOMOS2 UNIVERSAL" A2RS-F-1-W-(flange finish-baffle finish)- FD-N-9010D-35-50-4-SG/SN</p> <ul style="list-style-type: none"> ▪ Architect to specify flange and baffle finishes ▪ Housing depth 5.52" ▪ Max ceiling thickness 2" ▪ Electrical Engineer to coordinate driver option (SG or SN) ▪ Contractor to coordinate ceiling thickness and mounting with ceiling type <p>Or equal by</p> <ul style="list-style-type: none"> ▪ USAI - "the LittleTwos" ▪ Visual Comfort – "Element 2 LED"
L5	<p>Recessed 2.6" wide perimeter linear wall grazer</p> <p><u>Location:</u> Multiple</p>	<p>White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 750 lm/ft <u>Watts:</u> 7.6W/ft <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire</p>	<p>LUMENWERX "VIA 3 PERIMETER" V3PERD-HLO-SW-90CRI-750LMF-35K-(length)-UNV-D1-1C-(mounting)-(finish)-NEF</p> <ul style="list-style-type: none"> ▪ Architect to specify finish ▪ Contractor to coordinate run length based on field dimensions ▪ Contractor to coordinate mounting with ceiling type ▪ No end flanges (NEF) option ▪ Manufacturer's shop drawings are required for final approval <p>Or equal by</p> <ul style="list-style-type: none"> ▪ AXIS - "Beam3 Perimeter Linear" ▪ SELUX – "M36 Recessed Perimeter"

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than ¾" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L5A	<p>Recessed 2.6" wide perimeter linear wall grazer at soffit</p> <p><u>Location:</u> Café Seating Area , Café Servery</p>	<p>White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 500 lm/ft <u>Watts:</u> 5.3W/ft <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire</p>	<p>LUMENWERX "VIA 3 PERIMETER" V3PERD-HLO-SW-90CRI-500LMF-35K-(length)-UNV-D1-1C-(mounting)-(finish)-NEF</p> <ul style="list-style-type: none"> ▪ Architect to specify finish ▪ Contractor to coordinate run length based on field dimensions ▪ Contractor to coordinate mounting with ceiling type ▪ No end flanges (NEF) option ▪ Manufacturer's shop drawings are required for final approval <p>Or equal by</p> <ul style="list-style-type: none"> ▪ AXIS - "Beam3 Perimeter Linear" ▪ SELUX – "M36 Recessed Perimeter"
L6	NOT USED		

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than ¾" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L7	Pendant mounted 3"W x 4.25"H linear direct/indirect fixture <u>Location:</u> Multiple	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 350 lm/ft (indirect), 750 lm/ft (direct) <u>Watts:</u> 8.5W/ft total <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	LUMENWERX "VIA 3 PENDANT" VIA3P-DI-HLO-FH-TIO-SW-90CRI-750LMF-350LMF-35K-(length)-UNV-D1-2C-(emergency section)-(mounting)-(finish) <ul style="list-style-type: none"> ▪ Architect to specify finish ▪ Contractor to coordinate run lengths per architectural drawings ▪ Contractor to coordinate mounting with ceiling types; either on ceiling tile or ceiling grid ▪ Direct and indirect lights to be controlled individually ▪ Electrical Engineer to coordinate emergency lighting requirement Or equal by <ul style="list-style-type: none"> ▪ AXIS - "Beam3 Pendant" ▪ SELUX - "M36 Pendant"

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than 3/4" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L7A	Pendant mounted 3"W x 4.25"H linear high output direct/indirect fixture <u>Location:</u> Multiple	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 500 lm/ft (indirect), 750 lm/ft (direct) <u>Watts:</u> 9.8W/ft total <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	LUMENWERX "VIA 3 PENDANT" VIA3P-DI-HLO-FH-TIO-SW-90CRI-750LMF-500LMF-35K-(length)-UNV-D1-2C-(emergency section)-(mounting)-(finish) <ul style="list-style-type: none"> ▪ Architect to specify finish ▪ Contractor to coordinate run lengths per architectural drawings ▪ Contractor to coordinate mounting with ceiling types; either on ceiling tile or ceiling grid ▪ Direct and indirect lights to be controlled individually ▪ Electrical Engineer to coordinate emergency lighting requirement Or equal by <ul style="list-style-type: none"> ▪ AXIS - "Beam3 Pendant" ▪ SELUX - "M36 Pendant"

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than 3/4" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L7B	<p>Pendant mounted 3"W x 4.25"H linear direct/indirect fixture</p> <p><u>Location:</u> Vestibule 308</p>	<p>White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 350 lm/ft (indirect), 500 lm/ft (direct) <u>Watts:</u> 6.6W/ft total <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire</p>	<p>LUMENWERX "VIA 3 PENDANT" VIA3P-DI-HLO-FH-TIO-SW-90CRI-500LMF-350LMF-35K-(length)-UNV-D1-2C-(emergency section)-(mounting)-(finish)</p> <ul style="list-style-type: none"> ▪ Architect to specify finish ▪ Contractor to coordinate run lengths per architectural drawings ▪ Contractor to coordinate mounting with ceiling type ▪ Direct and indirect lights to be controlled individually ▪ Electrical Engineer to coordinate emergency lighting requirement <p>Or equal by</p> <ul style="list-style-type: none"> ▪ AXIS - "Beam3 Pendant" ▪ SELUX – "M36 Pendant"
L8 OFCI	<p>Decorative 11.1"W x 9.6"H x 11.1"L pendant - small</p> <p><u>Location:</u> ILR Hub 200, Reception 202, Lounge 300</p>	<p>White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 551 lm <u>Watts:</u> 15W <u>Voltage:</u> 120 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> Phase dimming</p>	<p>LOUIS POULSEN "DOO-WOP" Canopy: White Cord: 18 AWG white PVC Cord length: 12'</p> <ul style="list-style-type: none"> ▪ Architect to specify shade material and finish ▪ Architect verify white canopy and cord finishes ▪ Contractor to coordinate run lengths per architectural drawings ▪ Contractor to coordinate mounting with ceiling type

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than ¾" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L9 OFCI	Decorative 25.6" dia x 16.4"H pendant -large <u>Location:</u> ILR Hub 200	White LED <u>CCT:</u> 3000 <u>CRI:</u> <u>Lumens:</u> 4420 lm <u>Watts:</u> 96W <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	LOUIS POULSEN "PH 6 ½-6" 5741938698 <ul style="list-style-type: none"> ▪ Architect to verify white (RAL 016) finish ▪ Contractor to coordinate mounting with ceiling type
L10 OFCI	Decorative 27.5" dia. x 9.875"H round pendant - large <u>Location:</u> Café Seating Area 212	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 5860 lm (Indirect), 8590 lm (Direct) <u>Watts:</u> 50W (Indirect), 80W (Direct) <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	LIGHTNET "BEAM ME UP" 1M-P1-A-(surface finish)-D-9-35-M-D700-(suspension)-(reflector finish) <ul style="list-style-type: none"> ▪ Architect to specify surface and reflector finishes ▪ Architect to specify suspension type (tube or parallel) ▪ Contractor to coordinate mounting with ceiling type
L11 OFCI	Decorative 15.75" dia x 9.875"H round pendant - small <u>Location:</u> Café Servery 212A	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 2180 lm (Indirect), 3190 lm (Direct) <u>Watts:</u> 20W (Indirect), 32W (Direct) <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	LIGHTNET "BEAM ME UP" 1M-P1-A-(surface finish)-D-9-35-M-D400-(suspension)-(reflector finish) <ul style="list-style-type: none"> ▪ Architect to specify surface and reflector finishes ▪ Architect to specify suspension type (tube or parallel) ▪ Contractor to coordinate mounting with ceiling type

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than ¾" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L12 OFCI	Decorative 19.5" dia x 10.5"H pendant <u>Location:</u> Lounge 300	White LED <u>CCT:</u> 3500 <u>CRI:</u> <u>Lumens:</u> 1113 lm <u>Watts:</u> 22 W <u>Voltage:</u> 120 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> Phase dimming	LOUIS POULSEN "PH 5" <ul style="list-style-type: none"> ▪ Architect to specify finish ▪ Contractor to coordinate mounting with ceiling type
L13 OFCI	Pendant mounted 2.64"W x 4.57"H direct/indirect linear with curved edge in pattern <u>Location:</u> Conference Room 401	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 500 lm DN, 250 lm UP <u>Watts:</u> 6.75W/LF <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	FOCAL POINT "SEEM SWEEP 2" FSS2BS-DCFL-500DN-250UP-935K-2C-UNV-L11-(mounting)-WH-(pattern)-(angle)-(radius) <ul style="list-style-type: none"> ▪ Architect to verify white housing finish ▪ Pattern to be confirmed ▪ Contractor to coordinate mounting with ceiling type ▪ Manufacturer's shop drawings are required for final approval
L14 OFCI	Surface mounted cove uplight <u>Location:</u> Level 2, 3 & 4 Corridor	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 1078 lm/LF <u>Watts:</u> 10W/LF <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	I2SYSTEMS "i2Cove" CS-09W-35K-H-WF-V-Straight <ul style="list-style-type: none"> ▪ Mounting seamless up to 10' or seam filled and sanded in field for continuous run ▪ Contractor to coordinate mounting with wall details ▪ Manufacturer's shop drawings are required for final approval

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than ¾" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L15	Not used		
L16	Recessed 2x2 downlight <u>Location:</u> Touchdown, Phonebooth	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 2,000lm <u>Watts:</u> 19W <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	LUMENWERX "PRIMO 2x2 LED" PRIR-22-CMO(S)-LED-90-2000-35-UNV-D1-1-(mounting)-W <ul style="list-style-type: none"> ▪ Contractor to coordinate mounting with ceiling type Or equal by <ul style="list-style-type: none"> ▪ TARGETTI - "Eldorado" ▪ CORONET – "Kiss"
L17	Pendant mounted direct/indirect linear fixture – 8'L <u>Location:</u> Dean's Office 403A	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 846 lm/ft total <u>Watts:</u> 7W/ft total <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	FLUXWERX "PROFILE MINI" PM3-(endcap)-B-D-90-(finish)-08-(ceiling type)-E1-M-(suspension) <ul style="list-style-type: none"> ▪ Architect to specify endcap and finish ▪ Contractor to coordinate mounting with ceiling type and suspension length; bottom of fixture at 8'-0" Or equal by <ul style="list-style-type: none"> ▪ BETA CALCO - "Le Louvre" ▪ LUMENWERX – "Cava"

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than ¾" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L18	<p>Pendant mounted 3" dia. cylinder downlight with glow trim ring</p> <p><u>Location:</u> Pantry 203, Pantry 405</p>	<p>White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Beam:</u> 60° <u>Lumens:</u> 750 lm <u>Watts:</u> 9.5W <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire</p>	<p>DMF "X SERIES" XCP-R-6-(suspension)-(length)-S-D-07-WF-0-00-00-35-(finish)-O-00-F</p> <ul style="list-style-type: none"> ▪ Architect to specify housing finish and suspension type (cord or stem) ▪ Contractor to coordinate mounting with ceiling type <p>Or equal by</p> <ul style="list-style-type: none"> ▪ PRUDENTIAL- "Stream Dot Round" ▪ VISUAL COMFORT- "Element 3" Cylinder"
L19	<p>Recessed 3" dia. aperture downlight</p> <p><u>Location:</u> Level 3 Vestibule 300V</p>	<p>White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Beam:</u> 60° <u>Lumens:</u> 1457lm <u>Watts:</u> 15W <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire</p>	<p>LUCIFER LIGHTING "FRAXION 3 SLIM FIXED" F3R-M-1-F-(flange finish-baffle finish)-90S15A-35-60-Y-(ceiling thickness)-SG/SN-04</p> <ul style="list-style-type: none"> ▪ Architect to specify flange and baffle finishes ▪ Electrical Engineer to coordinate driver option (SG or SN) ▪ Contractor to coordinate ceiling thickness and mounting with ceiling type <p>Or equal by</p> <ul style="list-style-type: none"> ▪ USAI - "BeveLED Mini" ▪ Visual Comfort – "Element 3 LED"

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than 3/4" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L20	Surface mono point mounted 3.25" dia. cylinder downlight <u>Location:</u> MPR 523	White LED CCT: 3500 CRI: 90 Beam: 25° Lumens: 1566 lm Watts: 17W Voltage: 120-277 Driver: Integral Dimming Range: 100-1% Dimming Type: 0-10V, 4-wire	LUCIFER "MONOPOINT CM2" CM2-SL-AD1-(body finish)-(baffle finish)-(stem finish)-90S17A-35-25-CA-4-(mounting) <ul style="list-style-type: none"> ▪ Architect to specify body, baffle and stem finishes ▪ Contractor to coordinate mounting with ceiling type Or equal by <ul style="list-style-type: none"> ▪ USAI - "BeveLED Mini Cylinder" ▪ LSI - "C20"
L21 OFCI	Surface mounted 9.1"W x 1.5"H x 4"D rectangular asymmetric uplight <u>Location:</u> MPR 523	White LED CCT: 3500 CRI: 90 Lumens: 4932 lm Watts: 44W Voltage: 120-277 Driver: Integral Dimming Range: 100-1% Dimming Type: 0-10V, 4-wire	SPI LIGHTING "ECHO BLADE MICRO MAX" EIW12399-L44W-UNV-3500K-90-DF_DIM1-(mounting)-DAB <ul style="list-style-type: none"> ▪ Architect to specify finish ▪ Mounting to be coordinated ▪ Contractor to coordinate mounting with wall details

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than 3/4" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L21A OFCI	Surface mounted 9.1"W x 1.5"H x 4"D rectangular asymmetric uplight with custom extension yoke mounting <u>Location:</u> MPR 523	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 4932 lm <u>Watts:</u> 44W <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	SPI LIGHTING "ECHO BLADE MICRO MAX" EIW12399-L44W-UNV-3500K-90-DF_DIM1-YOK/MOD-DAB <ul style="list-style-type: none"> ▪ 6" extension modified yoke mounting to fit 42 deg. slope ceiling (15 weeks leadtime for the modification) ▪ Architect to specify finish ▪ Mounting to be coordinated ▪ Contractor to coordinate mounting with wall details
L22	Recessed 2x4 troffer with gasketing <u>Location:</u> Prep Room 214	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 6293 lm <u>Watts:</u> 46W <u>Voltage:</u> 120-277 <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	KENALL LIGHTING "SIMPLESEAL" CSEDO-24-45LD-35K8-DIM1-DV-5F-4H-SYM-FN <ul style="list-style-type: none"> ▪ Contractor to coordinate mounting with ceiling type <p>Or equal by</p> <ul style="list-style-type: none"> ▪ KURTZON - "FP-R-LED" ▪ HE WILLIAMS – "MCTA"

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than ¾" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L23 OFCI	Surface mounted low voltage flexible linear tape uplight at truss opening, 4ft run <u>Location:</u> MPR 523	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90+ <u>Beam:</u> 110° <u>Lumens:</u> 465 lm/ft <u>Watts:</u> 4.3W/ft <u>Voltage:</u> 120-277V <u>Secondary voltage:</u> 24VDC <u>Driver:</u> Remote <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	FEELUX LIGHTING "FLXible LED Tape Pro" FTP15-35K-24V-C90 Remote driver: FLE90-24V-L10-DIM <ul style="list-style-type: none"> ▪ Architect and Contractor to coordinate mounting with truss details ▪ Fixture increment is 1.31" ▪ Contractor to provide power connector, end cap, mounting accessories, etc. to make a complete system; see CBB sketch showing fixture connections included in the cut sheet ▪ Locations for remote drivers must be accessible and ventilated; max. distance from remote driver to fixture is 50ft.
L23A OFCI	Surface mounted low voltage flexible linear tape uplight at small truss opening, +/-8" run <u>Location:</u> MPR 523	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90+ <u>Beam:</u> 110° <u>Lumens:</u> 465 lm/ft <u>Watts:</u> 4.3W/ft <u>Voltage:</u> 120-277V <u>Secondary voltage:</u> 24VDC <u>Driver:</u> Remote <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	FEELUX LIGHTING "FLXible LED Tape Pro" FTP15-35K-24V-C90 Remote driver: FLE90-24V-L10-DIM <ul style="list-style-type: none"> ▪ Architect and Contractor to coordinate mounting with truss details ▪ Fixture increment is 1.31" ▪ Contractor to provide power connector, end cap, mounting accessories, etc. to make a complete system; see CBB sketch showing fixture connections included in the cut sheet ▪ Locations for remote drivers must be accessible and ventilated; max. distance from remote driver to fixture is 50ft.

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than 3/4" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L24	Pendant mounted 3' dia. direct/indirect ring <u>Location:</u> Lounge 400	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 525 lm DN, 260 lm UP <u>Watts:</u> 103W <u>Voltage:</u> 120-277 <u>Driver:</u> Remote <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	BETA CALCO "MICRO RING II" MRTP2P03-EFF1-LPF052-LPG026-CR90-CTA35-CTB35-V1-DA01-SS6-(fixture finish)-(canopy finish)-AP00-CS1 <ul style="list-style-type: none"> ▪ Architect to specify finishes ▪ Contractor to coordinate mounting with ceiling type ▪ Remote driver required Or equal by <ul style="list-style-type: none"> ▪ SPI - "Zynn Ring" ▪ ALW - "Moonring"
L24A	Pendant mounted ring 4' dia. direct/indirect ring <u>Location:</u> Touchdown 402	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 525 lm DN, 260 lm UP <u>Watts:</u> 138W <u>Voltage:</u> 120-277 <u>Driver:</u> Remote <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	BETA CALCO "MICRO RING II" MRTP2P04-EFF1-LPF052-LPG026-CR90-CTA35-CTB35-V1-DA01-SS6-(fixture finish)-(canopy finish)-AP00-CS1 <ul style="list-style-type: none"> ▪ Architect to specify finishes ▪ Contractor to coordinate mounting with ceiling type ▪ Remote driver required Or equal by <ul style="list-style-type: none"> ▪ SPI - "Zynn Ring" ▪ ALW - "Moonring"

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than 3/4" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L25	<p>Recessed 3" diameter aperture adjustable accent light</p> <p><u>Location:</u> MPR 523</p>	<p>White LED <u>CCT:</u> 3500 <u>CRI:</u> 90+ <u>Beam:</u> 60° <u>Lumens:</u> 1850 lm <u>Watts:</u> 21W <u>Voltage:</u> 120-277V <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire</p>	<p>LUCIFER LIGHTING "FRAXION 3 SLIM ADJUSTABLE" F3R-M-1-A-(flange finish-baffle finish)-90S21A-35-60-Y-(ceiling thickness)-SG/SN-04</p> <ul style="list-style-type: none"> ▪ Architect to specify flange and baffle finishes ▪ Electrical Engineer to coordinate driver option (SG or SN) ▪ Contractor to coordinate ceiling thickness and mounting with ceiling type <p>Or equal by</p> <ul style="list-style-type: none"> ▪ USAI - "BeveLED Mini" ▪ Visual Comfort – "Element 3 LED"
L25A	<p>Recessed 3" diameter aperture adjustable accent light</p> <p><u>Location:</u> MPR 523</p>	<p>White LED <u>CCT:</u> 3500 <u>CRI:</u> 90+ <u>Beam:</u> 40° <u>Lumens:</u> 1268 lm <u>Watts:</u> 15W <u>Voltage:</u> 120-277V <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire</p>	<p>LUCIFER LIGHTING "FRAXION 3 SLIM ADJUSTABLE" F3R-M-1-A-(flange finish-baffle finish)-90S15A-35-40-Y-(ceiling thickness)-SG/SN-04</p> <ul style="list-style-type: none"> ▪ Architect to specify flange and baffle finishes ▪ Electrical Engineer to coordinate driver option (SG or SN) ▪ Contractor to coordinate ceiling thickness and mounting with ceiling type <p>Or equal by</p> <ul style="list-style-type: none"> ▪ USAI - "BeveLED Mini" ▪ Visual Comfort – "Element 3 LED"

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than 3/4" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L26 OFCI	Wall mounted linear LED task light above counters, 8ft run <u>Location:</u> MPR 523	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90+ <u>Lumens:</u> 477 lm/ft <u>Watts:</u> 4.6W/ft <u>Voltage:</u> 120-277V <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	EXTANT LIGHTING "HTG-1W WALL" HTG-1W-TD-DT-8FT-DML-MEOGC-35-VU-D-(finish)-SW <ul style="list-style-type: none"> ▪ Architect to specify finish ▪ Contractor to coordinate mounting with wall type
L27	Recessed linear 4" wide LED fixture with 1.5" drop lens, 18ft run <u>Location:</u> Room 225	White LED <u>CCT:</u> 3500 <u>CRI:</u> 90+ <u>Lumens:</u> 875 lm/ft <u>Watts:</u> 9.65W/ft <u>Voltage:</u> 120-277V <u>Driver:</u> Integral <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire	FOCAL POINT "SEEM 4" FSM4L-PD15-875LF-935K-1C (Emergency circuit)-UNV-L11-(ceiling configuration)-(Emergency)-WH-8FT <ul style="list-style-type: none"> ▪ Architect to verify white trim finish ▪ Electrical Engineer to coordinate emergency circuit ordering ▪ Contractor to coordinate mounting with ceiling type <p>Or equal by</p> <ul style="list-style-type: none"> ▪ LUMENWERX - "VIA 3 Recessed" ▪ A LIGHT – "ACL 5"

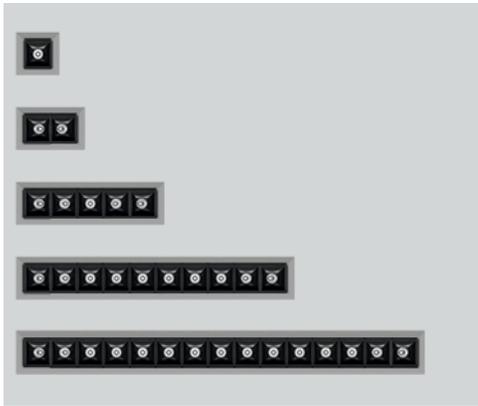
- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than 3/4" to 1") where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).

PART 4 - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMP/ELECTRICAL	MANUFACTURER/CATALOG CODE
L28	<p>Surface mounted linear LED under-cabinet light</p> <p><u>Location:</u> Pantries, café seating/ servery</p>	<p>White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Lumens:</u> 500 lm/ft <u>Watts:</u> 8.5W/ft <u>Voltage:</u> 120V <u>Driver:</u> Integral <u>Dimming Range:</u> 100-15% <u>Dimming Type:</u> ELV</p>	<p>VISUAL COMFORT “Unilume LED Slimline” 700UCF-(length)-9-5-(finish)-LED</p> <ul style="list-style-type: none"> ▪ Architect to specify finish ▪ Contractor to coordinate fixture lengths and mounting with cabinet millwork details <p>Or equal by</p> <ul style="list-style-type: none"> ▪ BARTCO – “Task BSS350” ▪ BOCA - “Task”
L29	<p>Pendant mounted 2.5” dia. LED cylinder downlight -3D textured ceiling panel</p> <p><u>Location:</u> Dean’s Assist 403</p>	<p>White LED <u>CCT:</u> 3500 <u>CRI:</u> 90 <u>Beam:</u> 60° <u>Lumens:</u> 952lm <u>Watts:</u> 11W <u>Voltage:</u> 120-277 <u>Driver:</u> Remote <u>Dimming Range:</u> 100-1% <u>Dimming Type:</u> 0-10V, 4-wire</p>	<p>LUCIFER LIGHTING “Cylinder 1 Suspended Cable” CP1X-(cable color & length)-D-1-(cylinder finish)-(baffle finish)-90S11A-35-60-4-URA-PS-RMT</p> <ul style="list-style-type: none"> ▪ Architect to specify cylinder and baffle finishes ▪ Jbox and driver to be located above accessible ceiling nearby; location must be ventilated and accessible; Contractor to coordinate all required mounting devices accordingly and refer to max. distance chart provided by Manufacturer <p>Or equal by</p> <ul style="list-style-type: none"> ▪ USAI - “LittleTwos Cylinder High Output” ▪ VISUAL COMFORT – “Element 2” Cylinder”

THE CATALOG CUTS THAT FOLLOW ARE PART OF SECTION 265110

- Notes:
1. Contractor shall verify all catalog codes with written and drawn descriptions.
 2. Architect shall verify all fixture finishes.
 3. Contractor shall verify ceiling types and grid system types for all light fixture installations and coordinate ceiling materials and thicknesses with fixture trim/mounting requirements. For recessed fixtures in thick ceilings (greater than ¾” to 1”) where standard thickness mounting collars will not fit, see Part 3.1 D.1 within this Section and notify Lighting Designer.
 4. Contractor to coordinate wiring of fixtures for dimming as specified and test compatibility with dimming system for smooth, flicker free dimming within range specified.
 5. All supply voltages are 120V, unless otherwise noted, Electrical Engineer to verify.
 6. All fixtures shall have a 5-year warranty minimum (see Part 1.5 C within this Section).



Laser blade original is a collection of recessed downlights for architectural applications. The luminaires are equipped with high performance Opti Beam optics system for low luminance downlights (UGR < 10). Laser blade original is available in 5 aperture sizes, trim or trimless, 5 distributions, generous outputs of up to 2583 lumens and excellent chromatic performance .

NOW ASSEMBLED IN NORTH AMERICA.

Luminaire characteristic:

Power input: 3.1W to 36.6W (system wattage)
Lumens: 187lm to 2583lm (for 3000K, 92CRI)
Luminaire efficacy: up to 70lm/W

Source:

White LED module (LM-80)
2700K: 92CRI (90CRI min),
3000K: 92CRI (90CRI min),
3500K: 92CRI (90CRI min),
4000K: 92CRI (90CRI min).

Lumen maintenance:

90% of initial lumens at 50 000 hours (L90) (LM-79).

Optics:

Low luminance: Spot, flood, wide flood, general light pro, medium oval transversal or longitudinal and wide flood oval transversal or longitudinal optics with Opti Beam technology.

Material:

Body and heat sink: Die-cast aluminum
Reflector and baffle: Thermoplastic
Housing: Galvanized steel

Mounting:

New construction housing or chicago plenum rated housing, both suitable for insulated ceiling.

Electrical:

High efficiency LED driver ratings:
ILB01: 50 000 hours with insulation
ILB02: 50 000 hours with insulation
ILB05: 50 000 hours with insulation
ILB10: 48 000 hours with insulation
85 000 hours without insulation
ILB15: 38 000 hours with insulation
76 000 hours without insulation

Dimming:

0-10V dimming (120-277V) or leading edge (TRIAC) and trailing edge (ELV) dimming (120V only). Both options down to ±15% dimming range.

Finish:

Black, white (RAL9010) and grey (RAL9006) (page 2).

Weight:

ILB01: 0.11lbs (0.05kg)
ILB02: 0.20lbs (0.09kg)
ILB05: 0.66lbs (0.30kg)
ILB10: 1.32lbs (0.60kg)
ILB15: 1.90lbs (0.86kg)

Warranty:

5 year limited warranty.

Ratings:

IP20, IP23 (from under the ceiling)

Certification:



cULus listed for damp location. Interior use only.

Energy star certified product (except ILB01/ILB02). To confirm which versions are certified, please consult the product list: www.energystar.gov/productfinder

Assembled in North America.

LASER BLADE ORIGINAL

DOWNLIGHT - NEW CONSTRUCTION WITH HOUSING - INTEGRAL

Type:

Project :

TYPE L1

Page: 2 of 10

ORDERING INFO

I-

BI-



PRODUCT CODE

INSTALLATION CODE

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MODEL	MOUNTING	INSTALLATION	LED	OPTIC	VOLTAGE	FINISH (trim finish / baffle finish*)	DIMMING
ILB01 01 cell	TR Trim	IC New construction insulated ceiling	027 ¹ 2700K, 92CRI	SP ² Spot 13°	120 ⁵ 120V	TRIM	120V
ILB02 02 cells	TL Trimless	CP New construction chicago plenum housing	030 ¹ 3000K, 92CRI	FL Flood 32°	UNV ⁶ 120-277V	01 White / black	LTE Leading edge and trailing edge (down to 15%)
ILB05 05 cells			035 ¹ 3500K, 92CRI	WF ² Wide flood 47°		31 White / white	120-277V (UNV)
ILB10 10 cells			040 ¹ 4000K, 92CRI	GP ² General light pro		02 Black / black	D10 0-10V (down to 15%)
ILB15 15 cells				LM ³ Medium oval longitudinal		10 Gray / black	
				TM ³ Medium oval transversal		TRIMLESS	
			LW ⁴ Wide flood oval longitudinal	31 White			
			TW ⁴ Wide flood oval transversal	02 Black			

Black baffle



White baffle



1 92CRI typical - 90CRI minimum.
 2 Available with five (05), ten (10) and fifteen (15) models.
 3 Available with five (05) model.
 4 Available with five (05) and ten (10) models.
 5 Available with single (01), five (05), ten (10) and fifteen (15) models.
 6 When ordered for single (01) model, no dimming applicable.
 *Custom baffle finish available, contact customer service for details.

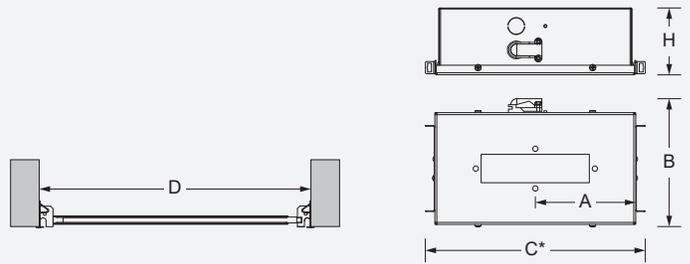
INSTALLATION OPTIONS

New construction with housing suitable for insulated ceiling (IC) or chicago plenum (CP)

Housing with hanger bars system for new construction installations.
Suitable for insulated ceiling or chicago plenum applications.
Housing and trim can be shipped separately.

Ceiling thickness:

Trim: 1/8" - 1 1/8" (3mm - 29mm)
Trimless: 5/8" (16mm)

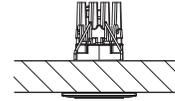
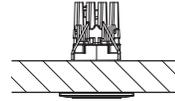
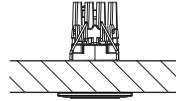
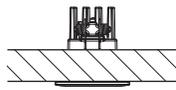
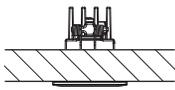


*Provide a minimum of 1 1/8" (46mm) on each side for the hanger bar fixations

Model	Housing	Cut-out dimensions	Cut-out positions (A)	Overall dimensions (BxC)	Hanger bars range (D)	Clearance (H)
ILB01	BI-LB01TR-IC/CP	1 1/8" x 1 3/8" (35 x 35mm)	6 3/8" (174mm)	6 3/8" x 11 1/2" (167 x 292mm)	14 1/4" to 26" (362 to 660mm)	3 1/2" (89mm)
	BI-LB01TL-IC/CP					
ILB02	BI-LB02TR-IC/CP	1 1/8" x 2 1/2" (35 x 64mm)	6 3/8" (160mm)			
	BI-LB02TL-IC/CP					
ILB05	BI-LB05TR-IC/CP	1 1/2" x 5 5/8" (37 x 141mm)	5 1/4" (133mm)			
	BI-LB05TL-IC/CP	1 3/8" x 5 5/8" (35 x 141mm)				
ILB10	BI-LB10TR-IC/CP	1 1/2" x 10 3/8" (37 x 274mm)	8 3/8" (223mm)	6 1/2" x 21 1/8" (166 x 540mm)		
	BI-LB10TL-IC/CP	1 3/8" x 10 3/8" (35 x 271mm)				
ILB15	BI-LB15TR-IC/CP	1 1/2" x 16" (37 x 406mm)	13 3/8" (332mm)	9 1/4" x 28 7/8" (238 x 716mm)		
	BI-LB15TL-IC/CP	1 3/8" x 15 5/8" (37 x 404mm)				

TRIM MODELS DIMENSIONS

ILB01 ILB02 ILB05 ILB10 ILB15



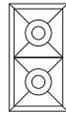
FRONT VIEW

1 3/4"
(44mm)



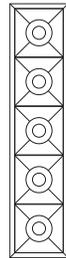
1 3/4"
(44mm)

1 3/4"
(44mm)



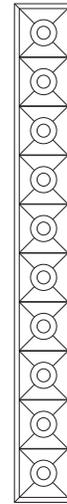
2 7/8"
(73mm)

1 3/4"
(44mm)



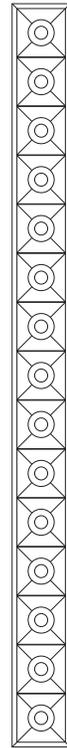
5 5/8"
(148mm)

1 3/4"
(44mm)



11"
(280mm)

1 3/4"
(44mm)

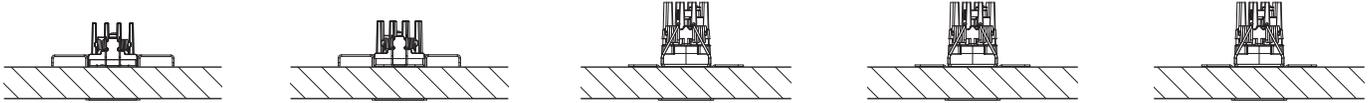


16 1/4"
(413mm)

BOTTOM VIEW

TRIMLESS MODELS DIMENSIONS

ILB01 ILB02 ILB05 ILB10 ILB15



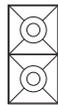
FRONT VIEW

1 3/16" (30mm)



1 3/16" (30mm)

1 3/16" (30mm)



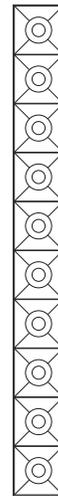
2 1/4" (58mm)

1 3/16" (30mm)



5 1/4" (132mm)

1 3/16" (30mm)



10 3/8" (264mm)

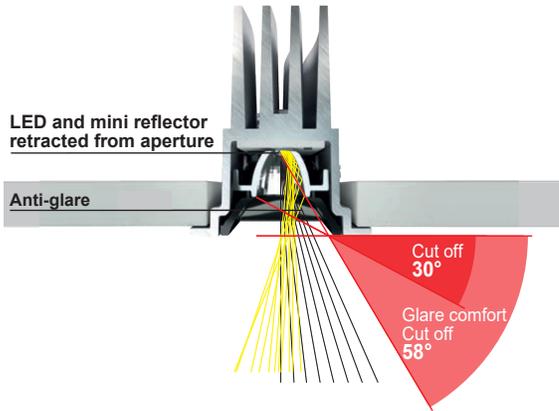
1 3/16" (30mm)



15 5/8" (396mm)

BOTTOM VIEW

Visual comfort UGR < 10.



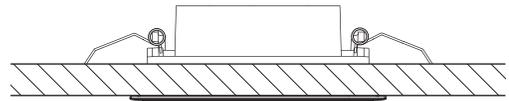
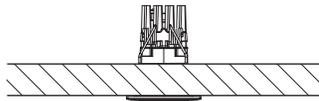
LED COLOR FIDELITY DATA

CRI	CCT	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	Rf	Rg	Melanopic ratio
92	2700K	92	96	98	91	91	95	91	79	55	89	92	86	93	98	88	91	100	0.488
	3000K	93	97	98	92	93	95	92	82	60	91	92	82	94	99	90	92	99	0.571
	3500K	92	95	96	92	91	93	93	83	59	87	92	79	93	97	89	92	99	0.635
	4000K	93	94	94	93	92	91	94	86	64	85	93	78	93	96	90	91	100	0.715

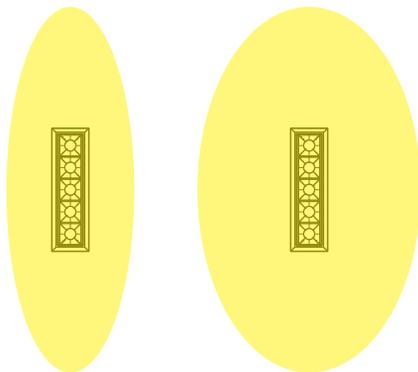
OVAL BEAM DISTRIBUTION

Oval Longitudinal

Oval Transversal

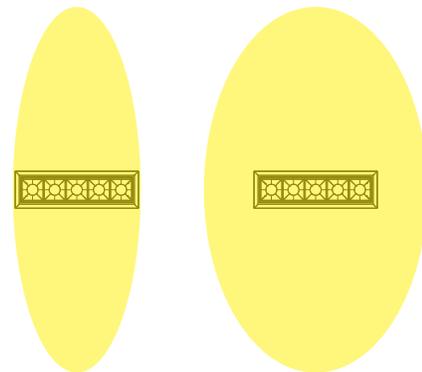


FRONT VIEW



Medium

Wide flood



Medium

Wide flood

TOP VIEW

PHOTOMETRIC DATA

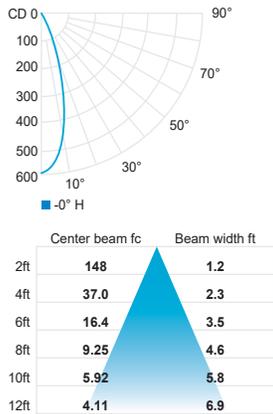
ILB01



CCT (K)	CRI	LOAD (W)	OPTIC	LUMENS (lm)	EFFICACY (lm / W)	MAX CANDELA (cd)	MODELS
3000K	92	3.1W	Flood 32°	187	60	591	ILB01-030-FL

Use multiplier table for other CCT and CRI output data. Efficacy based on IESNA LM-79 test reports. Visit iguzzini.com/us for complete photometric data.

Flood 32° (3000K, 92CRI)



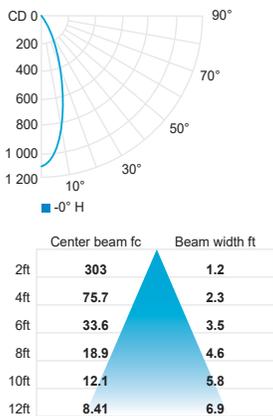
ILB02



CCT (K)	CRI	LOAD (W)	OPTIC	LUMENS (lm)	EFFICACY (lm / W)	MAX CANDELA (cd)	MODELS
3000K	92	6.1W	Flood 32°	374	61	1184	ILB02-030-FL

Use multiplier table for other CCT and CRI output data. Efficacy based on IESNA LM-79 test reports. Visit iguzzini.com/us for complete photometric data.

Flood 32° (3000K, 92CRI)



CCT options	2700K	3000K	3500K	4000K
CRI options	92CRI	92CRI	92CRI	92CRI
Multiplier	0.95	1	1.05	1.09

PHOTOMETRIC DATA

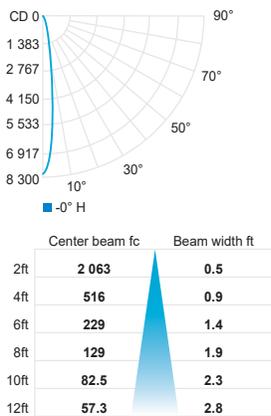
ILB05



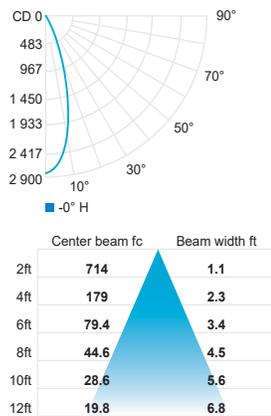
CCT (K)	CRI	LOAD (W)	OPTIC	LUMENS (lm)	EFFICACY (lm / W)	MAX CANDELA (cd)	MODELS
3000K	92	12.6W	Spot 13°	861	68	8 250	ILB05-030-SP
			Flood 32°	851	67	2 857	ILB05-030-FL
			Wide flood 47°	851	67	1 628	ILB05-030-WF
			General light pro	788	62	1 122	ILB05-030-GP
			Medium oval longitudinal	767	60	1 281	ILB05-030-LM
			Medium oval transversal	746	59	1 221	ILB05-030-TM
			Wide flood oval longitudinal	756	60	722	ILB05-030-LW
			Wide flood oval transversal	746	59	718	ILB05-030-TW

Use multiplier table for other CCT and CRI output data. Efficacy based on IESNA LM-79 test reports. Visit iguzzini.com/us for complete photometric data.

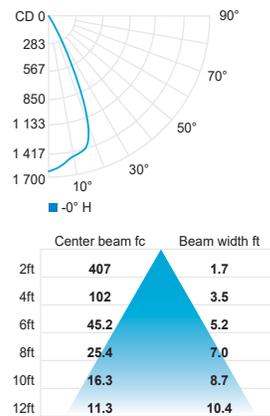
Spot 13° (3000K, 92CRI)



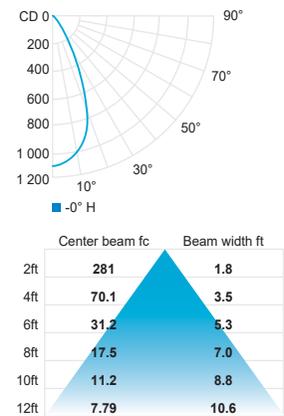
Flood 32° (3000K, 92CRI)



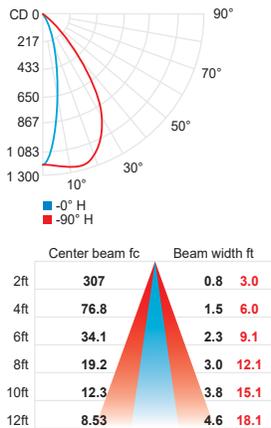
Wide flood 47° (3000K, 92CRI)



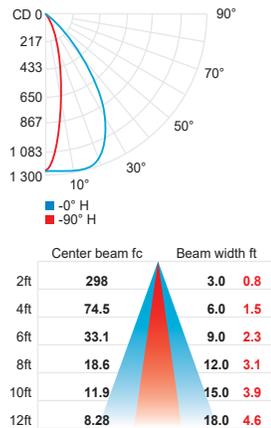
General light pro (3000K, 92CRI)



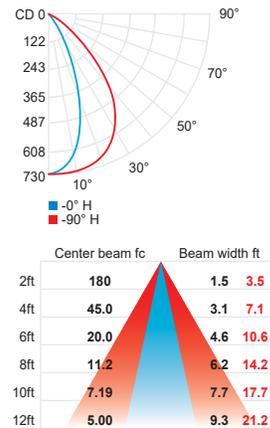
Medium oval long. (3000K, 92CRI)



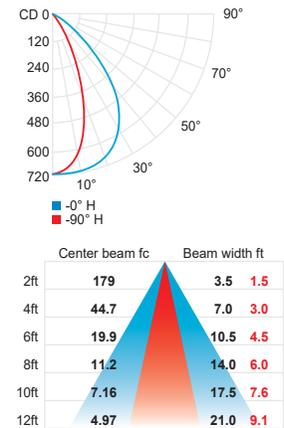
Medium oval tran. (3000K, 92CRI)



Wide flood oval long. (3000K, 92CRI)



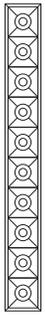
Wide flood oval tran. (3000K, 92CRI)



CCT options	2700K	3000K	3500K	4000K
CRI options	92CRI	92CRI	92CRI	92CRI
Multiplier	0.95	1	1.05	1.10

PHOTOMETRIC DATA

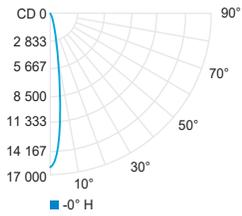
ILB10



CCT (K)	CRI	LOAD (W)	OPTIC	LUMENS (lm)	EFFICACY (lm / W)	MAX CANDELA (cd)	MODELS
3000K	92	24.7W	Spot 13°	1 681	68	16 108	ILB10-030-SP
			Flood 32°	1 661	67	5 578	ILB10-030-FL
			Wide flood 47°	1 661	67	3 179	ILB10-030-WF
			General light pro	1 538	62	2 191	ILB10-030-GP
			Wide flood oval longitudinal	1 476	59	1 410	ILB10-030-LW
			Wide flood oval transversal	1 456	58	1 402	ILB10-030-TW

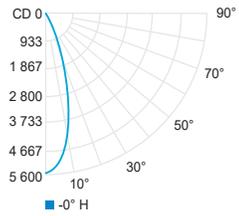
Use multiplier table for other CCT and CRI output data. Efficacy based on IESNA LM-79 test reports. Visit iguzzini.com/us for complete photometric data.

Spot 13° (3000K, 92CRI)



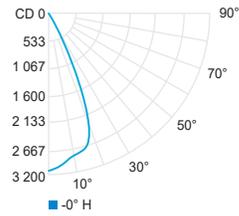
Center beam fc	Beam width ft
2ft	4 027 0.5
4ft	1 007 0.9
6ft	447 1.4
8ft	252 1.9
10ft	161 2.3
12ft	112 2.8

Flood 32° (3000K, 92CRI)



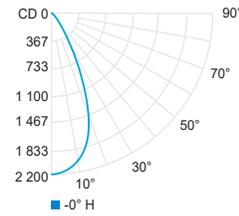
Center beam fc	Beam width ft
2ft	1 395 1.1
4ft	349 2.3
6ft	155 3.4
8ft	87.2 4.5
10ft	55.8 5.6
12ft	38.7 6.8

Wide flood 47° (3000K, 92CRI)



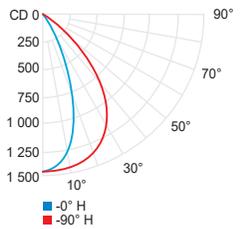
Center beam fc	Beam width ft
2ft	714 1.8
4ft	179 3.5
6ft	73.9 5.3
8ft	44.6 7.0
10ft	28.6 8.8
12ft	19.8 10.6

General light pro (3000K, 92CRI)



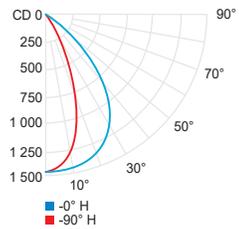
Center beam fc	Beam width ft
2ft	548 1.8
4ft	137 3.5
6ft	60.9 5.3
8ft	34.2 7.0
10ft	21.9 8.8
12ft	15.2 10.6

Wide flood oval long. (3000K, 92CRI)



Center beam fc	Beam width ft
2ft	351 1.6 3.5
4ft	87.8 3.1 7.1
6ft	39.0 4.7 10.6
8ft	21.9 6.2 14.2
10ft	14.0 7.8 17.7
12ft	9.75 9.3 21.2

Wide flood oval tran. (3000K, 92CRI)



Center beam fc	Beam width ft
2ft	349 3.5 1.5
4ft	87.3 7.0 3.0
6ft	38.8 10.5 4.5
8ft	21.8 14.0 6.0
10ft	14.0 17.5 7.6
12ft	9.70 21.0 9.1

CCT options	2700K	3000K	3500K	4000K
CRI options	92CRI	92CRI	92CRI	92CRI
Multiplier	0.95	1	1.05	1.10

PHOTOMETRIC DATA

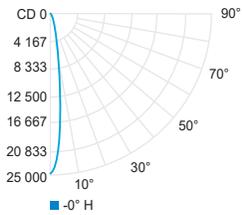
LB15



CCT (K)	CRI	LOAD (W)	OPTIC	LUMENS (lm)	EFFICACY (lm / W)	MAX CANDELA (cd)	MODELS
3000K	92	36.6W	Spot 13°	2 583	70	24 751	ILB15-030-SP
			Flood 32°	2 552	69	8 571	ILB15-030-FL
			Wide flood 47°	2 552	69	4 885	ILB15-030-WF
			General light pro	2 363	64	3 367	ILB15-030-GP

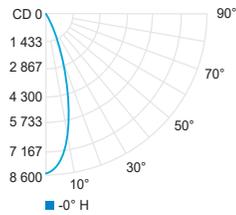
Use multiplier table for other CCT and CRI output data. Efficacy based on IESNA LM-79 test reports. Visit iguzzini.com/us for complete photometric data.

Spot 13° (3000K, 92CRI)



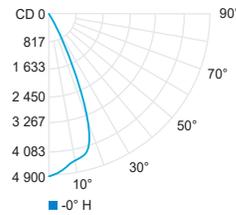
Center beam fc	Beam width ft
2ft	6 188 0.5
4ft	1 547 0.9
6ft	688 1.4
8ft	387 1.9
10ft	248 2.3
12ft	172 2.8

Flood 32° (3000K, 92CRI)



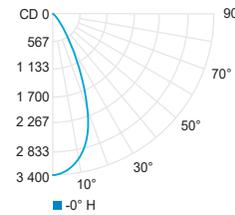
Center beam fc	Beam width ft
2ft	2 143 1.1
4ft	536 2.3
6ft	238 3.4
8ft	134 4.5
10ft	85.7 5.6
12ft	59.5 6.8

Wide flood 47° (3000K, 92CRI)



Center beam fc	Beam width ft
2ft	1 221 1.7
4ft	305 3.5
6ft	136 5.2
8ft	76.3 7.0
10ft	48.9 8.7
12ft	33.9 10.4

General light pro (3000K, 92CRI)

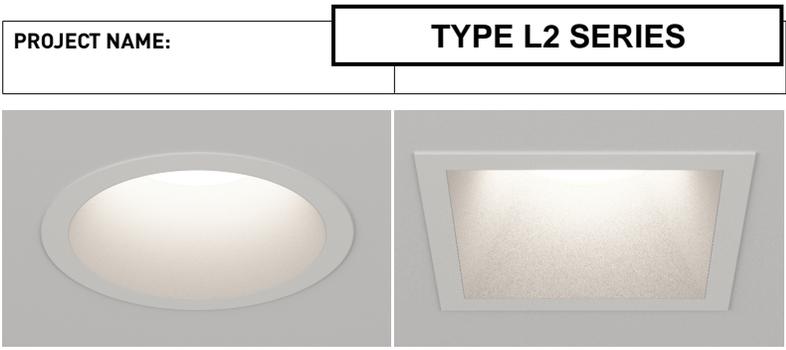


Center beam fc	Beam width ft
2ft	842 1.8
4ft	210 3.5
6ft	93.5 5.3
8ft	52.6 7.0
10ft	33.7 8.8
12ft	23.4 10.6

CCT options	2700K	3000K	3500K	4000K
CRI options	92CRI	92CRI	92CRI	92CRI
Multiplier	0.95	1	1.05	1.10

FRAXION®3 SLIM FIXED

Starting Q4 2024, we will begin shipping our new, enhanced, Fraxion3 family. This update features increased lumen outputs up to 2750lm delivered and the addition of deep regress, and remodel fixtures. See Page 2 for fixture comparison.



ORDERING INFORMATION - DOWNLIGHT / HOUSING

TYPE 24 JA8-2022 INDICATED BY SHADING

SHAPE	TRIM	RATING	TYPE	FLANGE FINISH	BAFFLE FINISH	CRI / WATTAGE PACKAGE	CCT	OPTIC (UGR)	INSTALL TYPE	CEILING THICKNESS	DRIVER	MEDIA
F3R Round	M Microflange	1 Dry/Damp	F Fixed	WH White	WH White	STATIC WHITE	24 2400K*	10 10°* (>19)	INTEGRAL DRIVER	1 0.50" - 1.375"	INTEGRAL / REMOTE	STANDARD MEDIA
F3S Square	T Trimless Drywall	2 Wet*		AG Satin Silver	AG Satin Silver	80S06A 80+ CRI, 06 Watts Lumens Divd. - 774	24 2400K* *(90+ CRI only, 15W max)	15 15° (>19)	X IC	2 1.375" - 2.125"	PH Forward / Reverse Phase, 2%, 120V	04 Soft Focus Lens
	W Trimless Millwork	*Suction cup provided for aim & focus)		AU Cashmere Gold	AU Cashmere Gold	80S11A 80+ CRI, 11 Watts Lumens Divd. - 1259	27 2700K	20 20° (<16)	Y NIC	*[Only available for 10° and 15° optic]	SG eldoLED, ECOdrive 1%, 0-10V, LOG, 120V-277V	NL No Lens*
				BB Burnt Bronze	BB Burnt Bronze	80S15A 80+ CRI, 15 Watts Lumens Divd. - 1696	30 3000K	25 25° (<16)	C IC, Airtight*	T 0.50" - 1.375"	SN eldoLED, ECOdrive 1%, 0-10V, LIN, 120V-277V	*[Standard with 10° optic. Not available for Wet location, Warm Dim or Airtight Housings]
				BK Black	BK Black	80S21A 80+ CRI, 21 Watts* Lumens Divd. - 2304	35 3500K	40 40° (>19)	*[CCEA, Airtight & Title 24 compliant housing]	*[Includes adjustable housing height bracket, recommended for T-Grid applications]	EG eldoLED, SOL0drive 0.1% 0-10V, LOG, 120V-277V	ALTERNATE MEDIA
				PR Primer	PR Primer	90S06A 90+ CRI, 6 Watts Lumens Divd. - 665	40 4000K	60 60° (>19)	REMOTE DRIVER		EN eldoLED, SOL0drive 0.1% 0-10V, LIN, 120V-277V	02 Honeycomb Louver*
				00 Trimless*	CF Custom Finish*	90S11A 90+ CRI, 11 Watts Lumens Divd. - 1082		85 85°* (>19)	V IC, Remote	*[Requires -14 WDL effects device]	ED eldoLED, SOL0drive 0.1% DALI-2, LOG, 120V-277V	*[Not available for Wet location, 21W, Warm Dim or Airtight Housings]
				*[Required for trimless]	*[Consult Factory]	90S15A 90+ CRI, 15 Watts Lumens Divd. - 1457			W NIC, Remote		LP Lutron, Hi-Lume Premier Ecosystem 0.1% Fade to Black, 120V or 277V*	03 Clear Glass Lens*
				CF Custom Finish*	*[Consult Factory]	90S21A 90+ CRI, 21 Watts* Lumens Divd. - 1979			D IC, Airtight, Remote*		*[Not available for 21W packages in X and C install types]	05 Frosted Glass Lens
						97S06A 97+ CRI, 06 Watts Lumens Divd. - 583			*[CCEA, Airtight & Title 24 compliant housing]		AS1 / Athena Control eldoLED, SOL0drive 0.1%, 120V-277V*	08 Frosted Soft Focus Lens
						97S11A 97+ CRI, 11 Watts Lumens Divd. - 950					ASR eldoLED, SOL0drive 0.1%, 120V-277V*	14 Wide Distribution Lens*
						97S15A 97+ CRI, 15 Watts Lumens Divd. - 1279					*[Includes Athena Node. Extended lead time, consult factory. ASR includes shunt]	*[Required and only available for 85° beam spread]
						97S21A 97+ CRI, 21 Watts* Lumens Divd. - 1738					CS1 / Casambi Control eldoLED, SOL0drive 0.1%, 120V-277V*	26 Frosted Linear Spread Lens
						*[21W Not available for IC housings or with "HCL+SFL" media]					*[Includes Casambi Node. Extended lead time, consult factory. CSR includes shunt]	
						WARM DIM		20 20° (<13)			TUNABLE WHITE REMOTE (120-277V)	
						90W10A 90+ CRI, 10 Watts		25 25° (<16)			DG eldoLED, DUALdrive 0.1% 0-10V, LOG	
						90W15A 90+ CRI, 15 Watts Incandescent Profile 11W Lumens Divd. - 1031 15W Lumens Divd. - 1031	WL 2600K (11W) 2700K (15W) -1800K	40 40° (<19)			DN eldoLED, DUALdrive 0.1% 0-10V, LIN	
						Halogen Profile 11W Lumens Divd. - 1031 15W Lumens Divd. - 1031	WD 2900K (11W) 3000K (15W) -1800K	60 60° (>19)			DD eldoLED, DUALdrive 0.1% DALI-2, LOG	
						SEE PAGE 5 FOR DETAILED WARM DIM PROFILE COMPARISON.		85 85° (>19)			AD1 / Athena Control eldoLED, DUALdrive, 0.1%*	
						TUNABLE WHITE					ADR eldoLED, DUALdrive, 0.1%*	
						90T17A 90+ CRI, 17 Watts* * [Only available for remote housings]	TH 5000K - 2700K	15 15° (>19)			*[Includes Athena Node. Extended lead time, consult factory. ADR includes shunt]	
						Cool Profile Lumens Divd. - 1213		20 20° (<13)			CD1 / Casambi Control eldoLED, DUALdrive, 0.1%*	
						Warm Profile Lumens Divd. - 1219	TR 4000K - 1800K	25 25° (<13)			CDR eldoLED, DUALdrive, 0.1%*	
						DELIVERED LUMEN OUTPUTS AND T24 COMPLIANCE REFLECT 3000K, 20° OPTIC, AND SOFT FOCUS LENS.		40 40° (<16)			*[Includes Casambi Node. Extended lead time, consult factory. CDR includes shunt]	
								60 60° (<19)				
								85 85°* (>19)				
									SEE PAGE 4 FOR UGR RATINGS.			



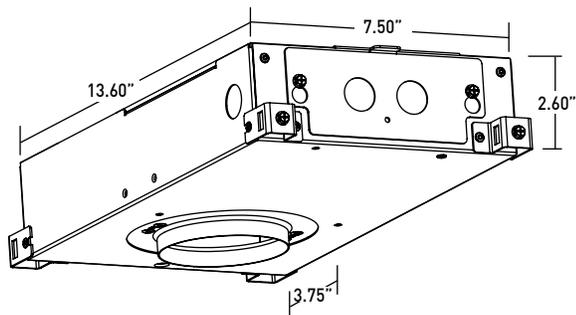
PART NUMBER NOTES

- Fixture ships as e.g., F3RM1F-WHWH-90S11A2-3X1-PH*

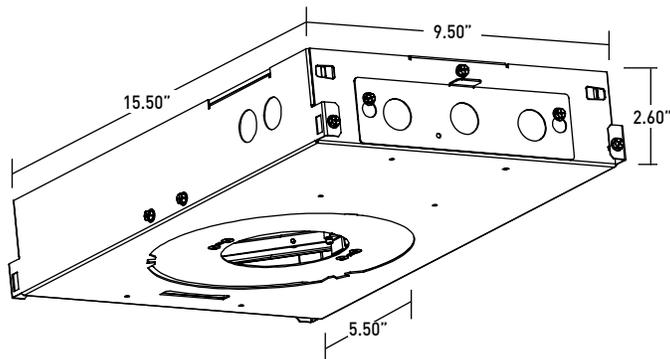


ACCESSORIES

CURRENT FRAXION3



NEW FRAXION3



FIXTURE COMPARISON	CURRENT	NEW
MAX DELIVERED LUMENS	2304	2750
REMODEL	NO	YES
CONCRETE SOLUTION	NO	YES
INTERNATIONAL	NO	YES
DEEP REGRESS	NO	YES
SQUARE TO SQUARE BAFFLE	NO	YES

ACCESSORIES

ROUND SECONDARY MEDIA

Dry / Damp location only

Wet location requires alternate baffle.

- HCL-F3R** Honeycomb Louver w/ Diffusion Lens*
*(Not available for Warm Dim, Wet locations, 21W or Airtight Housings)
- CGL-F3R** Clear Glass Lens*
*(Not available for Warm Dim)
- FGL-F3R** Frosted Glass Lens
- SFL-F3R** Soft Focus Lens
- FSFL-F3R** Frosted Soft Focus Lens
- WDL-F3R** Wide Distribution Lens*
*(For use with 60° optic only)
- FLSL-F3R** Frosted Linear Spread Lens

SQUARE SECONDARY MEDIA

Dry / Damp location only

Wet location requires alternate baffle.

- HCL-F3S** Honeycomb Louver w/ Diffusion Lens*
*(Not available for Warm Dim, Wet locations, 21W, or Airtight Housings)
- CGL-F3S** Clear Glass Lens*
*(Not available for Warm Dim)
- FGL-F3S** Frosted Glass Lens
- SFL-F3S** Soft Focus Lens
- FSFL-F3S** Frosted Soft Focus Lens
- WDL-F3S** Wide Distribution Lens*
*(For use with 60° optic only)
- FLSL-F3S** Frosted Linear Spread Lens

REPLACEMENT OPTICS

Interchangeable optics accessible through fixture aperture.

- | Static White | | Warm Dim | | Tunable White | |
|--|-----------|--|-----------|--|-----------|
| <input type="checkbox"/> RO-50-15-S | 15° optic | <input type="checkbox"/> RO-50-20-W | 20° optic | <input type="checkbox"/> RO-50-15-T | 15° optic |
| <input type="checkbox"/> RO-50-20-S | 20° optic | <input type="checkbox"/> RO-50-25-W | 25° optic | <input type="checkbox"/> RO-50-20-T | 20° optic |
| <input type="checkbox"/> RO-50-25-S | 25° optic | <input type="checkbox"/> RO-50-40-W | 40° optic | <input type="checkbox"/> RO-50-25-T | 25° optic |
| <input type="checkbox"/> RO-50-40-S | 40° optic | <input type="checkbox"/> RO-50-60-W | 60° optic | <input type="checkbox"/> RO-50-40-T | 40° optic |
| <input type="checkbox"/> RO-50-60-S | 60° optic | | | <input type="checkbox"/> RO-50-60-T | 60° optic |

ALTERNATE BAFFLE ASSEMBLY (INCLUDES EFFECTS DEVICE)

ASSEMBLY	SHAPE	RATING	TYPE	BAFFLE FINISH	EFFECTS DEVICE
RBA			F		
REPLACEMENT BAFFLE ASSEMBLY	F3R Round F3S Square	1 Dry / Damp 2 Wet* *(Requires suction cup to service or aim & focus)	F Fixed	WH White BK Black PR Primer AU Cashmere Gold AG Satin Silver BB Burnt Bronze CF Custom Finish * *(Consult Factory)	Leave blank for standard Soft Focus Lens CGL Clear Glass Lens * *(Not available for Warm Dim) FGL Frosted Glass Lens FSFL Frosted Soft Focus Lens WDL Wide Distribution Lens * *(For use with 60° optic only) FLSL Frosted Linear Spread Lens

REPLACEMENT SUCTION TOOL

One included with every six fixtures designated Wet location.

- F4-TOOL-SUCTION** Allows for removal of Wet Location baffles

T-GRID ACCESSORY KIT

Supplied with ceiling thickness "T" and recommended for installations in T-Grid up to 1.5" tall. Available for ceiling thicknesses from 0.50" - 2.125".

- TG-FX3-KIT**

FURRING CHANNEL ACCESSORY KIT

Recommended for installations in furring channel. Available for ceiling thicknesses from 0.50" - 2.125".

- DHA-FC-KIT**

HANGER BAR EXTENDER KIT

Extends hanger bars from 24.0" to 46.0" maximum.

- FRX-HBE-46** Extender, Hanger Bar

EMERGENCY LIGHTING - REMOTE MOUNT ONLY

During disruption of main power, emergency battery inverter provides temporary 120V or 277V to fixture.

- EMB-S-25-120/277-LEDX** 25 watt max capacity, 120 or 277 VAC 60Hz, Non-Dimmable
- EMB-S-100-120-LEDX** 100 watt max capacity, 120 VAC 60Hz, 0-10V Dimmable
- EMB-S-100-277-LEDX** 100 watt max capacity, 277 VAC 60Hz, 0-10V Dimmable
- EMB-S-250-120/277-LEDX** 250 watt max capacity, 120 or 277 VAC 60Hz, 0-10V Dimmable

***SHUNT REQUIRED FOR USE WITH ATHENA AND CASAMBI CONTROLS, CONSULT FACTORY FOR DETAILS.**

REPLACEMENT APPLIQUÉ

- DLA-APP-F3RT** Round
- DLA-APP-F3ST** Square

 PERFORMANCE - 3000K

LUMEN PACKAGE	WATT-AGE	10° OPTIC NO SOFT FOCUS LENS		15° OPTIC SOFT FOCUS LENS		20° OPTIC SOFT FOCUS LENS		25° OPTIC SOFT FOCUS LENS		40° OPTIC SOFT FOCUS LENS		60° OPTIC SOFT FOCUS LENS		85° OPTIC WIDE DISTRIBUTION	
		DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW
80S06A	06	-	-	727	121	774	129	745	124	673	112	722	120	585	98
80S11A	11	-	-	1179	107	1259	114	1211	110	1098	100	1172	107	949	86
80S15A	15	1022	93	1594	106	1696	113	1634	109	1476	98	1583	106	1283	86
80S21A	21	-	-	2158	103	2304	110	2216	106	2006	96	2153	103	1731	82
90S06A	06	-	-	624	104	665	111	640	107	578	96	620	103	503	84
90S11A	11	-	-	1013	92	1082	98	1040	95	943	86	1007	92	815	74
90S15A	15	881	80	1369	91	1457	97	1404	94	1268	85	1360	91	1102	73
90S21A	21	-	-	1854	88	1979	94	1904	91	1723	82	1850	88	1487	71
97S06A	06	-	-	548	91	583	97	562	94	508	85	545	91	441	74
97S11A	11	-	-	889	81	950	86	913	83	828	75	884	80	716	65
97S15A	15	760	69	1202	80	1279	85	1233	82	1113	74	1194	80	968	65
97S21A	21	-	-	1628	78	1738	83	1672	80	1513	72	1624	77	1306	62
90W10A (27K-18K)	10	-	-	-	-	737	73	726	72	664	66	709	70	582	58
90W10A (30K-18K)	10	-	-	-	-	736	73	720	72	667	66	714	71	588	58
90W15A (27K-18K)	15	-	-	-	-	1031	69	1001	67	928	62	992	66	814	54
90W15A (30K-18K)	15	-	-	-	-	1031	69	1009	67	934	62	1000	67	823	55
90T17A (50K-27K)	17	-	-	1065	63	1213	71	1204	71	1219	72	1226	72	997	59
90T17A (40K-18K)	17	-	-	1070	63	1219	71	1218	71	1118	65	1231	72	992	59

OUTPUT MULTIPLIER

CCT	CCT SCALE
2400K	0.85
2700K	0.97
3000K	1.00
3500K	1.03
4000K	1.08

MEDIA LIGHT LOSS FACTOR

MEDIA	LIGHT LOSS FACTOR
NO LENS	1.08
CGL	1.00
SFL	1.00
FGL	0.86
FSFL	0.80
FLSL	0.77
WDL	0.81
HCL	0.68

TUNABLE WHITE MULTIPLIER

CCT	5000K-2700K	4000K-1800K
5000K	1.16	-
4000K	1.08	1.14
3500K	1.04	1.07
3000K	1.00	1.00
2700K	0.96	0.92
2400K	-	0.84
1800K	-	0.69

 **JA8-2022 INDICATED BY SHADING**

UNIFIED GLARE RATING

10° OPTIC NO LENS	15° OPTIC SOFT FOCUS LENS	20° OPTIC SOFT FOCUS LENS	25° OPTIC SOFT FOCUS LENS	40° OPTIC SOFT FOCUS LENS	60° OPTIC SOFT FOCUS LENS	85° OPTIC WIDE DISTRIBUTION LENS
>19	>19	<16	<16	<19	>19	>19

WARM DIM PERFORMANCE - SOFT FOCUS LENS - 20° OPTIC

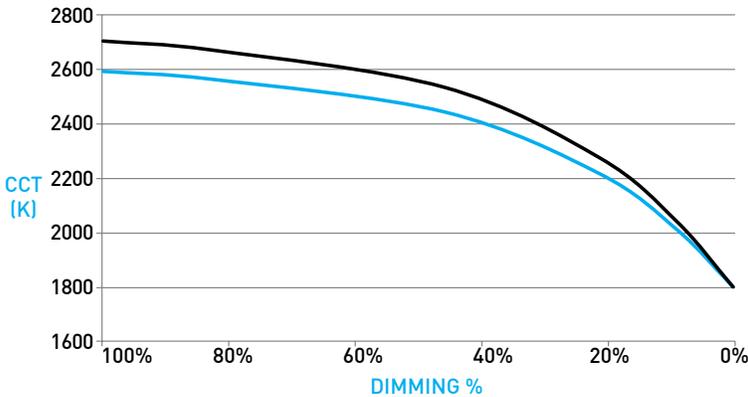
INCANDESCENT PROFILE

90W10AL 2700K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2600	2550	2520	2450	2200	1925	1800
Light Output (Lm)	737	589	515	368	147	73	14
Power (W)	10	8	7	5	2	1	.2
Efficacy (LPW)	73	73	73	73	73	73	73
90W15AL 2700K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2700	2650	2620	2520	2180	1950	1800
Light Output (Lm)	1031	824	721	515	206	103	20
Power (W)	15	12	10.5	7.5	3	1.5	0.3
Efficacy (LPW)	69	69	69	69	69	69	69

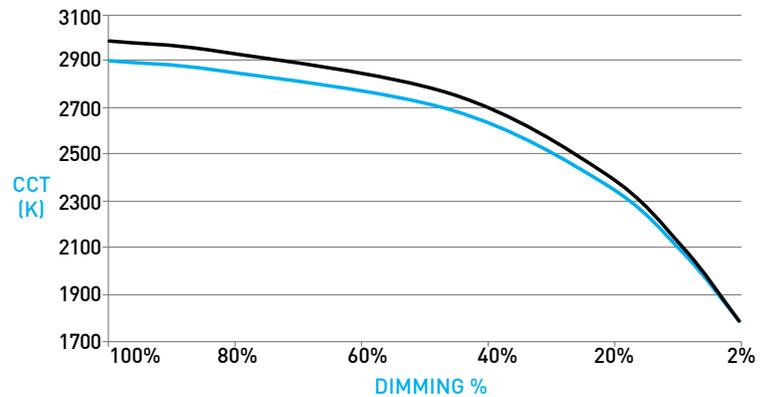
HALOGEN PROFILE

90W10AD 3000K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2900	2850	2800	2720	2350	1975	1800
Light Output (Lm)	736	589	515	368	147	73	14
Power (W)	10	8	7	5	2	1	.2
Efficacy (LPW)	73	73	73	73	73	73	73
90W15AD 3000K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	3000	2950	2920	2775	2375	2000	1800
Light Output (Lm)	1031	824	721	515	206	103	20
Power (W)	15	12	10.5	7.5	3	1.5	0.3
Efficacy (LPW)	69	69	69	69	69	69	69

10W / 15W



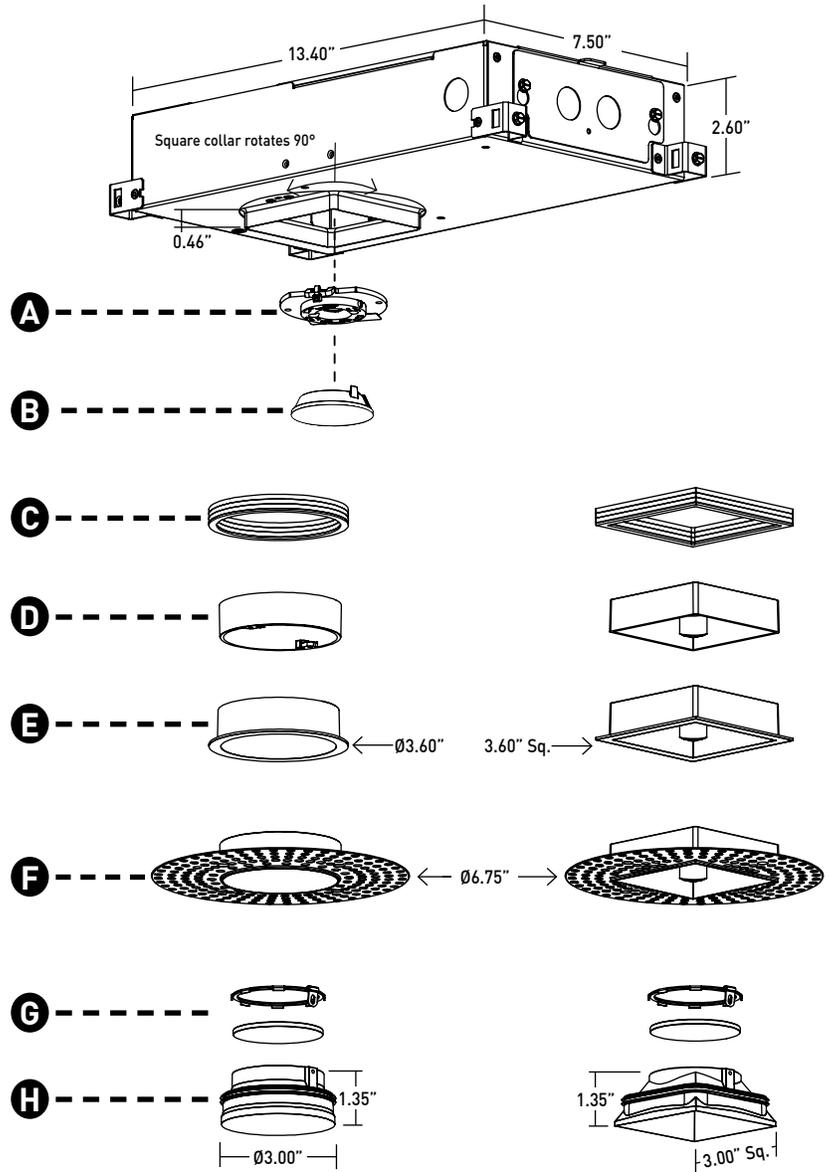
10W / 15W



DOWNLIGHT / HOUSING

- A LED**
Integral LED module design enables field service / replacement through housing aperture.
 - B OPTIC**
Robust light engine with optimized optic pairing integrates Reflection, Refraction, and TIR offering 10°, 15°, 20°, 25°, 40° & 60° beams.
 - C TRIMLESS MILLWORK SPACERS**
Provided for Trimless Millwork installations; includes (1) 1/16" spacer and (5) 1/8" spacers.
 - D TRIM EXTENSION**
Provided for -2 ceiling thickness; accommodates 2.125" max ceiling thickness.
 - E MICROFLANGE PROFILE**
Features 0.30" flange. Thickness measures 0.06". Installed after ceiling is complete. Requires 3.375" diameter cutout. Wet location features integral silicone gasket.
 - F TRIMLESS DRYWALL PROFILE**
Installs totally flush with the ceiling with no visible trim. Appliqué includes screws for mounting and has 0.06" plaster stop. Not recommended for stucco applications.
 - G MEDIA / LENS RETAINER**
Fixture is limited to 1 effects device. Wet location effects device is sealed in place. Suction tool provided for removal of baffle with wet location. Lens retainer allows effects devices to be changed in Dry /Damp locations.
 - H ROUND BAFFLE**
Die-cast removable baffle provides easy access to tilting mechanism and features 62° glare cutoff. Minimizes aperture glare and conceals view into housing; includes gasket.
- SQUARE TRANSITIONAL BAFFLE**
Die-cast removable baffle provides easy access to tilting mechanism and features 62° glare cutoff. Transitions from square aperture at ceiling plane to round aperture at light source. Minimizes aperture glare and conceals view into housing; includes gasket.

DIMENSIONS / DRAWINGS



DOWNLIGHT / HOUSING

- I** **IC HOUSING**
 - For IC ceilings.
 - No setback from polycell spray foam insulation having max R-Value of 60 on all sides and top of housing.
- J** **NIC HOUSING**
 - Minimum 0.50" setback from combustible and non-combustible materials on all sides and top of housing.
 - Minimum 3.00" setback from insulation material having max R-Value 30 on all sides and top of housing.
 - Minimum 6.00" setback from polycell spray foam insulation having max R-Value 60.
- K** **ADJUSTABLE HANGER BAR HEIGHT ACCESSORY**

Provided with ceiling thickness "T" and recommended for installations in T-Grid up to 1.5" tall. Hanger bars are installed to adjustable bracket. Allows housing to be raised and lowered; ceiling thickness remains 0.5" to 1.375" max.
- L** **APPLIQUÉ DETAIL**

Appliqué for plaster floating directly to baffle.
- M** **REMOTE POWER SUPPLY**

Provided with install Types "V", "W" and "D". Remote power supply provides additional driver options. See page 8 for maximum allowable secondary run lengths between PSF3-RMT and fixture. Must be installed in an accessible location.
- N** **ATHENA / CASAMBI CONTROL**

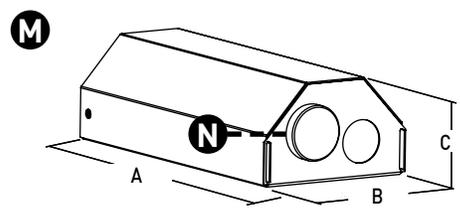
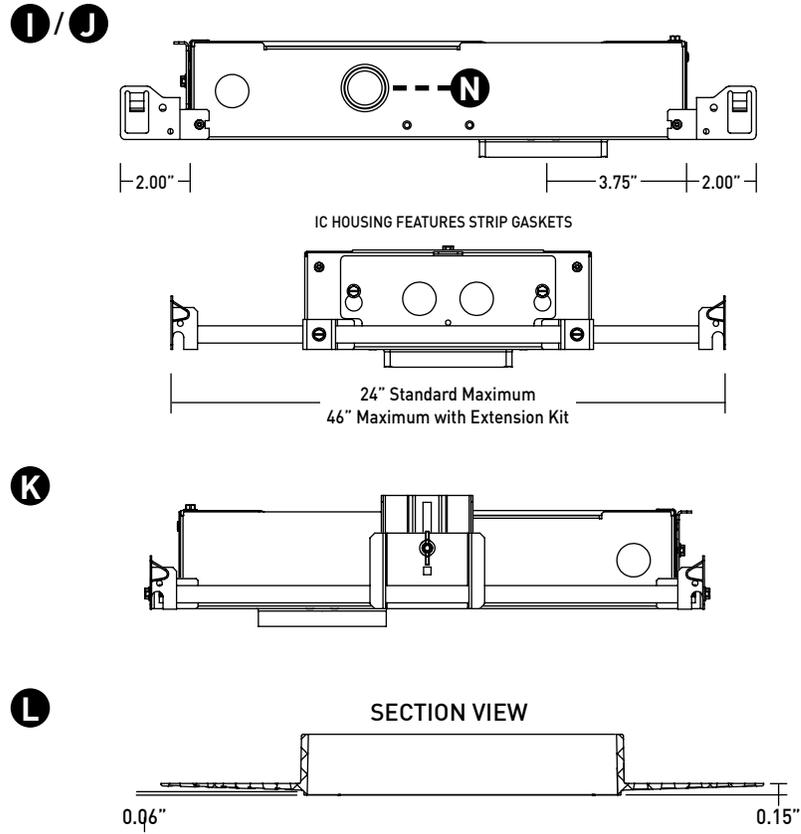
Controls integrated into housing or remote driver assembly. All equipment is serviceable.

Athena Model Numbers: A-WN-D01-RF-BL & DFC-OEM-DBI

Casambi Model Number: BT-S1E1-5400
- O** **ATHENA / CASAMBI EM SHUNT**

Included with drivers specified as ASR, ADR, CSR, or CDR. One required for each wireless EM fixture, requires class 2 control wiring between fixture and shunt. Features integrated test switch.

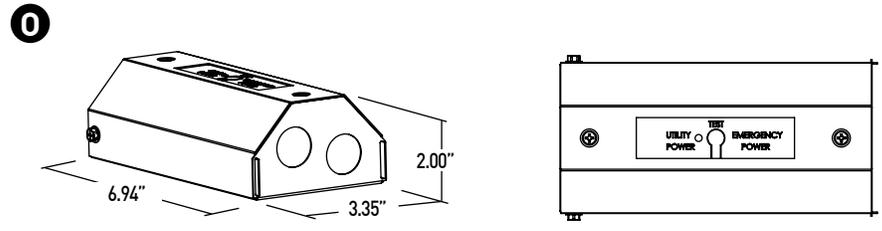
Model Number: PS-RMT-SHUNT



	A	B	C
STATIC WHITE / WARM DIM	6.94"	3.35"	2.00"
TUNABLE WHITE	8.10"	5.00"	2.00"
ATHENA / CASAMBI CONTROLLED	8.10"	5.00"	2.00"

HOUSING NOTES

- Do not install NON-IC housings in environments where ambient temperatures exceed 40°C (104°F). See table below for IC housings.
- Power supply compartment and all splice connections may be serviced from room side.
- Consult factory for spacing requirements for any installations exceeding R-Value 60.
- Hanger bars fitted to short side of housing or long side when TG accessory is specified; extend from 14.0" to 24.0", but may be field cut to accommodate narrow stud spacing. Can be extended up to 46" maximum with FRX-HBE-46 kit.
- Hanger bars and brackets add 4.00" max to the overall dimension, but are exclusive of the setback requirements.
- Housings for round trims feature a round aperture housing collar. Housings for square trims feature a square housing collar that rotates up to 90 degrees for fixture alignment. Housing collars accommodate ceiling thicknesses between 0.50" and 2.125".



IC HOUSING MAX AMBIENT TEMPERATURE	
LUMEN PACKAGE	TEMPERATURE
06W / 11W STATIC WHITE	40°C (104°F)
10W WARM DIM	35°C (95°F)
15W STATIC WHITE	25°C (77°F)
15W WARM DIM	30°C (86°F)
17W TUNABLE WHITE	30°C (86°F)

TECHNICAL

CONSTRUCTION

Downlight: Painted finishes are granulated powder coat.
Housing: Aluminum and 22 Gauge galvanized steel. Die-cast aluminum heat-sink.
Remote Power Supply: 22 Gauge galvanized steel.
Appliqué: Zinc alloy.

STATIC WHITE LED

2-step MacAdam ellipse LED module available in 80+, 90+ and 97+ CRI configurations in color temperatures of 2700K, 3000K, 3500K and 4000K.
 3-step MacAdam ellipse LED module available in 90+ CRI configuration in color temperature of 2400K. Average rated lamp life of 50,000 hours. LED and driver assemblies are field-replaceable.

WARM DIM LED

3-step MacAdam ellipse warm dim LED module available in 90+ CRI configuration. 3000K or 2700K at full brightness, warming to 1800K at full dim. Average rated lamp life of 50,000 hours. LED and driver assemblies are field-replaceable.

TUNABLE WHITE LED

3-step MacAdam ellipse tunable white LED module available in 90+ CRI configuration. Features tuning ranges of 1800K to 4000K and 2700K to 5000K. Average rated lamp life of 50,000 hours. LED and driver assemblies are field-replaceable.

POWER SUPPLY PERFORMANCE AND DIMMING INFORMATION

Power Supply	PHASE		0-10V					ECO	DALI-2		ATHENA		CASAMBI	
	PH	SG	SN	EG	EN	DG	DN	LP	ED	DD	AS	AD	CS	CD
Minimum °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	0 °C	-20 °C	-20 °C	0 °C	0 °C	-20 °C	-20 °C
Maximum °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Dimming %	2.0%	1.0%	1.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%

Note: For LP, EG and EN drivers consult chart on page 9 to confirm appropriate dimming curve for compatibility with selected control.

MAXIMUM ALLOWABLE REMOTE DRIVER WIRING DISTANCES

DRIVER	WIRE AWG				
	12	14	16	18	20
PH	285'	180'	113'	71'	45'
LP	60'	40'	25'	15'	-
EG, EN, ED, DG, DN, DD, SG, SN, AS, CS, AD, CD	-	-	118'	72'	46'

LISTING

cTUVus listed to UL1598 standard for Dry / Damp and Wet locations. CCEA, Airtight, and Title 24 JA8-2022 Listed. NEMA 410 Compliant.

BUY AMERICAN ACT

All Fraxion3 Slim Adjustable configurations are Buy American Act compliant.

DECLARE

LBC Red List Approved.

WEIGHT

Fixture - 2.4 lbs
 Remote Driver - 1.4 lbs

LIMITED WARRANTY

Manufacturer's Limited Warranty guarantees product(s) listed to be free from defects in material and workmanship under normal use and service for 1-year. LED and power supplies are warranted to operate with 70% of original flux and remain within a range of 3 duv for a period of 5-years.

10-year Lutron Advantage limited warranty available on Lutron equipped systems. Warranty period begins from the date of shipment by Seller.

Consult website for full warranty terms and conditions.

CHANGE LOG

- 10/17/2022: REMOVED 90W13A 3200K-1800K WARM DIM AND ADDED 90W15AD 3000K-1800K WARM DIM.
- 10/17/2022: UPDATED MAX AMBIENT TEMPERATURE TABLE.
- 02/14/2023: ADDED EG, EN, AND ED DRIVER OFFERINGS.
- 04/26/2023: ADDED DECLARE LBC RED LIST APPROVED.
- 08/07/2023: ADDED NEW LED AND OPTIC OFFERINGS. REMOVED 2200K OFFERING.
- 02/01/2024: ADDED ATHENA AND CASAMBI CONTROL OFFERING, 2400K, AND WARM PROFILE TUNABLE WHITE.
- 07/15/2024: REMOVED L2 DRIVER OFFERING.



DIMMING COMPATIBILITY

LUTRON DRIVER COMPATIBILITY

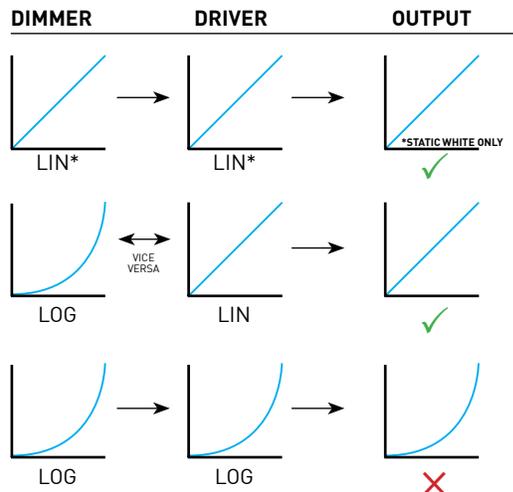
Power supply LP Lutron Product Family	Part No.
PowPak Dimming Modules	RMJ-EC032-DV-B
PowPak Dimming Modules	FCJ/FCJS-ECO
Energi Savr Nodes	QSN-1ECO-S
GRAFIK Eye QS control unit Homeworks QS control unit	QSN-2ECO-S
GRAFIK Eye QS control unit Homeworks QS control unit	QSGRJ-_E (wireless) QSGR-_E
Quantum Hub	QP2-__2C
Quantum Hub	QP2-__4C
Quantum Hub	QP2-__6C
Quantum Hub	QP2-__8C
Homeworks QS power module myRoom Plus power module	LQSE-2ECO-D



eldoLED DRIVER COMPATIBILITY

Power supply EG/SG Manufacturer	Family/Model #
Busch-Jaeger	2112U-101
Jung	240-10
Leviton Lighting Controls	IP710-DLX
Lightolier Controls	ZP600FAM120
Merten	5729
Pass & Seymour	CD4FB-W
The Watt Stopper	DCLV1
Synergy	ISD BC
Crestron®	GLX-DIMFLV8
Crestron®	GLXP-DIMFLV8
Crestron®	GLPAC-DIMFLV4-*
Crestron®	GLPAC-DIMFLV8-*
Crestron®	GLPP-DIMFLVEX-PM
Crestron®	GLPP-1DIMFLV2EX-PM
Crestron®	GLPP-1DIMFLV3EX-PM
Crestron®	DIN-A08
Crestron®	DIN-4DIMFLV4
Crestron®	CLS-EXP-DIMFLV
Crestron®	CLCI-1DIMFLV2EX
Power supply EN/SN Manufacturer	Family/Model #
Lutron Electronics	Nova T® - NTFTV
Lutron Electronics	Diva® - DDTV
Lutron Electronics	Nova® - NFTV
Lutron Electronics	GrafixEye® GRX-TVI w GRX3503
Lutron Electronics	Energy Savr Node™ - QSN-4T16-S
Lutron Electronics	TVM2 Module
Sensor Switch	nIO EZ
ABB	SD/S 2.16.1

ANALOG DRIVERS AND DIMMERS



LIN = LINEAR
 LOG = LOGARITHMIC
 *LIN-TO-LIN NOT COMPATIBLE FOR WARM-DIM

FRAXION®3 SLIM

WALLWASH

Starting Q4 2024, we will begin shipping our new, enhanced, Fraxion3 family. This update features increased lumen outputs up to 2750lm delivered and the addition of deep regress, and remodel fixtures. See Page 2 for fixture comparison.

PROJECT NAME: TYPE L3



ORDERING INFORMATION - DOWNLIGHT / HOUSING



JA8-2022 INDICATED BY SHADING

SHAPE	TRIM	RATING	TYPE	FLANGE FINISH	BAFFLE FINISH	CRI / WATTAGE PACKAGE	CCT	OPTIC	INSTALL TYPE	CEILING THICKNESS	DRIVER
F3R Round	M Microflange	1 Dry/Damp	W Wallwash	WH White	WH White	STATIC WHITE	24 2400K* *90+ CRI only, 15W max	WW Wallwash	INTEGRAL DRIVER	1 0.50" - 1.375"	INTEGRAL / REMOTE
F3S Square	T Trimless Drywall W Trimless Millwork	2 Wet* * (Suction cup provided for aim & focus)		AG Satin Silver AU Cashmere Gold BB Burnt Bronze BK Black PR Primer OO Trimless* * (Required for trimless) CF Custom Finish* * (Consult Factory)	AG Satin Silver AU Cashmere Gold BB Burnt Bronze BK Black PR Primer CF Custom Finish* * (Consult Factory)	80S06A 80+ CRI, 06 Watts Lumens Divd. - 629 80S11A 80+ CRI, 11 Watts Lumens Divd. - 1012 80S15A 80+ CRI, 15 Watts Lumens Divd. - 1378 80S21A 80+ CRI, 21 Watts* Lumens Divd. - 1850 90S06A 90+ CRI, 6 Watts Lumens Divd. - 540 90S11A 90+ CRI, 11 Watts Lumens Divd. - 869 90S15A 90+ CRI, 15 Watts Lumens Divd. - 1184 90S21A 90+ CRI, 21 Watts* Lumens Divd. - 1589 97S06A 97+ CRI, 06 Watts Lumens Divd. - 474 97S11A 97+ CRI, 11 Watts Lumens Divd. - 763 97S15A 97+ CRI, 15 Watts Lumens Divd. - 1040 97S21A 97+ CRI, 21 Watts* Lumens Divd. - 1395	27 2700K 30 3000K 35 3500K 40 4000K		X IC Y NIC C IC, Airtight* * (Chicago Plenum, Airtight & Title 24 compliant housing) REMOTE DRIVER V IC, Remote W NIC, Remote D IC, Airtight, Remote* * (Chicago Plenum, Airtight & Title 24 compliant housing)	2 1.375" - 2.125" T 0.50" - 1.375"* * (Includes adjustable housing height bracket, recommended for any T-Grid applications)	PH Forward / Reverse Phase, 2%, 120V SG eldoLED, ECOdrive 1%, 0-10V, LOG, 120V-277V SN eldoLED, ECOdrive 1%, 0-10V, LIN, 120V-277V EG eldoLED, SOLdrive 0.1% 0-10V, LOG, 120V-277V EN eldoLED, SOLdrive 0.1% 0-10V, LIN, 120V-277V ED eldoLED, SOLdrive 0.1% DALI-2, LOG, 120V-277V LP Lutron, Hi-Lume Premier Ecosystem 0.1% Fade to Black, 120V or 277V* * (Not available for 21W packages in X and C install types) AS1/ Athena Control ASR eldoLED, SOLdrive 0.1%, 120V-277V* * (Includes Athena Node. Extended lead time, consult factory. ASR includes shunt) CS1/ Casambi Control CSR eldoLED, SOLdrive 0.1%, 120V-277V* * (Includes Casambi Node. Extended lead time, consult factory. CSR includes shunt) TUNABLE WHITE REMOTE (120-277V) DG eldoLED, DUALdrive 0.1% 0-10V, LOG DN eldoLED, DUALdrive 0.1% 0-10V, LIN DD eldoLED, DUALdrive 0.1% DALI-2, LOG AD1/ Athena Control ADR eldoLED, DUALdrive, 0.1%* * (Includes Athena Node. Extended lead time, consult factory. ADR includes shunt) CD1/ Casambi Control CDR eldoLED, DUALdrive, 0.1%* * (Includes Casambi Node. Extended lead time, consult factory. CDR includes shunt)
						WARM DIM 90W10A 90+ CRI, 10 Watts 90W15A 90+ CRI, 15 Watts Incandescent Profile 11W Lumens Divd. - 592 15W Lumens Divd. - 828 Halogen Profile 11W Lumens Divd. - 600 15W Lumens Divd. - 840 *SEE PAGE 6 FOR DETAILED WARM DIM PROFILE COMPARISON.	WL 2600K (11W) 2700K (15W) -1800K WD 2900K (11W) 3000K (15W) -1800K				
						TUNABLE WHITE 90T17A 90+ CRI, 17 Watts* * (Only available for remote housings) Cool Profile Lumens Divd. - 960 Warm Profile Lumens Divd. - 966	TH 5000K - 2700K TR 4000K - 1800K				
						ALL DELIVERED LUMEN OUTPUTS AND T24 COMPLIANCE REFLECT 3000K.					



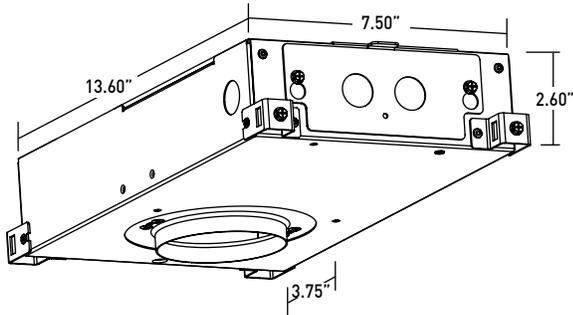
PART NUMBER NOTES

- Housing and trim ship as e.g., F3RM1W-WHWH-90S11A2-3X1-PH*

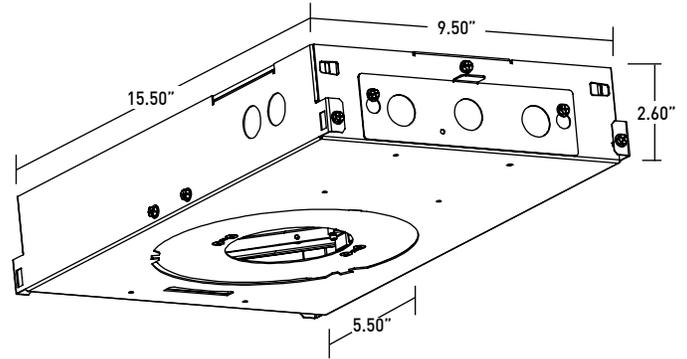


ACCESSORIES

CURRENT FRAXION3



NEW FRAXION3



FIXTURE COMPARISON	CURRENT	NEW
MAX DELIVERED LUMENS	1850	2200
REMODEL	NO	YES
CONCRETE SOLUTION	NO	YES
INTERNATIONAL	NO	YES

ACCESSORIES

REPLACEMENT OPTICS

Interchangeable optics accessible through fixture aperture.

Static White

RO-50-WW-S Wallwash optic

Warm Dim

RO-50-WW-W Wallwash optic

Tunable White

RO-50-WW-T Wallwash optic

ALTERNATE BAFFLE ASSEMBLY (INCLUDES EFFECTS DEVICE)

ASSEMBLY	SHAPE	RATING	TYPE	BAFFLE FINISH
RBA			W	
REPLACEMENT BAFFLE ASSEMBLY	F3R Round F3S Square	1 Dry / Damp 2 Wet* <small>*Requires suction cup to service or aim & focus)</small>	W Wallwash	WH White BK Black PR Primer AU Cashmere Gold AG Satin Silver BB Burnt Bronze CF Custom Finish * <small>*(Consult Factory)</small>

T-GRID ACCESSORY KIT

Supplied with ceiling thickness "T" and recommended for installations in T-Grid up to 1.5" tall. Available for ceiling thicknesses from 0.50" - 2.125".

TG-FX3-KIT

FURRING CHANNEL ACCESSORY KIT

Recommended for installations in furring channel. Available for ceiling thicknesses from 0.125" - 1.25".

DHA-FC-KIT

HANGER BAR EXTENDER KIT

Extends hanger bars from 24.0" to 46.0" maximum.

FRX-HBE-46 Extender, Hanger Bar

EMERGENCY LIGHTING - REMOTE MOUNT ONLY

During disruption of main power, emergency battery inverter provides temporary 120V or 277V to fixture.

- EMB-S-25-120/277-LEDX** 25 watt max capacity, 120 or 277 VAC 60Hz, Non-Dimmable
- EMB-S-100-120-LEDX** 100 watt max capacity, 120 VAC 60Hz, 0-10V Dimmable
- EMB-S-100-277-LEDX** 100 watt max capacity, 277 VAC 60Hz, 0-10V Dimmable
- EMB-S-250-120/277-LEDX** 250 watt max capacity, 120 or 277 VAC 60Hz, 0-10V Dimmable

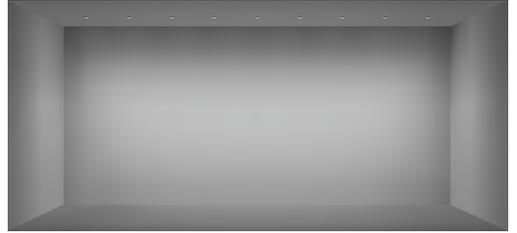
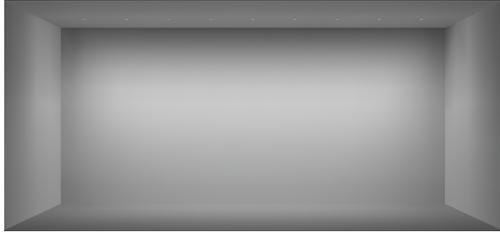
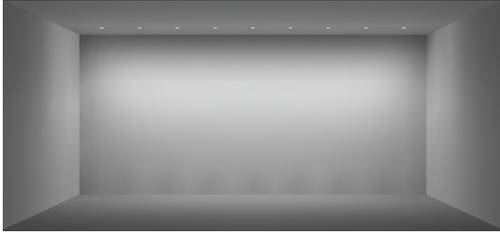
***SHUNT REQUIRED FOR USE WITH ATHENA AND CASAMBI CONTROLS, CONSULT FACTORY FOR DETAILS.**

REPLACEMENT APPLIQUÉ

- DLA-APP-F3RT** Round
- DLA-APP-F3ST** Square

WALLWASH DESIGN GUIDE

ROUND



RECOMMENDED

30" SETBACK / 30" ON CENTER SPACING

- AVERAGE FC: 19.53
- MIN / MAX: 4.63
- 10FT CEILING SHOWN / 8-12FT IDEAL
- 9 FIXTURES / 25FT WALL SHOWN

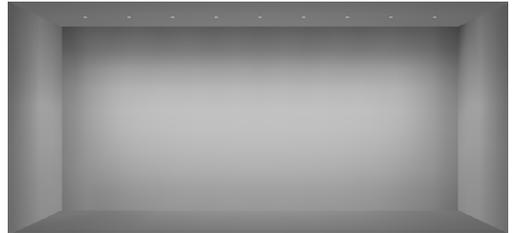
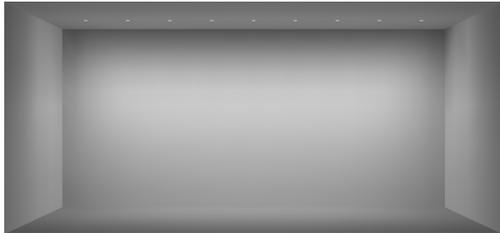
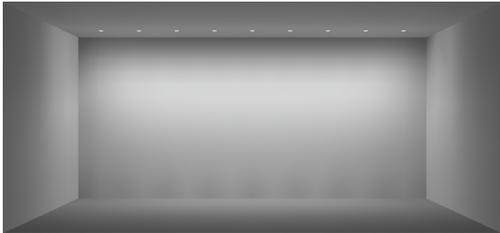
36" SETBACK / 36" ON CENTER SPACING

- AVERAGE FC: 14.96
- MIN / MAX: 4.79
- 10FT CEILING SHOWN / 8-12FT IDEAL
- 9 FIXTURES / 30FT WALL SHOWN

42" SETBACK / 42" SPACING ON CENTER

- AVERAGE FC: 11.82
- MIN / MAX: 6.10
- 10FT CEILING SHOWN / 8-12FT IDEAL
- 9 FIXTURES / 35FT WALL SHOWN

SQUARE



RECOMMENDED

30" SETBACK / 30" ON CENTER SPACING

- AVERAGE FC: 20.30
- MIN / MAX: 4.45
- 10FT CEILING SHOWN / 8-12FT IDEAL
- 9 FIXTURES / 25FT WALL SHOWN

36" SETBACK / 36" ON CENTER SPACING

- AVERAGE FC: 15.59
- MIN / MAX: 4.47
- 10FT CEILING SHOWN / 8-12FT IDEAL
- 9 FIXTURES / 30FT WALL SHOWN

42" SETBACK / 42" SPACING ON CENTER

- AVERAGE FC: 12.29
- MIN / MAX: 5.76
- 10FT CEILING SHOWN / 8-12FT IDEAL
- 9 FIXTURES / 35FT WALL SHOWN

ADDITIONAL SPACINGS AND SETBACKS

ROUND			
ON CENTER SPACING	SETBACK		
	30"	36"	42"
30"	SHOWN ABOVE	AVERAGE FC: 17.71 MIN / MAX: 4.78	AVERAGE FC: 15.93 MIN / MAX: 5.19
36"	AVERAGE FC: 16.38 MIN / MAX: 4.53	SHOWN ABOVE	AVERAGE FC: 13.57 MIN / MAX: 5.20
42"	AVERAGE FC: 14.11 MIN / MAX: 5.79	AVERAGE FC: 12.90 MIN / MAX: 5.94	SHOWN ABOVE

SQUARE			
ON CENTER SPACING	SETBACK		
	30"	36"	42"
30"	SHOWN ABOVE	AVERAGE FC: 18.46 MIN / MAX: 4.45	AVERAGE FC: 16.69 MIN / MAX: 4.87
36"	AVERAGE FC: 17.03 MIN / MAX: 4.26	SHOWN ABOVE	AVERAGE FC: 14.17 MIN / MAX: 4.91
42"	AVERAGE FC: 14.69 MIN / MAX: 5.53	AVERAGE FC: 13.44 MIN / MAX: 5.47	SHOWN ABOVE

***ALL DATA REFLECTS 90S15A WATTAGE PACKAGE**

 PERFORMANCE - 3000K

LUMEN PACKAGE	WATT-AGE	WALLWASH OPTIC	
		DELIVERED	LPW
80S06A	06	629	105
80S11A	11	1012	92
80S15A	15	1378	92
80S21A	21	1850	88
90S06A	06	540	90
90S11A	11	869	79
90S15A	15	1184	79
90S21A	21	1589	76
97S06A	06	474	79
97S11A	11	763	69
97S15A	15	1040	69
97S21A	21	1395	66
90W10A (26K-18K)	10	592	59
90W10A (29K-18K)	10	600	60
90W15A (27K-18K)	15	828	56
90W15A (30K-18K)	15	840	56
90T17A (50K-27K)	17	960	56
90T17A (40K-18K)	17	966	56

OUTPUT MULTIPLIER

CCT	CCT SCALE
2400K	0.85
2700K	0.97
3000K	1.00
3500K	1.03
4000K	1.08

TUNABLE WHITE MULTIPLIER

CCT	5000K-2700K	4000K-1800K
5000K	1.16	-
4000K	1.08	1.14
3500K	1.04	1.07
3000K	1.00	1.00
2700K	0.96	0.92
2400K	-	0.84
1800K	-	0.69



JA8-2022 INDICATED BY SHADING

WARM DIM PERFORMANCE - SOFT FOCUS LENS - WW OPTIC

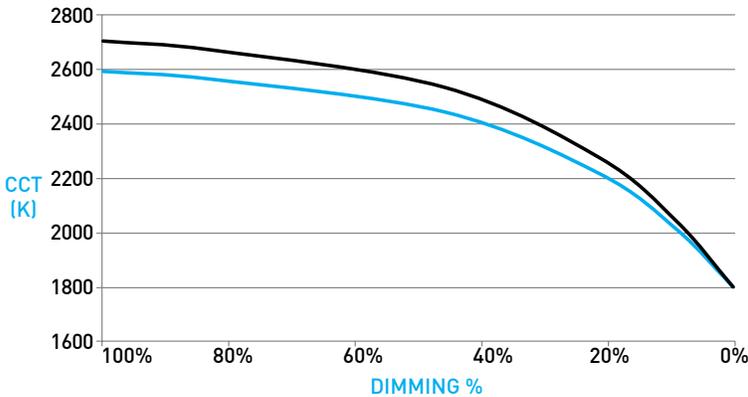
INCANDESCENT PROFILE

90W10AL 2700K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2600	2550	2520	2450	2200	1925	1800
Light Output (Lm)	592	473	414	296	118	59	1
Power (W)	10	8	7	5	2	1	.2
Efficacy (LPW)	59	59	59	59	59	59	59
90W15AL 2700K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2700	2650	2620	2520	2180	1950	1800
Light Output (Lm)	828	662	579	414	165	82	16
Power (W)	15	12	10.5	7.5	3	1.5	0.3
Efficacy (LPW)	56	56	56	56	56	56	56

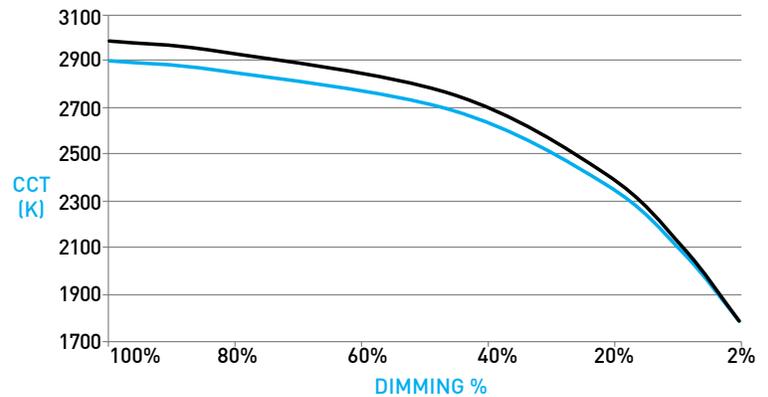
HALOGEN PROFILE

90W10AD 3000K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2900	2850	2800	2720	2350	1975	1800
Light Output (Lm)	600	480	420	300	120	60	12
Power (W)	10	8	7	5	2	1	.2
Efficacy (LPW)	60	60	60	60	60	60	60
90W15AD 3000K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	3000	2950	2920	2775	2375	2000	1800
Light Output (Lm)	840	672	588	420	168	84	16
Power (W)	15	12	10.5	7.5	3	1.5	0.3
Efficacy (LPW)	56	56	56	56	56	56	56

10W / 15W



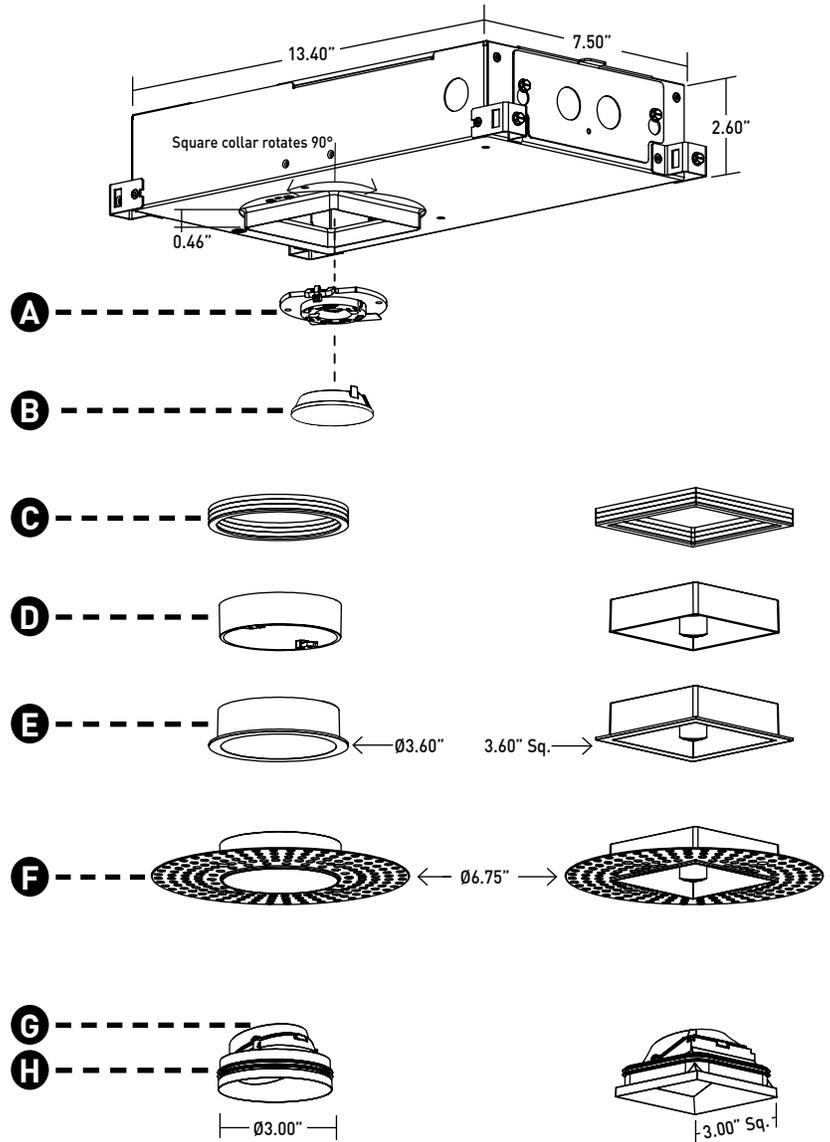
10W / 15W



DOWNLIGHT / HOUSING

- A LED**
Integral LED module design enables field service / replacement through housing aperture.
- B OPTIC**
Robust light engine with optimized optic pairing integrates Reflection, Refraction, and TIR principles.
- C TRIMLESS MILLWORK SPACERS**
Provided for Trimless Millwork installations; includes (1) 1/16" spacer and (5) 1/8" spacers.
- D TRIM EXTENSION**
Provided for -2 ceiling thickness; accommodates 2.125" max ceiling thickness.
- E MICROFLANGE PROFILE**
Features 0.30" flange. Thickness measures 0.06". Installed after ceiling is complete. Requires 3.375" diameter cutout. Wet location features integral silicone gasket.
- F TRIMLESS DRYWALL PROFILE**
Installs totally flush with the ceiling with no visible trim. Appliqué includes screws for mounting and has 0.06" plaster stop. Not recommended for stucco applications.
- G MEDIA**
Asymmetrical spread lens, included and sealed in place, combined with angled optic and wide aperture enhance uniformity. Suction tool provided for removal of baffle.
- H BAFFLE**
Die-cast baffle minimizes aperture glare and conceals view into housing; includes gasket.

DIMENSIONS / DRAWINGS



DOWNLIGHT / HOUSING

- I** **IC HOUSING**
 - For IC ceilings.
 - No setback from polycell spray foam insulation having max R-Value of 60 on all sides and top of housing.
- J** **NIC HOUSING**
 - Minimum 0.50" setback from combustible and non-combustible materials on all sides and top of housing.
 - Minimum 3.00" setback from insulation material having max R-Value 30 on all sides and top of housing.
 - Minimum 6.00" setback from polycell spray foam insulation having max R-Value 60.
- K** **ADJUSTABLE HANGER BAR HEIGHT ACCESSORY**

Provided with ceiling thickness "T" and recommended for installations in T-Grid up to 1.5" tall. Hanger bars are installed to adjustable bracket. Allows housing to be raised and lowered; ceiling thickness remains 0.5" to 1.375" max.
- L** **APPLIQUÉ DETAIL**

Appliqué for plaster floating directly to baffle.
- M** **REMOTE POWER SUPPLY**

Provided with install Types "V", "W" and "D". Remote power supply provides additional driver options. See page 9 for maximum allowable secondary run lengths between PSF3-RMT and fixture. Must be installed in an accessible location.
- N** **ATHENA / CASAMBI CONTROL**

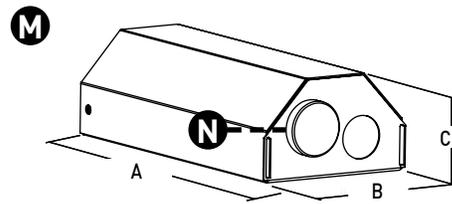
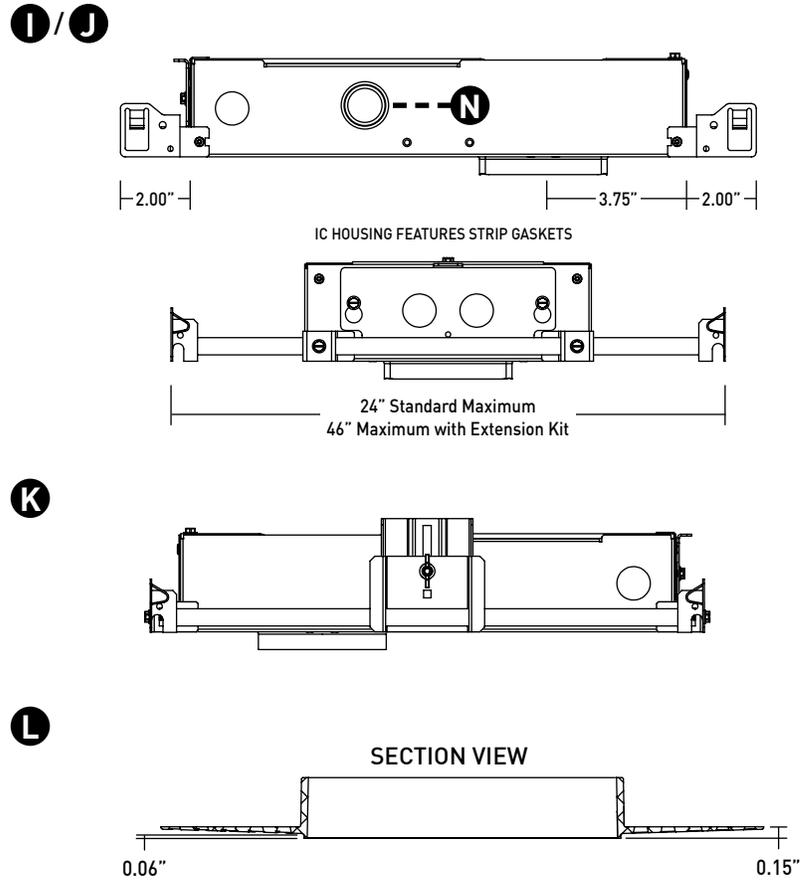
Controls integrated into housing or remote driver assembly. All equipment is serviceable.

Athena Model Numbers: A-WN-D01-RF-BL & DFC-OEM-DBI

Casambi Model Number: BT-S1E1-5400
- O** **ATHENA / CASAMBI EM SHUNT**

Included with drivers specified as ASR, ADR, CSR, or CDR. One required for each wireless EM fixture, requires class 2 control wiring between fixture and shunt. Features integrated test switch.

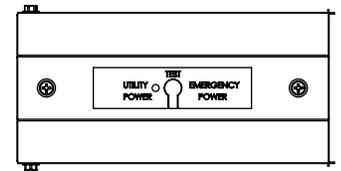
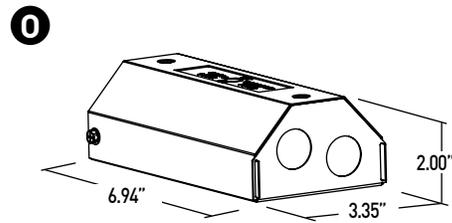
Model Number: PS-RMT-SHUNT



	A	B	C
STATIC WHITE / WARM DIM	6.94"	3.35"	2.00"
TUNABLE WHITE	8.10"	5.00"	2.00"
ATHENA / CASAMBI CONTROLLED	8.10"	5.00"	2.00"

HOUSING NOTES

- Do not install NON-IC housings in environments where ambient temperatures exceed 40°C (104°F). See table below for IC housings.
- Power supply compartment and all splice connections may be serviced from room side.
- Consult factory for spacing requirements for any installations exceeding R-Value 60.
- Hanger bars fitted to short side of housing or long side when TG accessory is specified; extend from 14.0" to 24.0", but may be field cut to accommodate narrow stud spacing. Can be extended up to 46" maximum with FRX-HBE-46 kit.
- Hanger bars and brackets add 4.00" max to the overall dimension, but are exclusive of the setback requirements.
- Housings for round trims feature a round aperture housing collar. Housings for square trims feature a square housing collar that rotates up to 90 degrees for fixture alignment. Housing collars accommodate ceiling thicknesses between 0.50" and 2.125".



IC HOUSING MAX AMBIENT TEMPERATURE	
LUMEN PACKAGE	TEMPERATURE
06W / 11W STATIC WHITE	40°C (104°F)
10W WARM DIM	35°C (95°F)
15W STATIC WHITE	25°C (77°F)
15W WARM DIM	30°C (86°F)
17W TUNABLE WHITE	30°C (86°F)

TECHNICAL

CONSTRUCTION

Downlight: Painted finishes are granulated powder coat.
Housing: Aluminum and 22 Gauge galvanized steel. Die-cast aluminum heat-sink.
Remote Power Supply: 22 Gauge galvanized steel.
Appliqué: Zinc alloy.

STATIC WHITE LED

2-step MacAdam ellipse LED module available in 80+, 90+ and 97+ CRI configurations in color temperatures of 2700K, 3000K, 3500K and 4000K.
 3-step MacAdam ellipse LED module available in 90+ CRI configuration in color temperature of 2400K. Average rated lamp life of 50,000 hours.
 LED and driver assemblies are field-replaceable.

WARM DIM LED

3-step MacAdam ellipse warm dim LED module available in 90+ CRI configuration. 3000K or 2700K at full brightness, warming to 1800K at full dim. Average rated lamp life of 50,000 hours. LED and driver assemblies are field-replaceable.

TUNABLE WHITE LED

3-step MacAdam ellipse tunable white LED module available in 90+ CRI configuration. Features tuning ranges of 1800K to 4000K and 2700K to 5000K. Average rated lamp life of 50,000 hours. LED and driver assemblies are field-replaceable.

POWER SUPPLY PERFORMANCE AND DIMMING INFORMATION

Power Supply	PHASE		0-10V					ECO	DALI-2		ATHENA		CASAMBI	
	PH	SG	SN	EG	EN	DG	DN	LP	ED	DD	AS	AD	CS	CD
Minimum °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	0 °C	-20 °C	-20 °C	0 °C	0 °C	-20 °C	-20 °C
Maximum °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Dimming %	2.0%	1.0%	1.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%

Note: For LP, EG and EN drivers consult chart on page 10 to confirm appropriate dimming curve for compatibility with selected control.

MAXIMUM ALLOWABLE REMOTE DRIVER WIRING DISTANCES

DRIVER	WIRE AWG				
	12	14	16	18	20
PH	285'	180'	113'	71'	45'
LP	60'	40'	25'	15'	-
EG, EN, ED, DG, DN, DD, SG, SN, AS, CS, AD, CD	-	-	118'	72'	46'

LISTING

cTUVus listed to UL1598 standard for Dry / Damp and Wet locations. CCEA, Airtight, and Title 24 JA8-2022 Listed. NEMA 410 Compliant.

BUY AMERICAN ACT

All Fraxion3 Slim Wallwash configurations are Buy American Act compliant.

DECLARE

LBC Red List Approved.

WEIGHT

Fixture - 2.4 lbs
 Remote Driver - 1.4 lbs

LIMITED WARRANTY

Manufacturer's Limited Warranty guarantees product(s) listed to be free from defects in material and workmanship under normal use and service for 1-year. LED and power supplies are warranted to operate with 70% of original flux and remain within a range of 3 duv for a period of 5-years.

10-year Lutron Advantage limited warranty available on Lutron equipped systems. Warranty period begins from the date of shipment by Seller.

[Consult website for full warranty terms and conditions.](#)

CHANGE LOG

- 10/17/2022: REMOVED 90W13A 3200K-1800K WARM DIM AND ADDED 90W15AD 3000K-1800K WARM DIM.
- 10/17/2022: UPDATED MAX AMBIENT TEMPERATURE TABLE.
- 02/14/2023: ADDED EG, EN, AND ED DRIVER OFFERINGS.
- 04/26/2023: ADDED DECLARE LBC RED LIST APPROVED.
- 08/07/2023: ADDED NEW LED AND OPTIC OFFERINGS. REMOVED 2200K OFFERING.
- 02/01/2024: ADDED ATHENA AND CASAMBI CONTROL OFFERING, 2400K, AND WARM PROFILE TUNABLE WHITE.
- 07/15/2024: REMOVED L2 DRIVER OFFERING.



DIMMING COMPATIBILITY

LUTRON DRIVER COMPATIBILITY

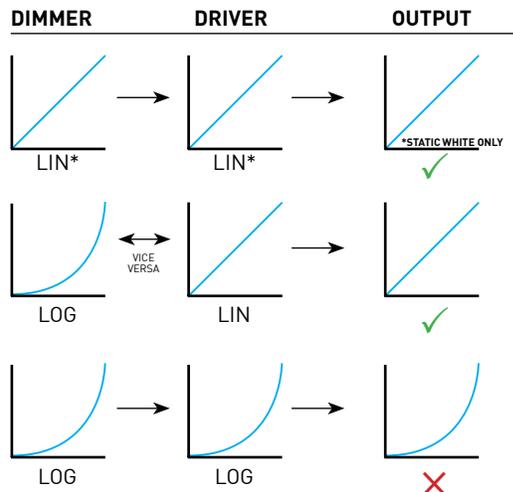
Power supply LP Lutron Product Family	Part No.
PowPak Dimming Modules	RMJ-EC032-DV-B
PowPak Dimming Modules	FCJ/FCJS-ECO
Energi Savr Nodes	QSN-1ECO-S
GRAFIK Eye QS control unit Homeworks QS control unit	QSN-2ECO-S
GRAFIK Eye QS control unit Homeworks QS control unit	QSGRJ- _E (wireless) QSGR- _E
Quantum Hub	QP2- _ _ 2C
Quantum Hub	QP2- _ _ 4C
Quantum Hub	QP2- _ _ 6C
Quantum Hub	QP2- _ _ 8C
Homeworks QS power module myRoom Plus power module	LQSE-2ECO-D



eldoled DRIVER COMPATIBILITY

Power supply EG/SG Manufacturer	Family/Model #
Busch-Jaeger	2112U-101
Jung	240-10
Leviton Lighting Controls	IP710-DLX
Lightolier Controls	ZP600FAM120
Merten	5729
Pass & Seymour	CD4FB-W
The Watt Stopper	DCLV1
Synergy	ISD BC
Crestron®	GLX-DIMFLV8
Crestron®	GLXP-DIMFLV8
Crestron®	GLPAC-DIMFLV4-*
Crestron®	GLPAC-DIMFLV8-*
Crestron®	GLPP-DIMFLVEX-PM
Crestron®	GLPP-1DIMFLV2EX-PM
Crestron®	GLPP-1DIMFLV3EX-PM
Crestron®	DIN-A08
Crestron®	DIN-4DIMFLV4
Crestron®	CLS-EXP-DIMFLV
Crestron®	CLCI-1DIMFLV2EX
Power supply EN/SN Manufacturer	Family/Model #
Lutron Electronics	Nova T® - NTFTV
Lutron Electronics	Diva® - DDTV
Lutron Electronics	Nova® - NFTV
Lutron Electronics	GrafixEye® GRX-TVI w GRX3503
Lutron Electronics	Energy Savr Node™ - QSN-4T16-S
Lutron Electronics	TVM2 Module
Sensor Switch	nIO EZ
ABB	SD/S 2.16.1

ANALOG DRIVERS AND DIMMERS



LIN = LINEAR
 LOG = LOGARITHMIC
 *LIN-TO-LIN NOT COMPATIBLE FOR WARM-DIM

ATOMOS™2

UNIVERSAL AND SLIM

A miniature downlight range offering impressive performance in an extremely small profile with a 2" aperture. Available as flange overlay and trimless for both drywall and millwork applications.

PROJECT NAME:

TYPE L4



ORDERING INFORMATION - TRIM / HOUSING



JA8-2022 INDICATED BY SHADING

TRIM	TRIM TYPE	RATING	TRIM FINISH	BAFFLE FINISH	FIXTURE TYPE	INSTALL TYPE	LUMEN PACKAGE	CCT	OPTIC (UGR)	MEDIA	DRIVER
ADJUSTABLE & FIXED	F Flange Overlay	1 Dry / Damp (IP20)	WH White	WH White	5.52" UNIVERSAL HOUSING (SEPARATE TRIM AND HOUSING) 1/2" - 2" MAX CEILING THICKNESS SEE PAGE 2 FOR T-GRID ACCESSORY		STATIC WHITE	24 2400K*	10 10°* (<13)	STANDARD MEDIA	ALL INSTALL TYPES
	T Trimless Drywall	2 Wet (IP44)	AB Architectural Bronze	AB Architectural Bronze			8008D 80+ CRI AD/FD lm delivered - 538 SF lm delivered - 594	27 2700K	15 15° (<16)		
A2RS 2" Round	W Trimless Millwork*	* (Not available for remodel installations)	AG Satin Silver	AG Satin Silver	AD Adjustable, 30° Max Tilt	INTEGRAL	8009H 80+ CRI* * (For use with 10° optic only)	30 3000K	25 25° (<16)	W Wallwash Lens* * (Required for and only available with wallwash)	SG eldoLED, ECOdrive 1% 0-10V, LOG, 120 - 277V
A2SS 2" Square			AU Cashmere Gold	AU Cashmere Gold			FD Fixed	N Non-IC	35 3500K		
WALLWASH			BB Burnt Bronze	BB Burnt Bronze	WW Wallwash	N Non-IC	8012D 80+ CRI AD/FD lm delivered - 920 SF lm delivered - 1012	40 4000K	50 50° (<19)	ALTERNATE MEDIA	SN 1% 0-10V, LIN, 120 - 277V
A2RW 2" Round		BK Black	BK Black	IC, Airtight* * (Chicago Plenum, Airtight & Title 24 compliant housing)			A 8012D 80+ CRI AD/FD lm delivered - 920 SF lm delivered - 1012	80 80°* * (Requires -6 wide distribution film)	0 No Media* * (Not available for Wet Location or Warm Dim)		
A2SW 2" Square		PR Primer	PR Primer	L IC, Light Enclosed* * (Chicago Plenum, Airtight & Title 24 compliant housing. Prevents light leak in transparent ceilings)	L 8016D 80+ CRI Max Flux SF lm delivered - 1227* * (SF Fixture Type Only)	AZ Adjustable Zoom* (<19) * (AD/FD Static White only, 24°, 30°, 36°, 42° and 48° beam spreads.)	2 Honeycomb Louver* * (Not available for Wet Location, 8016D, 9014D or Warm Dim)	EN eldoLED, SOLOdrive 0.1% 0-10V, LIN, 120 - 277V			
		CF Trimless	CF Custom Finish* * (Consult Factory)	CF Custom Finish* * (Consult Factory)		S IC, Remote	9007D 90+ CRI AD/FD lm delivered - 455 SF lm delivered - 503	WL 2700K - 1800K	WW Wallwash* * (Required for and only available with wallwash)	3 Clear Film* * (Not available for Warm Dim)	ED eldoLED, SOLOdrive 0.1% DALI-2, LOG, 120 - 277V
						T Non-IC, Remote	9009H 90+ CRI* * (For use with 10° optic only)	WD 3000K - 1800K		5 Linear Spread Film	LP Lutron, Premier Ecosystem 0.1% Fade to Black, 120 or 277V* * (Not available for X, Y and C install types, consult factory)
						K IC, Airtight, Remote* * (Chicago Plenum, Airtight & Title 24 compliant housing)	9010D 90+ CRI AD/FD lm delivered - 779 SF lm delivered - 860			6 80° Wide Distribution Film* * (Must be paired with 80° optic)	REMOTE ONLY
						J IC, Light Enclosed, Remote* * (Chicago Plenum, Airtight & Title 24 compliant housing. Prevents light leak in transparent ceilings)	9014D 90+ CRI Max Flux SF lm delivered - 1042* * (SF Fixture Type Only)			S Honeycomb Louver w/ Soft Focus Film* * (Not available for 8016D or 9014D)	LH Lutron, Hi-Lume Ecosystem 1% Fade to Black, 120 or 277V* * (Not available for 8008D, 8009H, 9007D, 9009H, or 9005D)
						REMODEL	9005D 90+ CRI, AD/FD lm delivered - 391 SF lm delivered - 443			C Honeycomb Louver w/ Clear Film* * (Not available for 8016D, 9014D or Warm Dim)	ASR Athena Control eldoLED, SOLOdrive 0.1% 120-277V* * (Includes Node, Extended lead time, consult factory ASR/CSR includes shunt)
						REMODEL REMODEL	9009D 90+ CRI, AD/FD lm delivered - 668 SF lm delivered - 757				CSR Casambi Control eldoLED, SOLOdrive 0.1% 120-277V* * (Includes Node, Extended lead time, consult factory ASR/CSR includes shunt)
						M Remote Remodel					TUNABLE WHITE REMOTE (0.1%, 120-277V)
						3.4" SLIM HIGH OUTPUT HOUSING (INTEGRATED LED HOUSING) SF: 1/2" - 1" MAX CEILING THICKNESS SW: 1/2" - 5/8" MAX CEILING THICKNESS SEE PAGE 2 FOR T-GRID ACCESSORY	TUNABLE WHITE	TR 4000K - 1800K			DD eldoLED, DUALdrive DALI-2, LOG
						SF Fixed	9010D 90+ CRI, Warm Profile* AD/FD lm delivered - 694 SF lm delivered - 764				DG eldoLED, DUALdrive 0-10V, LOG
						SW Wallwash* * (Not available for trimless millwork)	Cool Profile* AD/FD lm delivered - 611 SF lm delivered - 672 * (Tunable White packages not available for "R" install type)				DN eldoLED, DUALdrive 0-10V, LIN
						X IC					ADR eldoLED, DUALdrive*
						Y NIC					CDR eldoLED, DUALdrive*
						C IC, Airtight* * (Chicago Plenum, Airtight & Title 24 compliant housing)					* (Includes Node, Extended lead time, consult factory for EM use, ADR/CDR includes shunt)
						REMOTE					
						V IC, Remote					
						W NIC, Remote					
						D IC, Airtight, Remote* * (Chicago Plenum, Airtight & Title 24 compliant housing)	*All lm delivered reflect 3000K, 15° or WW optic, and Soft Focus or Wallwash Media.				

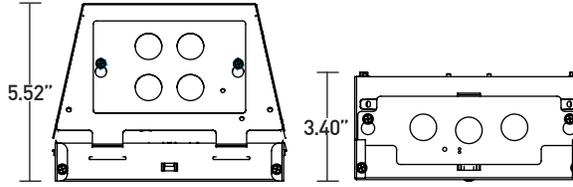


PART NUMBER NOTES

- Universal trims ship as e.g: A2RSFAD1AGAG-8012D27-15I-PH*0
- Universal housings ship as e.g: IFR-A2I-280A-PH*
- Slim fixtures ship as e.g: A2RSFSF1AGAG-8012D27-15X-PH*0
- Remote drivers ship as e.g: PSA2-RMT-280A-PH*



HOUSING COMPARISON



HOUSING COMPARISON	UNIVERSAL HOUSING	SLIM HIGH OUTPUT HOUSING
FIXTURE TYPES	AD FD WW	SF SW
HOUSING DEPTH	5.52"	3.4"
MAX DELIVERED LUMENS	AD - 920 FD - 920 WW - 1032	SF - 1227 SW - 1032
MAX CEILING THICKNESS	2"	1"
ROTATING COLLAR	NO	YES
OPTICS	15°, 25°, 35°, 50°, 80°, & ADJUSTABLE ZOOM	15°, 25°, 35°, 50°, & 80°

ACCESSORIES

ALTERNATE MEDIA

Consult factory for additional configurations.

- CGL-AR** Clear Film*
*(Not available for Warm Dim. Consult factory for Wet locations.)
- SFL-AR** Soft Focus Film*
*(Consult factory for Wet locations.)
- HCL-AR** Honeycomb Louver*
*(Soft Focus Film pairing required for Warm Dim and Wet Location)
- LSL-AR** Linear Spread Film*
*(Consult factory for Wet locations)
- WDL-AR** Wide Distribution Film*
*(Must be paired with 80° optic. Consult factory for Wet locations.)

HANGER BAR EXTENDER KIT

Extends hanger bars from 24.0" to 46.0" maximum.

- FRX-HBE-46** Extender, Hanger Bar.

T-GRID ACCESSORY KIT

Recommended for installations in T-Grid up to 1.5" tall.

- DHA-TG-KIT**

INSTALLATION / REMOVAL TOOL

Required for installation. One provided for every 10 fixtures.

- A2-TOOL-INSTALL** Installation Tool

EMERGENCY LIGHTING - REMOTE MOUNT ONLY

During disruption of main power, emergency battery inverter provides temporary 120V or 277V to fixture.

- EMB-S-25-120/277-LEDX** 25 watt max capacity, 120 or 277 VAC 60Hz, Non-Dimmable
- EMB-S-100-120-LEDX** 100 watt max capacity, 120 VAC 60Hz, 0-10V Dimmable
- EMB-S-100-277-LEDX** 100 watt max capacity, 277 VAC 60Hz, 0-10V Dimmable
- EMB-S-250-120/277-LEDX** 250 watt max capacity, 120 or 277 VAC 60Hz, 0-10V Dimmable

REPLACEMENT OPTICS

Interchangeable optics accessible through fixture aperture.

- RO-A-15-1** 15° optic
- RO-A-25-1** 25° optic
- RO-A-35-1** 35° optic
- RO-A-50-1** 50° optic
- RO-A-AZ-1** Adjustable zoom optic*
*(24°, 30°, 36°, 42° and 48° beam spreads. Not available for Warm Dim or Tunable White.)
- RO-A-WW-1** Wallwash optic

ADJUSTMENT TOOL

One provided for every 10 adjustable fixtures.

- TOOL-HEX-050** Adjustment Tool

FURRING CHANNEL ACCESSORY KIT

Recommended for installations in furring channel.

- DHA-FC-KIT**

STATIC WHITE PERFORMANCE - 3000K

UNIVERSAL HOUSING (AD, FD, WW)

LUMEN PACKAGE	WATTS	15° OPTIC SOFT FOCUS FILM		25° OPTIC SOFT FOCUS FILM		35° OPTIC SOFT FOCUS FILM		50° OPTIC SOFT FOCUS FILM		80° OPTIC WIDE DIST. FILM		ROUND WALLWASH WALLWASH LENS		SQUARE WALLWASH WALLWASH LENS	
		DLVD.	LPW	DLVD.	LPW	DLVD.	LPW								
8008D	6	538	90	534	89	472	79	501	84	431	72	549	92	603	101
8012D	12	920	77	912	76	807	67	857	71	779	65	934	77	1032	87
9007D	6	455	76	452	75	400	67	424	71	365	61	465	78	511	85
9010D	12	779	65	773	64	684	57	726	61	624	52	796	66	874	74
9005D (27K-18K)	6	391	65	388	65	343	57	364	61	313	52	396	66	416	69
9009D (30K-18K)	12	668	55	663	55	587	49	623	52	535	45	677	58	712	61
9010DTR (18K-4K)	10	694	69	696	70	612	61	685	68	582	58	709	70	723	72
9010DTH (27K-5K)	10	611	61	613	61	539	54	603	60	512	51	619	62	636	64

OUTPUT MULTIPLIER

CCT	CCT SCALE
2400K	0.76
2700K	0.95
3000K	1.00
3500K	1.05
4000K	1.06

LIGHT LOSS FACTOR

NO MEDIA	1.11
SOFT FOCUS	1
CLEAR	1
HONEYCOMB	0.77
HONEYCOMB W/ SOFT FOCUS	0.77
LINEAR SPREAD	0.76
HONEYCOMB W/ CLEAR	0.76

LUMEN PACKAGE	WATTS	10° OPTIC SOFT FOCUS FILM	
		DLVD.	LPW
80S09H	9	322	36
90S09H	9	273	30

LUMEN PACKAGE	WATTS	24° Zoom-Position 1 SOFT FOCUS FILM		30° Zoom-Position 2 SOFT FOCUS FILM		36° Zoom-Position 3 SOFT FOCUS FILM		42° Zoom-Position 4 SOFT FOCUS FILM		48° Zoom-Position 5 SOFT FOCUS FILM	
		DLVD.	LPW								
8008D	6	469	78	473	79	446	74	427	71	422	70
8012D	12	803	67	810	67	763	64	731	61	721	60
9007D	6	398	66	401	67	378	63	362	60	357	60
9010D	12	680	57	686	57	646	54	619	52	611	51

FINISH LIGHT LOSS FACTOR

BAFFLE FINISH	LLF
WHITE	1.00
CASHMERE GOLD	0.96
SATIN SILVER	0.95
BURNT BRONZE	0.93
BLACK	0.92

TUNABLE WHITE MULTIPLIER

CCT	5000K-2700K	4000K-1800K
5000K	1.16	-
4000K	1.08	1.14
3500K	1.04	1.07
3000K	1.00	1.00
2700K	0.96	0.92
2400K	-	0.84
1800K	-	0.69

TITLE 24 JA8-2022 INDICATED BY SHADING

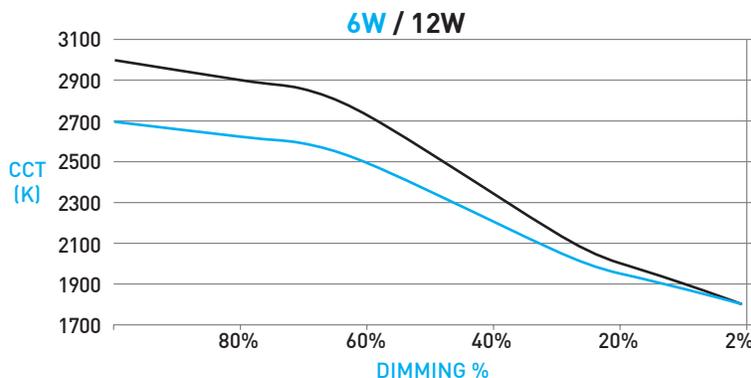
UNIFIED GLARE RATING

10° OPTIC FIELD REDUCER KIT	15° OPTIC SOFT FOCUS LENS	25° OPTIC SOFT FOCUS LENS	35° OPTIC SOFT FOCUS LENS	50° OPTIC SOFT FOCUS LENS	80° OPTIC SOFT FOCUS LENS	WALLWASH OPTIC WALLWASH LENS
<13	<16	<16	<19	<19	>19	>19

WARM DIM PERFORMANCE - SOFT FOCUS FILM - 15° OPTIC

UNIVERSAL ADJUSTABLE & FIXED

9009D 3000K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%	9005D 2700K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	3000	2900	2850	2550	2000	1900	1800	CCT (K)	2700	2160	1890	1350	540	270	54
Light Output (Lm)	668	534	467	334	133	66	13	Light Output (Lm)	391	313	274	196	78	39	8
Power (W)	12	9.6	8.4	6	2.4	1.2	0.2	Power (W)	6	4.8	4.2	3	1.2	0.6	0.1
Efficacy (LPW)	55	55	55	55	55	55	55	Efficacy (LPW)	65	65	65	65	65	65	65



STATIC WHITE PERFORMANCE - 3000K

SLIM HIGH OUTPUT HOUSING (SF, SW ONLY)

LUMEN PACKAGE	WATTAGE	15° OPTIC SOFT FOCUS FILM		25° OPTIC SOFT FOCUS FILM		35° OPTIC SOFT FOCUS FILM		50° OPTIC SOFT FOCUS FILM		80° OPTIC WIDE DIST. FILM	
		DLVD.	LPW								
8008D	6	594	99	585	98	547	91	574	96	483	81
8012D	12	1012	84	999	83	933	78	978	82	845	70
8016D	15	1227	78	1210	78	1130	73	1186	62	1060	70
9007D	6	503	84	496	83	463	77	486	81	409	68
9010D	12	860	69	848	68	792	64	831	67	700	58
9014D	15	1042	66	1028	66	960	62	1007	53	816	54
9005D (27K-18K)	6	443	74	435	73	406	68	426	71	365	61
9009D (30K-18K)	12	757	64	744	63	695	58	729	62	624	52
9010DTR (18K-4K)	10	764	76	762	76	708	71	782	78	632	63
9010DTH (27K-5K)	10	672	67	671	67	623	62	688	69	556	56

ROUND WALLWASH WALLWASH LENS		SQUARE WALLWASH WALLWASH LENS	
DELIVERED	LPW	DELIVERED	LPW
549	92	603	101
934	78	1032	86
-	-	-	-
465	78	511	85
796	66	874	74
-	-	-	-
396	66	416	69
677	58	712	61
703	70	723	72
619	62	636	64

OUTPUT MULTIPLIER

CCT	CCT SCALE
2400K	0.76
2700K	0.95
3000K	1.00
3500K	1.05
4000K	1.06

LIGHT LOSS FACTOR

NO MEDIA	1.11
SOFT FOCUS	1
CLEAR	1
HONEYCOMB	0.77
HONEYCOMB W/ SOFT FOCUS	0.77
LINEAR SPREAD	0.76
HONEYCOMB W/ CLEAR	0.76

TUNABLE WHITE MULTIPLIER

CCT	5000K-2700K	4000K-1800K
5000K	1.16	-
4000K	1.08	1.14
3500K	1.04	1.07
3000K	1.00	1.00
2700K	0.96	0.92
2400K	-	0.84
1800K	-	0.69

TYPE 24 JA8-2022 INDICATED BY SHADING

LUMEN PACKAGE	WATTS	10° OPTIC SOFT FOCUS FILM	
		DLVD.	LPW
80S09H	9	346	38
90S09H	9	293	33

FINISH LIGHT LOSS FACTOR

BAFFLE FINISH	LLF
WHITE	1.00
CASHMERE GOLD	0.96
SATIN SILVER	0.95
BURNT BRONZE	0.93
BLACK	0.92

UNIFIED GLARE RATING

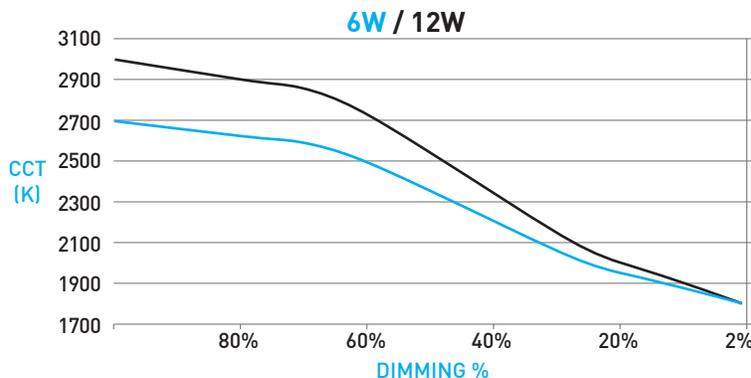
10° OPTIC FIELD REDUCER KIT	15° OPTIC SOFT FOCUS LENS	25° OPTIC SOFT FOCUS LENS	35° OPTIC SOFT FOCUS LENS	50° OPTIC SOFT FOCUS LENS	80° OPTIC SOFT FOCUS LENS	WALLWASH OPTIC WALLWASH LENS
<16	<19	<19	<19	>19	>19	>19

WARM DIM PERFORMANCE - SOFT FOCUS FILM - 15° OPTIC

SLIM FIXED

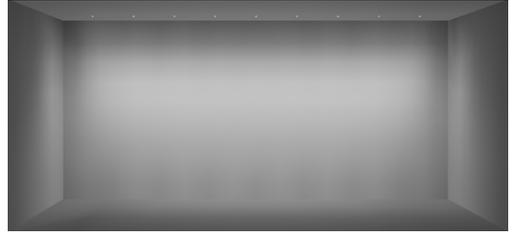
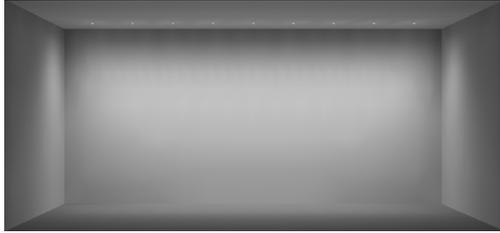
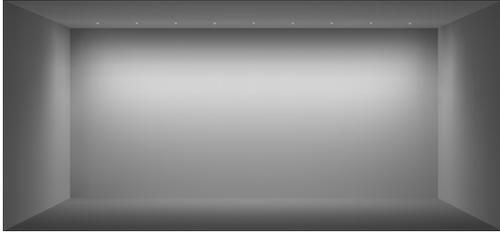
9009D 3000K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	3000	2900	2850	2550	2000	1900	1800
Light Output (Lm)	757	606	530	378	151	75	15
Power (W)	12	9.6	8.4	6	2.4	1.2	0.2
Efficacy (LPW)	64	64	64	64	64	64	64

9005D 2700K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2700	2160	1890	1350	540	270	54
Light Output (Lm)	443	354	310	222	89	44	9
Power (W)	6	4.8	4.2	3	1.2	0.6	0.1
Efficacy (LPW)	73	73	73	73	73	73	73



WALLWASH DESIGN GUIDE

ROUND



RECOMMENDED

30" SETBACK / 30" ON CENTER SPACING

- AVERAGE FC: 11.48
- MIN / MAX: 5.81
- 10FT CEILING SHOWN / 8-12FT IDEAL
- 9 FIXTURES / 25FT WALL SHOWN

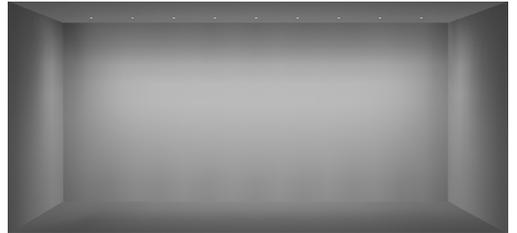
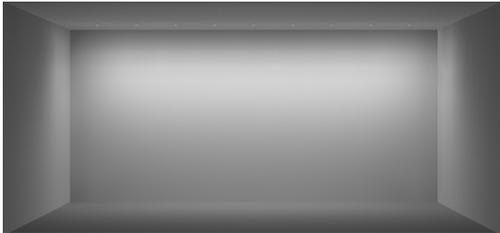
36" SETBACK / 36" ON CENTER SPACING

- AVERAGE FC: 9.26
- MIN / MAX: 5.30
- 10FT CEILING SHOWN / 8-12FT IDEAL
- 9 FIXTURES / 30FT WALL SHOWN

42" SETBACK / 42" SPACING ON CENTER

- AVERAGE FC: 7.22
- MIN / MAX: 7.60
- 10FT CEILING SHOWN / 8-12FT IDEAL
- 9 FIXTURES / 35FT WALL SHOWN

SQUARE



RECOMMENDED

30" SETBACK / 30" ON CENTER SPACING

- AVERAGE FC: 12.64
- MIN / MAX: 4.83
- 10FT CEILING SHOWN / 8-12FT IDEAL
- 9 FIXTURES / 25FT WALL SHOWN

36" SETBACK / 36" ON CENTER SPACING

- AVERAGE FC: 11.30
- MIN / MAX: 4.46
- 10FT CEILING SHOWN / 8-12FT IDEAL
- 9 FIXTURES / 30FT WALL SHOWN

42" SETBACK / 42" SPACING ON CENTER

- AVERAGE FC: 8.07
- MIN / MAX: 5.76
- 10FT CEILING SHOWN / 8-12FT IDEAL
- 9 FIXTURES / 35FT WALL SHOWN

ADDITIONAL SPACINGS AND SETBACKS

ROUND			
ON CENTER SPACING	SETBACK		
	30"	36"	42"
30"	SHOWN ABOVE	AVERAGE FC: 10.51 MIN / MAX: 5.83	AVERAGE FC: 9.62 MIN / MAX: 6.50
36"	AVERAGE FC: 10.01 MIN / MAX: 5.47	SHOWN ABOVE	AVERAGE FC: 8.53 MIN / MAX: 5.46
42"	AVERAGE FC: 8.47 MIN / MAX: 7.20	AVERAGE FC: 7.81 MIN / MAX: 7.18	SHOWN ABOVE

SQUARE			
ON CENTER SPACING	SETBACK		
	30"	36"	42"
30"	SHOWN ABOVE	AVERAGE FC: 11.68 MIN / MAX: 4.51	AVERAGE FC: 10.77 MIN / MAX: 4.69
36"	AVERAGE FC: 10.98 MIN / MAX: 4.43	SHOWN ABOVE	AVERAGE FC: 9.56 MIN / MAX: 4.09
42"	AVERAGE FC: 9.32 MIN / MAX: 5.75	AVERAGE FC: 8.67 MIN / MAX: 5.44	SHOWN ABOVE

TRIM / HOUSING / FIXTURE

A1 UNIVERSAL TRIMS
Adjustable (AD) - Hot-aim tilt up to 30° and 362° rotation. Offset pivot point optimizes center beam. Max ceiling thickness for 30° tilt is 1-3/8".

Fixed (FD) - Trim based fixed downlight.

Wallwash (WW) - Precision engineered to provide exceptionally even wallwashing and minimal aperture glare.

A2 UNIVERSAL HOUSING

- For IC or Non-IC ceilings.
- Chicago Plenum, Airtight and Title 24 (JA8) listed.
- Requires 2-5/16" cutout for flange overlay and trimless drywall applications.
- Accommodates max 1032 delivered lumens.
- No setback from polycell spray foam insulation having max R-Value of 60 on all sides and top.
- "L" and "J" Light Tight housings ensure there is no light leak through fabric or transparent ceilings.

B SLIM HIGH OUTPUT HOUSING
Integral LED module design enables field service / replacement through housing aperture.

- For IC or Non-IC ceilings.
- Chicago Plenum, Airtight and Title 24 (JA8) listed.
- Requires 2-5/16" cutout for flange overlay and trimless drywall applications.
- Accommodates max 1300 delivered lumens.
- No setback from polycell spray foam insulation having max R-Value of 60 on all sides and top.

HOUSING NOTES

- Do not install in environments where ambient temperatures exceed 40°C (104°F).
- Power supply compartment and all splice connections may be serviced from room side.
- Consult factory for spacing requirements for any installations exceeding R-Value 60.
- Hanger bars can be fitted to long or short side of housing; extend from 14.0" to 24.0", but may be field cut to accommodate narrow stud spacing. Can be extended up to 46" maximum with FRX-HBE-46 kit.
- Hanger bars and brackets add 3.16" to the overall dimension but are exclusive of the setback requirements.
- Housings feature a round or square aperture accommodating ceiling thicknesses between 0.50" and 2.00".

ADJUSTMENT

- **ADJUSTMENT TOOL**
Minimum 1 provided for every 10 adjustable fixtures. Utilizes a 0.050" Allen key driver.

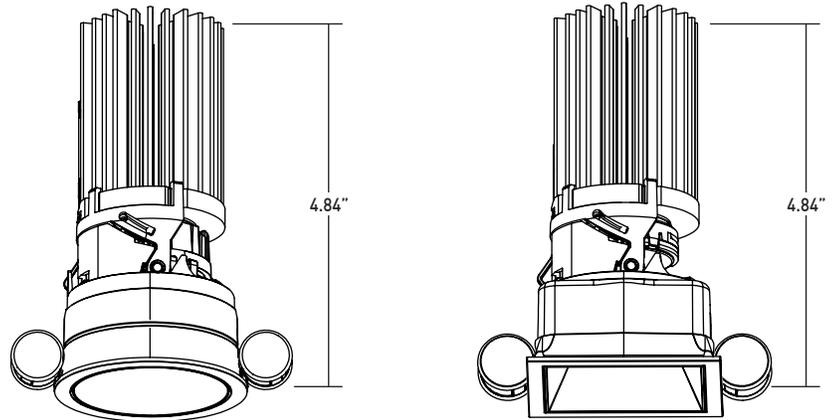


TILT CHART

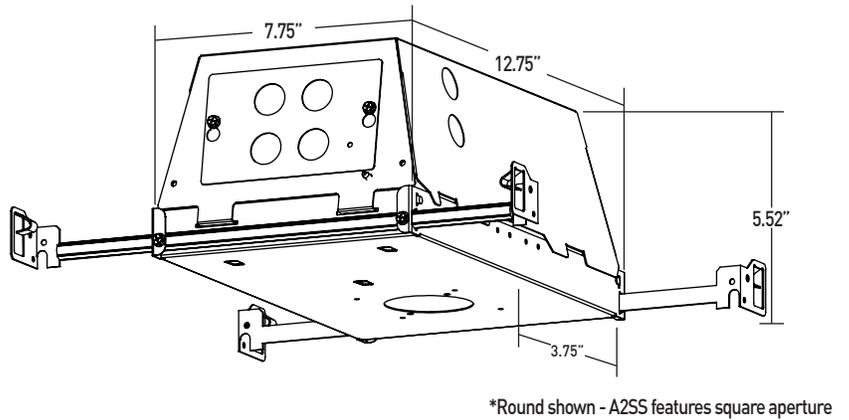
CEILING THICKNESS	≤1-1/2"	≤1-5/8"	≤1-3/4"	≤1-7/8"	≤2"
MAX TILT	30°	24°	18°	15°	13°

DIMENSIONS / DRAWINGS

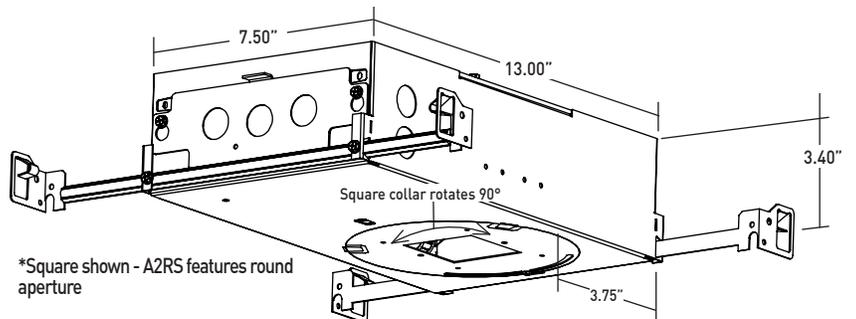
A1 UNIVERSAL ADJUSTABLE (AD) & FIXED (FD) TRIMS



A2 UNIVERSAL ADJUSTABLE (AD), FIXED (FD), WALLWASH (WW) HOUSING



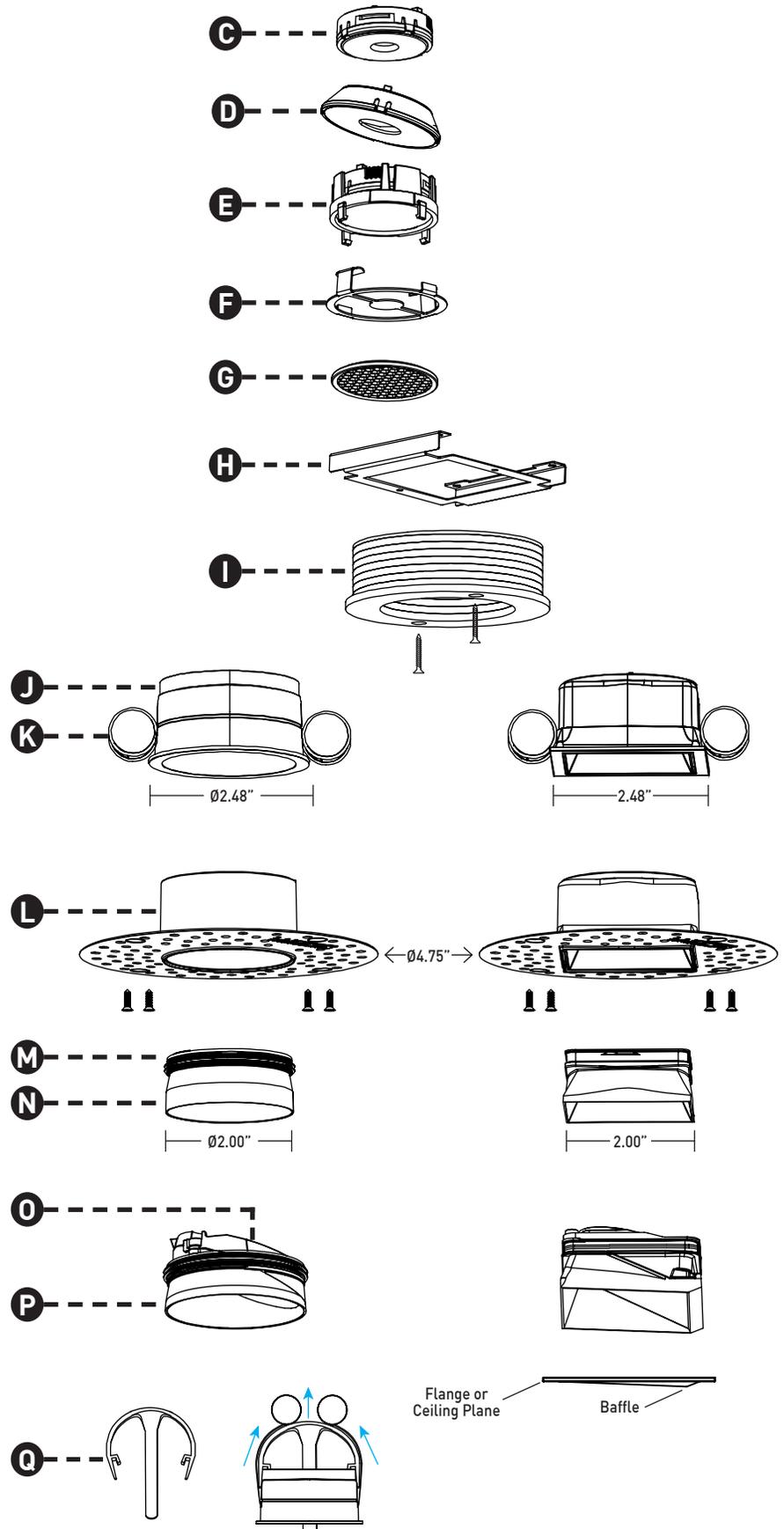
B SLIM FIXED (SF), SLIM WALLWASH (SW) FIXTURE



COMPONENTS

- C STANDARD OPTICS**
Proprietary optic integrates Reflection, Refraction and TIR offering 15°, 25°, 35°, and 50° beams. 25° optic used for optimal accent washing.
- D WALLWASH OPTIC**
35° optic.
- E ADJUSTABLE ZOOM OPTIC**
Proprietary optic integrates Refraction and TIR. Allows precision tuning to beam spreads of 24°, 30°, 36°, 42°, and 48°. Not Available with Slim Fixed (SF)
- F 10° FIELD REDUCER**
Included with 10° optic.
- G HONEYCOMB LOUVER**
Clips onto optic.
- H TRIMLESS MILLWORK HOUSING ADAPTOR**
Ships with housing when trimless millwork is specified and provides attachment point for spacers. Requires 3.50" x 3.50" cutout.
- I TRIMLESS MILLWORK SPACERS**
Ship with housing when trimless millwork is specified; includes (1) 1/16" spacer and (8) 1/8" spacers.
- J FLANGE OVERLAY**
Installed after ceiling is complete. Requires 2-5/16" diameter cutout. Provides 0.16" total contractor (goof) allowance with 0.20" flange. Thickness measures 0.06".
- K RETENTION WHEELS**
Innovative design features constant force wheels that pulls fixture against ceiling. Provides a snug fit that prevents light leak and maximizes contractor goof allowance.
- L TRIMLESS DRYWALL**
Installs totally flush with the ceiling with no visible trim. Appliqué includes screws for mounting and has 0.06" plaster stop. Not recommended for stucco applications.
- M ADJUSTABLE AND FIXED MEDIA**
Soft focus media standard and sealed to baffle on Wet locations. Fixture is limited to 1 media and the honeycomb louver.
- N ADJUSTABLE AND FIXED BAFFLE**
Die-cast removable baffle provides easy access to tilting mechanism and features 45° glare cutoff. Minimizes aperture glare and conceals view into housing or ceiling; includes silicone gasket. Square baffle transitions from square to round.
- O WALLWASH MEDIA**
Acrylic wallwash lens, included and sealed in place.
- P WALLWASH BAFFLE**
Die-cast removable baffle minimizes aperture glare and conceals view into housing or ceiling; includes silicone gasket. Square baffle sits proud of the flange or ceiling plane to provide enhanced wallwashing effect.
- Q INSTALLATION TOOL**
Minimum 1 provided for every 10 flange overlay and trimless millwork fixtures.

DIMENSIONS / DRAWINGS



HOUSING

- R TRIMLESS MILLWORK**
Installs totally flush with the ceiling with no visible trim. Utilizes the A2RS or A2SS standard configuration installed behind the ceiling.
- S ADJUSTABLE HANGER BAR HEIGHT ACCESSORY**
Specified as DHA-TG-KIT and recommended for installations in T-Grid. Hanger bars are installed to adjustable bracket. Allows housing to be raised and lowered; ceiling thickness remains 0.50" to 1.00" (SLIM) or 2.00" (Universal) max.
- T REMOTE POWER SUPPLY**
Provided with install types "S", "T", "K", "V", "W", and "D". Remote power supply provides additional driver options. Consult page 10 for maximum allowable secondary run lengths between PSA2-RMT and fixture. Must be installed in an accessible location.
- U ATHENA / CASAMBI CONTROL**
Controls integrated into remote driver assembly. All equipment is serviceable.

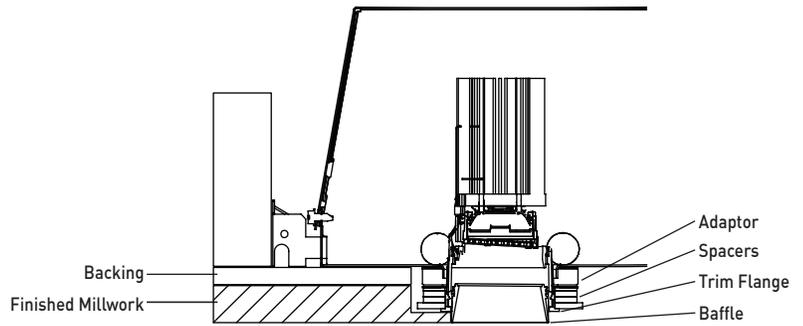
Athena Model Numbers: A-WN-D01-RF-BL & DFC-OEM-DBI

Casambi Model Number: BT-S1E1-5400
- V ATHENA / CASAMBI EM SHUNT**
Included with drivers specified as ASR, AD, CSR, or CDR. One required for each wireless EM fixture, requires class 2 control wiring between fixture and shunt. Features integrated test switch.

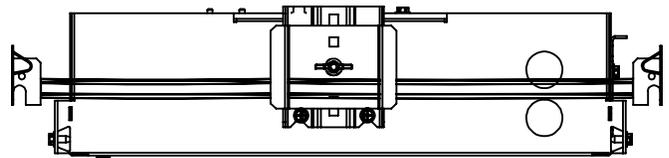
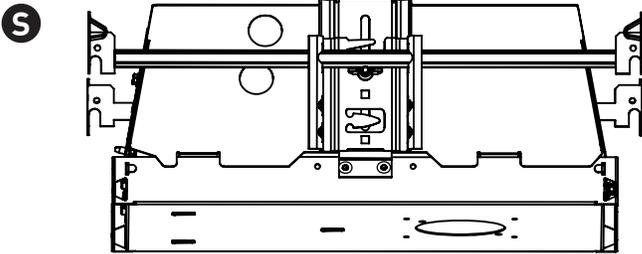
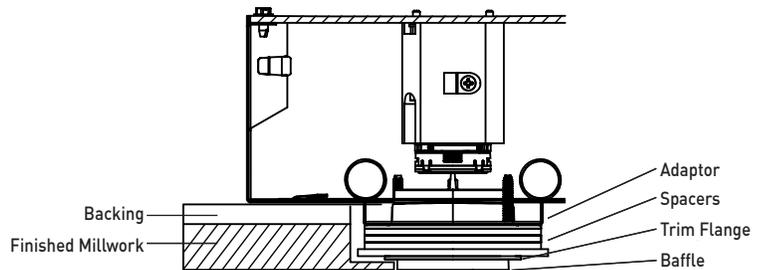
Model Number: PS-RMT-SHUNT

DIMENSIONS / DRAWINGS

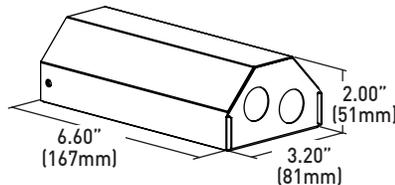
R UNIVERSAL TRIMLESS MILLWORK DETAIL (EXAMPLE)



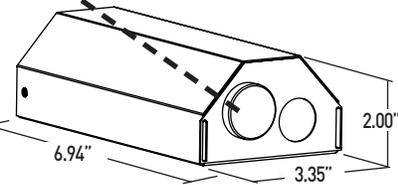
S SLIM TRIMLESS MILLWORK DETAIL (EXAMPLE)



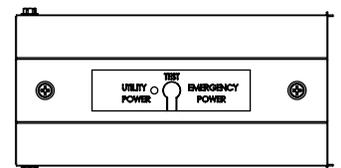
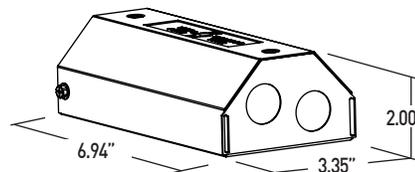
T



U



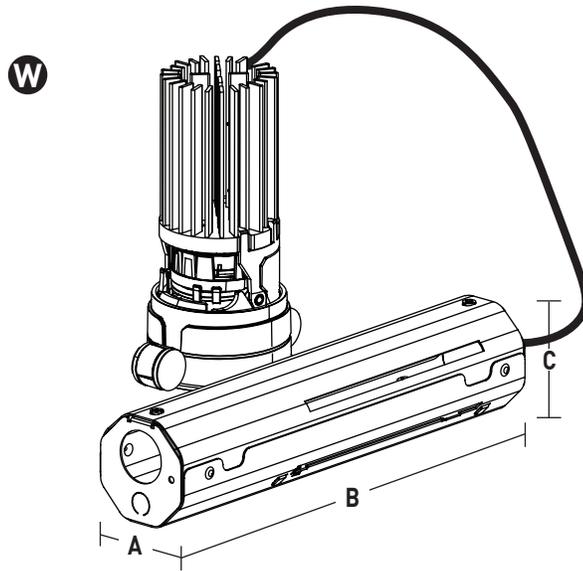
V



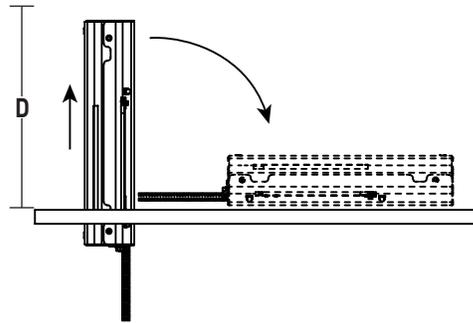
REMODEL POWER SUPPLY

DIMENSIONS / DRAWINGS

- W** REMODEL POWER SUPPLY
 - Included with "R" Install Type.
 - UL2043 listed for air-handling plenum.
 - Fixture mounts without conventional housing.
 - Minimum 6.75" (172mm) (PH Driver) or 9.25" (235mm) (All other drivers) clearance from top of the ceiling plane to allow for driver installation and servicing.
 - Minimum setback from combustible and non-combustible materials of 6.63" (168mm) radius from fixture centerline.
 - Minimum 3.00" (76mm) setback from surfaces of power supply / junction box.
 - Minimum additional 3.00" (76mm) setback from insulation material with max R-Value 30 from any surface of downlight fixture assembly.
 - Minimum additional 6.00" (152mm) setback from polycell spray foam insulation with max R-Value 60 from any surface of downlight fixture assembly.
- X** REMOTE REMODEL APPLICATIONS
 - Remote power supply included with "M" Install Type.
 - Minimum 0.75" (19mm) clearance from top of the fixture.
 - Requires plenum rated Class 2 cable between fixture and remote driver. Cable supplied by others.
 - See page 9 for maximum allowable wiring distances.



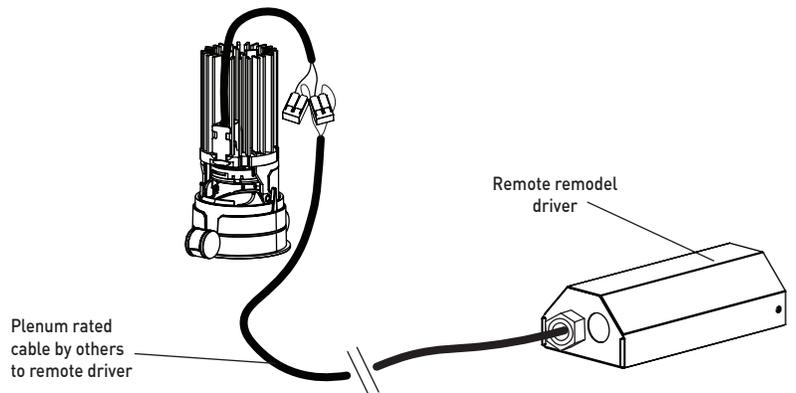
***D - MINIMUM REQUIRED CLEARANCE ABOVE CEILING**



REMODEL NOTES

- Do not install in environments where ambient temperatures exceed 40°C (104°F).
- Power supply compartment and all splice connections may be serviced from room side.
- Consult factory for spacing requirements for any installations exceeding R-Value 60.

DIMENSIONS				
DRIVER	A	B	C	D
PH	1.80"	5.55"	1.80"	6.75"
SG, SN, EG, EN, ED, LP, AS, CS	1.80"	8.07"	1.80"	9.25"



TECHNICAL

CONSTRUCTION

Downlight: Painted finishes are granulated powder coat.
Housing: Aluminum and 22 Gauge galvanized steel.
Remote Power Supply: 22 Gauge galvanized steel.
Remodel Power Supply: 24 Gauge cold rolled steel.
Appliqué: High strength fiber reinforced polymer.

STATIC WHITE LED

2-step MacAdam ellipse LED module available in 80+ and 90+ CRI configurations in color temperatures of 2700K, 3000K, 3500K and 4000K. 3-step MacAdam ellipse LED module available in 90+ CRI configuration in color temperature of 2400K. Average rated lamp life: 50,000 hours. LED and driver assemblies are field-replaceable.

WARM DIM LED

3-step MacAdam ellipse warm dim LED module available in 90+ CRI configuration. 3000K or 2700K at full brightness, warming to 1800K at full dim. Average rated lamp life of 50,000 hours. LED and driver assemblies are field-replaceable.

TUNABLE WHITE LED

3-step MacAdam ellipse tunable white LED module available in 90+ CRI configuration. Features tuning range of 2700K to 5000K and 1800K to 4000K. Average rated lamp life of 50,000 hours. Driver assemblies are field-replaceable.

POWER SUPPLY PERFORMANCE AND DIMMING INFORMATION

	PHASE			ECO			0-10V					DALI			ATHENA		CASAMBI	
Power Supply	PH	LP	LH	SG	SN	EG	EN	DN	ED	DD	DG	AS	AD	CS	CD			
Minimum °C	-10 °C	0 °C	0 °C	-20 °C	-10 °C	-20 °C	0 °C	0 °C	-20 °C	-20 °C								
Maximum °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C			
Dimming %	1.0%	0.1%	1.0%	1.0%	1.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%			

Note: For LH, LP, EG, EN, and SG drivers consult chart on page 11 to confirm appropriate dimming curve for compatibility with selected control.

MAXIMUM ALLOWABLE REMOTE DRIVER WIRING DISTANCES

DRIVER	WIRE AWG				
	12	14	16	18	20
PH, SN	285'	180'	113'	71'	45'
LP, LH	60'	40'	25'	15'	-
EG, EN, SG, ED, AS, CS, AD, CD, DN, DD, DG	-	-	118'	72'	46'

WALLWASH SPACING

Recommended fixture spacing is 36" on center with 36" setback from wall plane.

LISTING

UL listed to UL1598 standard for Dry / Damp and Wet locations. Chicago Plenum, Airtight and Title 24 JA8-2022 Listed. NEMA 410 compliant.

BUY AMERICAN ACT

All IC and Non-IC Atomos configurations are Buy American Act compliant.

DECLARE

LBC Red List Approved.

WARRANTY

Manufacturer's 1-year warranty guarantees product(s) listed to be free from defects in material and workmanship under normal use and service. 5-year warranty on LED and power supply to operate with 70% of the original flux and remain within a range of 3 duv. 10-year Lutron Advantage limited warranty available on Lutron equipped systems. Warranty period begins from the date of shipment by Seller. Consult website for full warranty terms and conditions.

CHANGE LOG

- 06/09/2023: UPDATED SG AND SN DRIVERS TO ELDOLED ECODEIVE.
- 02/07/2024: ADDED ATHENA AND CASAMBI CONTROL OFFERINGS. ADDED 2400K, TUNABLE WHITE, AND LOW WATTAGE OFFERINGS
- 03/15/2024: ADDED 10 DEGREE FIELD REDUCER, UPDATED 10 DEGREE PERFORMANCE DATA.
- 07/24/2024: DISCONTINUED L2 LUTRON HI-LUME 1% 2-WIRE DRIVER OFFERING.



DIMMING COMPATIBILITY

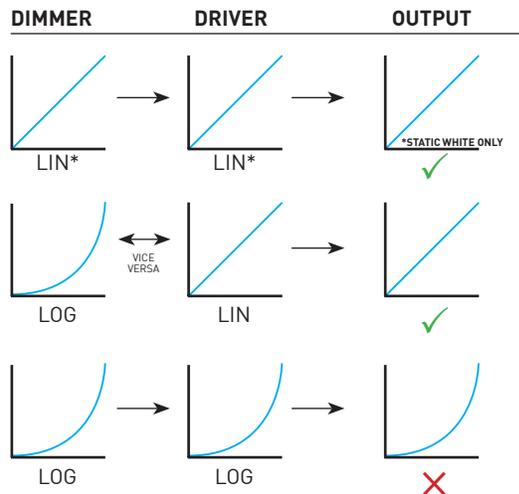
LUTRON DRIVER COMPATIBILITY

Power supply LP, LH Lutron Product Family	Part No.
PowPak Dimming Modules	RMJ-EC032-DV-B
PowPak Dimming Modules	FCJ/FCJS-ECO
Energi Savr Nodes	QSN-1ECO-S
GRAFIK Eye QS control unit Homeworks QS control unit	QSN-2ECO-S
GRAFIK Eye QS control unit Homeworks QS control unit	QSGRJ- E (wireless) QSGR- E
Quantum Hub	QP2-__ 2C
Quantum Hub	QP2-__ 4C
Quantum Hub	QP2-__ 6C
Quantum Hub	QP2-__ 8C
Homeworks QS power module myRoom Plus power module	LQSE-2ECO-D

eldoLED DRIVER COMPATIBILITY

Power supply EG, SG Manufacturer	Family/Model #
Busch-Jaeger	2112U-101
Jung	240-10
Leviton Lighting Controls	IP710-DLX
Lightolier Controls	ZP600FAM120
Merten	5729
Pass & Seymour	CD4FB-W
The Watt Stopper	DCLV1
Synergy	ISD BC
Crestron®	GLX-DIMFLV8
Crestron®	GLXP-DIMFLV8
Crestron®	GLPAC-DIMFLV4-*
Crestron®	GLPAC-DIMFLV8-*
Crestron®	GLPP-DIMFLVEX-PM
Crestron®	GLPP-1DIMFLV2EX-PM
Crestron®	GLPP-1DIMFLV3EX-PM
Crestron®	DIN-A08
Crestron®	DIN-4DIMFLV4
Crestron®	CLS-EXP-DIMFLV
Crestron®	CLCI-1DIMFLV2EX
Power supply EN Manufacturer	Family/Model #
Lutron Electronics	Nova T® - NTFTV
Lutron Electronics	Diva® - DDTV
Lutron Electronics	Nova® - NFTV
Lutron Electronics	GrafixEye® GRX-TVI w GRX3503
Lutron Electronics	Energy Savr Node™ - QSN-4T16-S
Lutron Electronics	TVM2 Module
Sensor Switch	nI0 EZ
ABB	SD/S 2.16.1

ANALOG DRIVERS AND DIMMERS



LIN = LINEAR
 LOG = LOGARITHMIC
 *LIN-TO-LIN NOT COMPATIBLE FOR WARM-DIM

VIA 3 PERIMETER

RECESSED
STATIC WHITE



Project: _____
Type: _____



Via 3 Perimeter Deep

DESCRIPTION

Via 3 Perimeter creates a continuously illuminated "slot" at the wall/ceiling intersection. Lighted corners with adjustable end sleeves are available. Via Perimeter installs in grid or drywall ceilings in a choice of three arrangements: level, shallow 1", and deep 3 1/4".



SENSORS
For latest information on sensors, click [here](#).



IC RATED

Up to 121 lm/W performance

Order Guide

LUMINAIRE ID	OPTIC	LIGHT SOURCE	CRI	LUMEN PACKAGE	COLOR TEMP.
		SW			
V3PERL - Via 3 Perimeter Level V3PERS - Via 3 Perimeter Shallow V3PERD - Via 3 Perimeter Deep	HLO - High-Efficiency Lambertian Optic ARFO ¹ - Asymmetric Room Fill Optic <small>¹Not available with Deep fixtures.</small>	SW - Static white	80CRI - 80 CRI 90CRI - 90 CRI	500LMF - Low output 500 lm/ft 750LMF - Medium output 750 lm/ft 1000LMF - High output 1000 lm/ft	27K - 2700K 30K - 3000K 35K - 3500K 40K - 4000K 50K - 5000K

LUMINAIRE LENGTH	VOLTAGE	DRIVER ³	ELECTRICAL	ELECTRICAL SECTIONS (optional) ^{8,9}	MOUNTING
#FT#IN - Specify nominal length (#) in 1' and/or 1" increments Standard nominal lengths: Single units: 2' to 12' Continuous runs: lengths over 12'	120V - 120V 277V - 277V UNV - 120V-277V 347V ² - 347V <small>²Only available with DI driver.</small>	DI - 1% 0-10V DA ⁴ - DALI LDEI ⁴ - Lutron Hi-lume 1% Eco ELD1 - eldoLED 1% ECOdrive 0-10V ELD0 - eldoLED 0.1% SOLOdrive 0-10V <small>³PoE (Power-over-Ethernet) compatible. Consult factory for details. ⁴On-site commissioning is required.</small>	1C - 1 circuit #MC ⁵ - Multi circuit EC - Emergency-powered fixture NL - Night light fixture DL - Daylight fixture GTD ^{6,7} - Generator transfer device fixture <small>⁵Specify total number of circuits (#), including any required for electrical section options. Provide drawing or layout specifications. Minimum 4' section per circuit. ⁶Minimum 4' fixture. ⁷Not available with 347V.</small>	#EC## ¹⁰ - Emergency-powered section #NL## ¹⁰ - Night light section #DL## ¹⁰ - Daylight section #GTD## ^{10,11,12} - Generator transfer device section #EMB ^{12,13} - Emergency battery NA - None <small>⁸Specify with multi circuit (#MC) electrical option only. ⁹Provide drawing or layout specifications. Consult factory for other configurations. Default section length is 4'. ¹⁰Specify quantity (#), and section length in inches (##). ¹¹Minimum 4' section. ¹²Not available with 347V. ¹³Specify quantity (#). All batteries will be on the same circuit. Each battery powers a 4' section.</small>	TC9 - Tegular 9/16" TG15 - Tegular 15/16" TB9 - T-bar 9/16" TB15 - T-bar 15/16" ST - Screw slot T-bar DTR - Drywall trim DTL - Drywall trimless DMF - Drywall mud flange

FINISH	CONTROL ¹⁴	OPTIONS ¹⁹	ADJUSTABLE SLEEVE (optional) ²¹
W - Matte white CF# - Custom finish, specify RAL#	STANDALONE CONTROLS ^{15,16,17} Specify the quantity (#) of sensors per fixture. #ODS - Onboard Daylight CONNECTED CONTROLS ¹⁸ LU - Lutron AWNR - Lutron Athena Wireless Node RF Only AWNS - Lutron Athena Wireless Node Sensor EN - Enlighted ENC - Encelium WL - Cooper Wavelinx AN - Acuity nLight CA - Casambi LG - Legrand NA - None <small>¹⁴Standalone and connected control options cannot be combined. ¹⁵Not available with Shallow or Deep fixtures. ¹⁶Available with DI driver and 1 circuit options only. ¹⁷Minimum 4' per zone. Provide control zone length. ¹⁸Consult factory for connected controls.</small>	NEF ²⁰ - No end flanges FU120 - Fuse 120V FU277 - Fuse 277V FWC - Flexible whip cable (6' std) CP - Chicago Plenum NA - None <small>¹⁹Separate codes with a "+" if more than one is specified. ²⁰For wall-to-wall installations.</small>	TES ²² - Adjustable end sleeve NA - None <small>²¹See page 3 for details. ²²Minimum 3' fixture for UNV/DI driver. Minimum 4' fixture for all other drivers. Minimum 5' fixture with EMB option.</small>

TECHZONE™ & USG Compatible with 4" ceiling

3737 Cote Vertu St-Laurent, Quebec, Canada H4R 2C9
T (514) 225-4304 F (514) 931-4862
www.lumenwerx.com



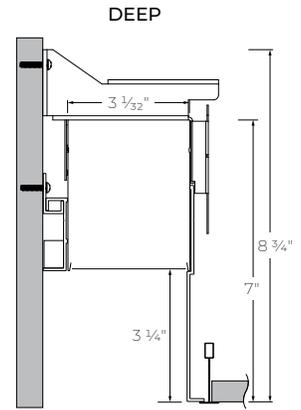
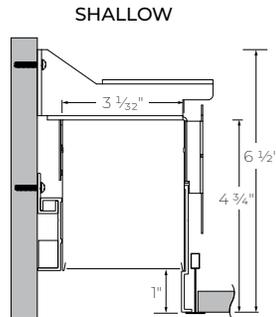
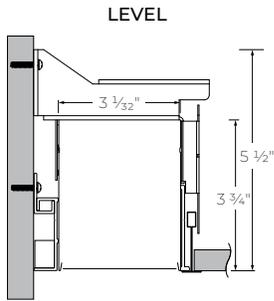
Lumenwerx reserves the right to modify product specifications without notification.
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VIA3-PERIMETER-SPEC-REV3 January 25, 2024



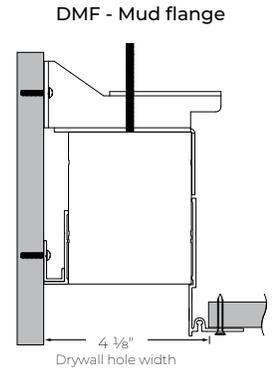
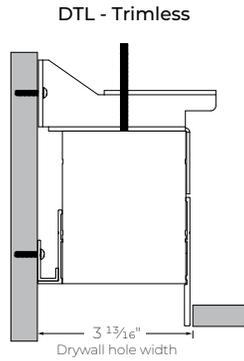
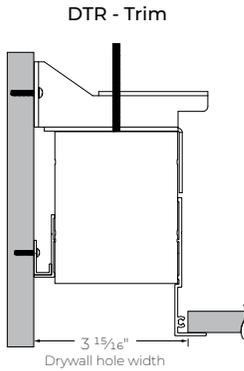
VIA 3 PERIMETER

RECESSED
STATIC WHITE

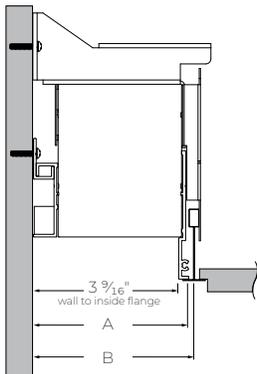
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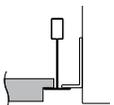
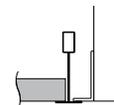
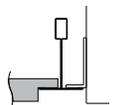
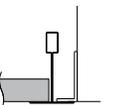
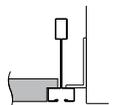


DRYWALL



GRID



	TC9	TB9	TC15	TB15	ST
	 Tegular 9/16"	 T-bar 9/16"	 Tegular 15/16"	 T-bar 15/16"	 Screw slot T-bar
A wall to flange	3 13/16"		3 15/16"		3 13/16"
B wall to T-bar	3 7/8"		4"		3 7/8"

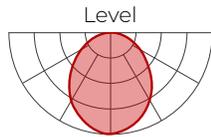
VIA 3 PERIMETER

RECESSED
STATIC WHITE

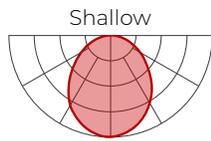
Photometrics

Values calculated based on a 4' fixture at 3500K and 80 CRI for all optics.

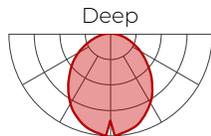
HLO



LM/FT	W/FT	LM/W
500	4.1	121
750	6.4	117
1000	8.8	114

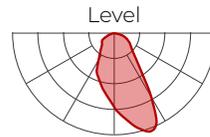


LM/FT	W/FT	LM/W
500	4.2	118
750	6.5	115
1000	9	111

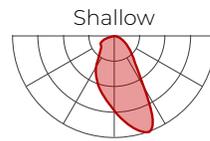


LM/FT	W/FT	LM/W
500	4.4	113
750	6.9	109
1000	9.5	105

ARFO



LM/FT	W/FT	LM/W
500	5.5	91
750	8.8	85
1000	12.4	81



LM/FT	W/FT	LM/W
500	5.6	89
750	8.9	84
1000	12.5	80

MULTIPLIER TABLE

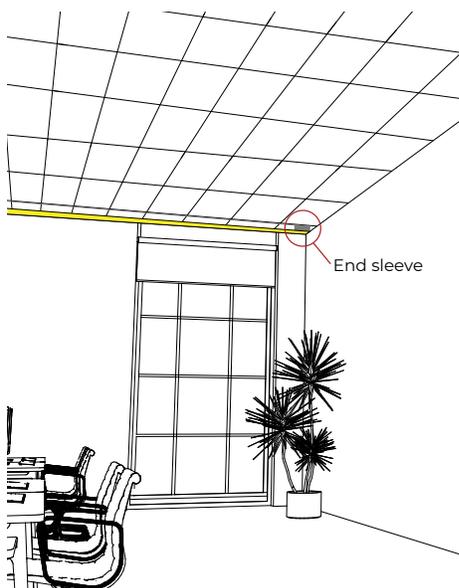
Use this table to get results for different color temperatures and CRI for all photometric tables.

Multiplier - CCT/CRI

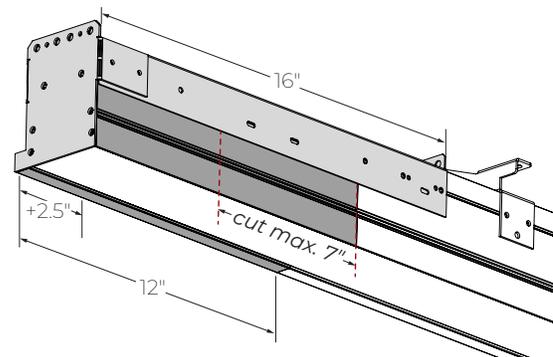
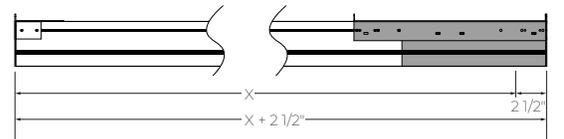
CCT	WATTS		LPW	
	80 CRI	90 CRI	80 CRI	90 CRI
2700K	1.05	1.27	0.95	0.79
3000K	1.02	1.23	0.98	0.81
3500K	1.00	1.19	1.00	0.84
4000K	1.00	1.19	1.04	0.84
5000K	0.96	1.12	1.00	0.89

Adjustable end sleeve - TES

Adjustable end sleeve (TES) is designed to provide on-site luminaire adjustability of +2.5" to -4.5". A sleeve accommodates an easy installation and maintenance. Please refer to the [End Sleeve Adjustment Installation Instructions](#) for more details.



X = Fixture measure provided by client.
X + 2.5" = Measurement built and supplied.



VIA 3 PERIMETER

RECESSED
STATIC WHITE



Technical Specifications

OPTICS

High-Efficiency Lambertian Optic (HLO)

The High-Efficiency Lambertian Optic (HLO) uses matte white reflectors to distribute LED output across 0.075" acrylic shielding, providing up to 88% transmission and good obscuration. Luminaire brightness is controlled by the flux-to-shielding area ratio.

Asymmetric Room Fill Optic (ARFO)

Our Asymmetric Room Fill Optic employs an advanced optical system to illuminate rooms and corridors from the perimeter, providing a direct distribution of light with precision and minimal glare.

LIGHT SOURCE

Custom linear array of mid-flux LEDs are cartridge-mounted with quick-connect wiring to facilitate service and thermal management. Available in 2700K, 3000K, 3500K, 4000K and 5000K with a minimum 80 CRI and an option for 90 CRI with elevated R9 value. Color consistency maintained to within 3 SDCM. LEDs operated at reduced drive current to optimize efficacy and lumen maintenance.

All LEDs have been tested in accordance with IESNA LM-80-08 and the results have shown L80 lumen maintenance greater than 60,000 hours. Absolute product photometry is measured and presented in accordance with IESNA LM-79, unless otherwise indicated.

LUMINAIRE LENGTH

Via 3 Perimeter is made up of standard 2' to 12' sections that may be joined together to create longer continuous run lengths. Exact run lengths must be noted in the product code. The minimum individual section available is 2'.

All individual sections are joined together onsite using the joiner kits provided. Lumenwerx offers joiner kits that are extremely simple to work with in the field and result in a fixture that appears virtually seamless with no light leak at any connection.

ELECTRICAL

Factory-set, adjustable output current LED driver with universal (120-277 VAC) input. Dimmable from 100% to 1% with 0-10V dimming control. Rated life (90% survivorship) of 50,000 hours at 50°C max. ambient (and 70°C max. case) temperature. At maximum driver load: Efficiency > 84%, PF > 0.9, THD < 20%. Other specifiable options include Lutron Hi-Lume 1% Eco, eidoLED 1% ECOdrive 0-10V, eidoLED 0.1% SOLOdrive 0-10V, and DALI protocol drivers. All of our standard 0-10V drivers are NEMA 410 compliant.

PoE

Depending on the PoE manufacturer selected, Lumenwerx will install the node in factory as either integral to the luminaire or as a remote module. Factory programming of the PoE node may or may not enable the following functionalities: lumen package, DUO (tunable white), QUADRO (RGBW), emergency battery backup, and sensor integration. These must be addressed and evaluated on a case-by-case basis.

ELECTRICAL SECTION OPTIONS

Electrical section options are available for fixtures specified as multi circuit (#MC). With MC, specify the total number of circuits (#), including any circuits required for optional electrical sections. A drawing is required to specify the layout. Please consult factory for custom configurations.

Electrical sections

Options include emergency-powered (#EC##), night light (#NL##), daylight (#DL##), and generator transfer device (#GTD##) sections. Specify the quantity (#), as well as the section length in inches (##).

Example 1: A 32' Direct fixture with two 8' emergency-powered sections on a second circuit.

Code: 2MC-2EC96

Example 2: A 24' Direct fixture with one 4' generator transfer device section.

Code: 1MC-1GTD48

Battery

Each emergency battery (#EMB) powers a 4' section. All batteries will be on the same circuit. Specify the number of batteries (#) required.

Factory installed long life, high temperature, maintenance-free Lithium-Ion battery pack with self-test functionality, test switch and charge indicator. Minimum of 90 minutes operation, up to 1000 lumens per 4' (25°C) emergency lighting output and recharge time of 24 hours.

MOUNTING

Recessed fixtures can be mounted into exposed or concealed T-bar or tegular ceiling, as well as in drywall ceilings with trim, trimless, or mud flange options.

FINISH

Interior: 95%, reflective matte powder coated white paint

Exterior: Matte white powder coating.

Custom finishes are also available.

VIA 3 PERIMETER

RECESSED

STATIC WHITE



CONTROLS

Lumenwerx offers several options for integrating occupancy and daylight harvesting controls in our luminaires.

For latest information on sensors, click [here](#).



STANDALONE CONTROLS

An integrated standalone sensor controls the luminaire in which it is installed. Depending on the length, more than one sensor may be necessary and may control the entire luminaire, or just a section of it. These controls operate independently. Unless otherwise agreed, location and functionality of the sensor within the luminaire are selected by Lumenwerx. See client drawings for details.

ODS: An integral, daylight harvesting sensor with closed-loop operation dims the luminaire in which it is installed in order to compensate for available daylight. The sensor measures the combination of daylight and luminaire light reflected from horizontal surfaces below the luminaire. Initial onsite calibration is required via the use of provided remote control.

CONNECTED CONTROLS

With connected controls, sensors or nodes installed in the luminaire form part of a larger control system infrastructure from manufacturers such as: Lutron, Enlighted, Encelium, Cooper Wavelinx, Acuity nLight, Casambi, Legrand, and others. These connected controls allow for a scalable system providing features like occupancy and daylight control, manual control, scheduling and configuration of various zones and scenes. Energy reporting and system monitoring are also possible. Specific capabilities depend on the control system being used.

Lumenwerx installs the components (sensors, nodes, power packs, etc) which may be supplied to us by a third party, or procured directly by Lumenwerx, depending on the control system manufacturer.

Lumenwerx is solely responsible for the installation of specified components; the controls manufacturer is responsible for performance of the control system.

To indicate a Lumenwerx luminaire with connected controls, identify the specific onsite control system to be integrated into the luminaires using the ordering code. Due to the diversity of components, you must contact factory to assure complete compatibility with intended control system and to fully specify the luminaire.

Complete control specifications, sensor/node/power pack layout, and narrative for the control system are required for Lumenwerx to create shop drawings and submittals.

CONSTRUCTION

Housing: Extruded aluminum, up to 90% recycled content

Interior brackets: Die-formed cold rolled sheet steel

Joining system: Die-cast zinc

Reflectors: Flat rolled aluminum sheet or die-formed cold rolled steel, 95% reflective matte white painted

Lens: Acrylic

Recessed flanges: Extruded aluminum, up to 90% recycled content

End plate: Die-formed cold rolled sheet steel

MAINTENANCE

LED boards are housed in a removable cartridge for easy replacement. Driver is accessible from below.

WEIGHT

4': 11.12 lbs - 5.05 kg

8': 22.25 lbs - 10.1 kg

12': 33.48 lbs - 15.2 kg

CERTIFICATIONS

ETL: Rated for indoor dry/damp locations. Conforms to UL Standard 1598 and certified to CAN/CSA Standard C22.2 No. 250.0.

Chicago Plenum: City of Chicago Approved (CCEA) when specified with CP option.

IC rated: Suitable for direct contact with insulation

WARRANTY

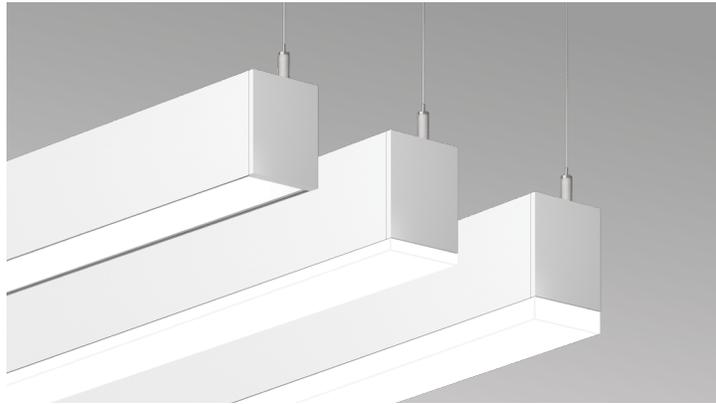
Lumenwerx provides a five-year limited warranty of electrical and mechanical performance of the luminaires, including the LED boards, drivers, and auxiliary electronics. Lumenwerx will repair or replace defective luminaires or components at our discretion, provided they have been installed and operated in accordance with our specifications. Other limitations apply, please refer to the full warranty on our website.

VIA 3 PENDANT

DIRECT/INDIRECT, DIRECT, INDIRECT
 STATIC WHITE, BIOS



Project: _____
 Type: _____



Lens Positions ¹

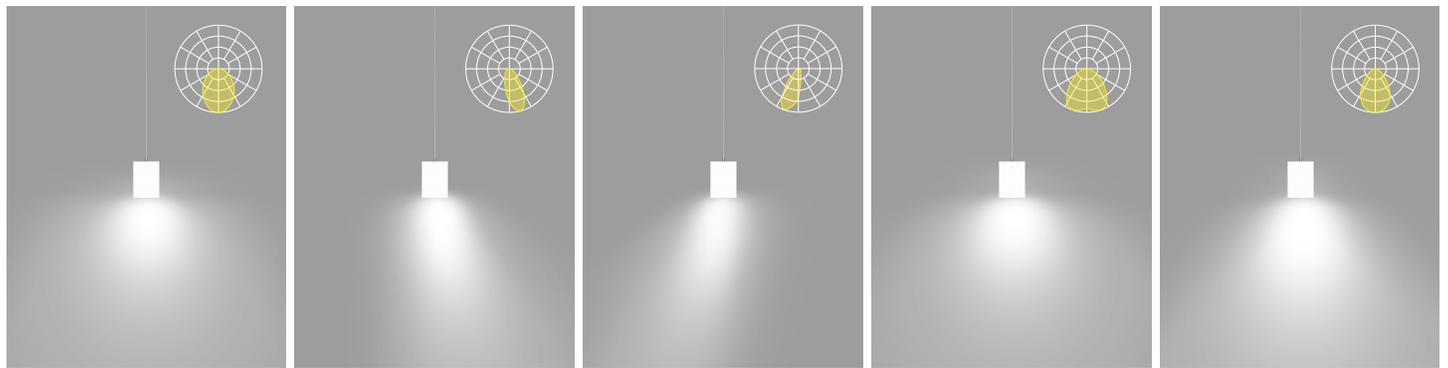
DESCRIPTION

Our elegant, flexible Via family is composed of linear, pendant, surface, recessed, and wall mounted luminaires. Each lighting fixture can be installed as a discrete luminaire or in continuous runs or patterns. Via 3 Pendant is offered with Lambertian, asymmetric, widespread, wall wash, or low-glare optics.

Up to 153 lm/W performance

SENSORS
 For latest information on sensors, click [here](#).

DIRECT OPTICS



HLO
 High-Efficiency Lambertian Optic

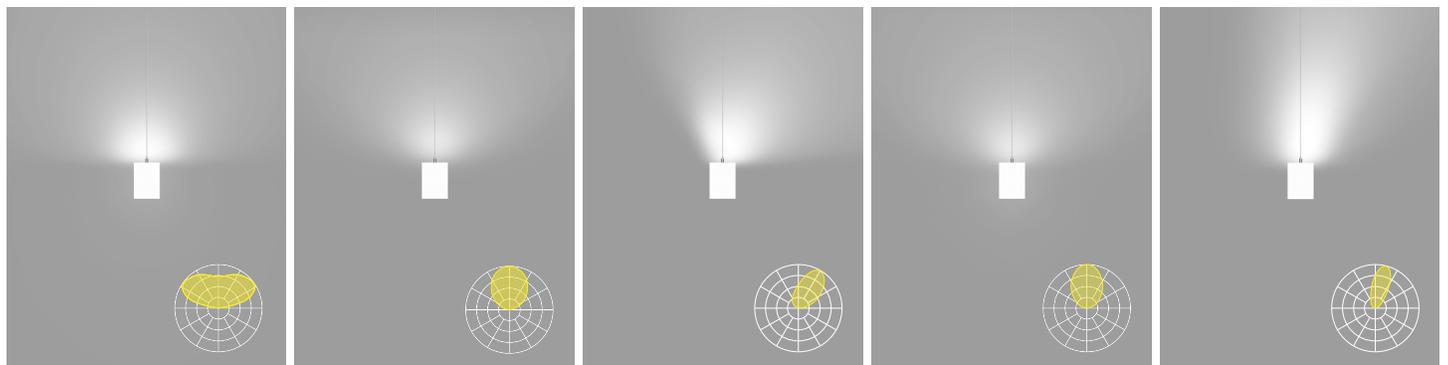
ARO2
 Asymmetric Refractive Optic

WRO2
 Wall Wash Refractive Optic

WDO
 Widespread Direct Optic

LGO
 Low-Glare Optic

INDIRECT OPTICS



WIO2
 Widespread Indirect Optic

TIO2
 Translucent Indirect Optic

WAI2
 Widespread Asymmetric Indirect Optic

HLO3
 High-Efficiency Lambertian Optic

ARO23
 Asymmetric Refractive Optic

¹ Drop lens positions available with HLO direct lens only.
² Available only with Direct/Indirect.
³ Not available with Direct/Indirect.

VIA 3 PENDANT

DIRECT/INDIRECT, DIRECT, INDIRECT
STATIC WHITE, BIOS



Project: _____

Type: _____

Order Guide

LUMINAIRE ID	DISTRIBUTION	DIRECT OPTIC Specify NA for Indirect fixture	LENS POSITION Specify NA for Indirect fixture	INDIRECT OPTIC Specify NA for Direct fixture	LIGHT SOURCE ⁶
VIA3P					
VIA3P - Via 3" Pendant	DI - Direct/Indirect D - Direct I - Indirect	HLO - High-Efficiency Lambertian Optic ARO2 - Asymmetric Refractive Optic WRO2 - Wall Wash Refractive Optic WDO - Widespread Direct Optic LGO - Low-Glare Optic NA - Not applicable	FH - Flush 0.5D ¹ - 0.5" drop 1.0D ¹ - 1.0" drop NA - Not applicable ¹ Available with HLO direct lens only.	WIO2 ² - Widespread Indirect Optic TIO ^{3,4} - Translucent Indirect Optic WAI2 ³ - Widespread Asymmetric Indirect Optic HLO ⁵ - High-Efficiency Lambertian Optic ARO2 ⁵ - Asymmetric Refractive Optic NA - Not applicable ² Not available with BIOSU. ³ Not available with BIOS. ⁴ Available only with Direct/Indirect. ⁵ Not available with Direct/Indirect.	SW - Static white BIOSST ^{7,8} - BIOS Biological Static BIOSDY ^{7,8} - BIOS Biological Dynamic BIOSTU ^{7,8} - BIOS Biological Tunable ⁶ Chromawerx Sola, Duo and Quadro also available. Consult other spec sheets. ⁷ Only available with low and medium lumen packages. ⁸ See page 7 for details.

CRI	DIRECT LUMEN PACKAGE Specify NA for Indirect fixture	INDIRECT LUMEN PACKAGE Specify NA for Direct fixture	COLOR TEMP.	LUMINAIRE LENGTH	VOLTAGE
80CRI - 80 CRI 90CRI - 90 CRI ⁹ Not available with BIOS.	350LMF ¹⁰ - Hypo output 350 lm/ft 500LMF - Low output 500 lm/ft 750LMF - Medium output 750 lm/ft 1000LMF ¹¹ - High output 1000 lm/ft 1200LMF ^{12,13} - Hyper output 1200 lm/ft NA - Not applicable ¹⁰ Minimum 3' fixture. ¹¹ For Direct/Indirect, Indirect must not exceed 1000 lm/ft. ¹² For Direct/Indirect, Indirect must not exceed 750 lm/ft.	350LMF - Hypo output 350 lm/ft 500LMF - Low output 500 lm/ft 750LMF - Medium output 750 lm/ft 1000LMF ¹⁴ - High output 1000 lm/ft 1200LMF ^{13,15} - Hyper output 1200 lm/ft NA - Not applicable ¹³ Fixture will be very bright. Use in suitable applications. ¹⁴ For Direct/Indirect, Direct must not exceed 1000 lm/ft. ¹⁵ For Direct/Indirect, Direct must not exceed 750 lm/ft.	27K ¹⁶ - 2700K 30K - 3000K 35K - 3500K 40K - 4000K 50K ¹⁶ - 5000K ¹⁶ Not available with BIOS.	#FT#IN ¹⁷ - Specify nominal length (#) in 1' and/or 1" increments Standard nominal lengths: Single units: 2' to 12' Continuous runs: lengths over 12' ¹⁷ Minimum 3' for Direct/Indirect.	120V - 120V 277V - 277V UNV - 120V-277V 347V ¹⁸ - 347V ¹⁸ Available with D1 driver only.

DRIVER ¹⁹	ELECTRICAL	ELECTRICAL SECTIONS (optional) ^{26,27}	MOUNTING ³²
DI - 1% 0-10V DA ²⁰ - DALI LDEI ²⁰ - Lutron Hi-lume 1% Eco ELDI - eldoLED 1% ECOdrive 0-10V ELDO - eldoLED 0.1% SOLOdrive 0-10V ELV ²¹ - ELV 120V TRI ²¹ - TRIAC 120V ¹⁹ PoE (Power-over-Ethernet) compatible. Consult factory for details. ²⁰ On-site commissioning is required. ²¹ Available with 120V only.	1C - 1 circuit 2C ²² - 2 circuits #MC ²³ - Multi circuit EC - Emergency-powered fixture NL - Night light fixture DL - Daylight fixture GTD ^{24,25} - Generator transfer device fixture ²² Available for Direct/Indirect only. Separate direct and indirect circuits. ²³ Specify total number of circuits (#), including any required for electrical section or COB options. Provide drawing or layout specifications. Minimum 4' section per circuit. ²⁴ Minimum 4' fixture. ²⁵ Not available with 347V.	#EC## ²⁸ - Emergency-powered section #NL## ²⁸ - Night light section #DL## ²⁸ - Daylight section #GTD## ^{28,29,30} - Generator transfer device section #EMB ^{30,31} - Emergency battery NA - None ²⁶ Specify with multi circuit (#MC) electrical option only. ²⁷ Provide drawing or layout specifications. Consult factory for other configurations. Default section length is 4'. ²⁸ Specify quantity (#), and section length in inches (##). ²⁹ Minimum 4' section. ³⁰ Not available with 347V. ³¹ Specify quantity (#). All batteries will be on the same circuit. Each battery powers a 4' section. For Direct/Indirect, minimum 8' fixture.	ACS - Aircraft cable, standard STS - Stem, standard ACC () - Aircraft cable, custom STC () - Stem, custom ³² See page 3 for ordering details.

FINISH	CONTROL ³³	OPTIONS	MODULE (optional) ^{41,42}
W - Matte white AL - Aluminum B - Matte black CF# - Custom finish, specify RAL#	STANDALONE CONTROLS ^{34,35,36} Specify the quantity (#) of sensors per fixture. #OMS ³⁷ - Onboard Occupancy #OMS## ³⁸ - Onboard Occupancy with bi-level dimming #ODS - Onboard Daylight #OCS - Onboard Occupancy & Daylight CONNECTED CONTROLS ³⁹ LU - Lutron AWN - Lutron Athena Wireless Node RF Only AWNS - Lutron Athena Wireless Node Sensor EN - Enlighted ENC - Encelium WL - Cooper Wavelinx AN - Acuity nLight CA - Casambi LG - Legrand NA - None ³³ Standalone and connected control options cannot be combined. ³⁴ Available with D1 driver and 1 circuit options only. ³⁵ Minimum 4' per zone. Provide control zone length.	FU120 - Fuse 120V FU277 - Fuse 277V CTB9 ⁴⁰ - T-bar caddy clip, 9/16" CTB15 ⁴⁰ - T-bar caddy clip, 15/16" CTG9 ⁴⁰ - Tegular caddy clip, 9/16" CTG15 ⁴⁰ - Tegular caddy clip, 15/16" CST ⁴⁰ - Screw slot caddy clip NA - None ⁴⁰ Available with aircraft cable only.	#COB20 () - COB downlight 20° #COB30 () - COB downlight 30° #COB40 () - COB downlight 40° NA - None ⁴¹ See page 3 for ordering details. ⁴² If more than one option is specified, separate codes with a "+", e.g. 1COB20()+1COB30().

VIA 3 PENDANT

DIRECT/INDIRECT, DIRECT, INDIRECT
STATIC WHITE, BIOS



Module

For a module, specify the options in the parentheses.

Example: 1COB20(SW-80CRI-600LM-27K)

MODULES (optional)				
MODULES ^{1,2,3,4,5}	LIGHT SOURCE	CRI	LUMEN PACKAGE ⁶	COLOR TEMP.
#COB20() - COB downlight 20° #COB30() - COB downlight 30° #COB40() - COB downlight 40° NA - None ¹ LED downlight available with Direct only. ² Minimum 4' fixture and minimum 2' section per COB. Consult factory for other configurations. ³ Specify quantity (#). ⁴ 6" blank per module. ⁵ If more than one option is specified, separate codes with a "+", e.g. 1COB20(..)+1COB30(..).	SW - Static white	80CRI - 80 CRI 90CRI - 90 CRI 97CRI - 97 CRI	600LM - 600 lm 1200LM - 1200 lm 1800LM - 1800 lm ⁶ See page 6 for wattages.	27K - 2700K 30K - 3000K 35K - 3500K 40K - 4000K 50K - 5000K

Pendant Mounting Code

Standard

For a standard mounting, please refer to the information below.

MOUNTING	
ACS - Aircraft cable, standard	STS - Stem, standard
Ø5" for power canopy Ø3" for non-power Canopies are white Power cord is white for all fixture finishes (except black fixture is black power cord) Aircraft cable length is 36"	Ø5" for power canopy Ø5" for non-power Canopies are white Stem finish is the same color as fixture Stem length is 18" Stem is not field adjustable

Custom

Aircraft Cable

For a custom mounting, specify the options in the parentheses.

Example: ACC(3NPC-72IN-W-PCB-SLC)

MOUNTING					
ACC()					
	NON-POWER CANOPY SIZE	AIRCRAFT CABLE LENGTH	CANOPY FINISH	POWER CORD COLOR	OPTIONS
ACC	3NPC - Ø3" non-power canopy 5NPC - Ø5" non-power canopy	36IN - 36" 72IN - 72" 120IN - 120" #IN ¹ - Other lengths, specify in inches ¹ Maximum length is 288". For longer lengths, please consult factory.	W - Matte white AL - Aluminum B - Matte black CF# - Custom finish, specify RAL#	PCW - White PCB - Black	SEM - Seismic mounting SLC - Sloped ceiling for aircraft cable NA - None

Stem

For a custom mounting, specify the options in the parentheses.

Example: STC(5NPC-36IN-W-STW-SLS)

MOUNTING					
STC()					
	NON-POWER CANOPY SIZE	STEM LENGTH	CANOPY FINISH	STEM COLOR	OPTIONS
STC	5NPC - Ø5" non-power canopy	18IN - 18" 36IN - 36" #IN ² - Specify length in inches ² Minimum length is 6". Maximum length is 72". Stem is not field adjustable.	W - Matte white AL - Aluminum B - Matte black CF# - Custom finish, specify RAL#	STW - Matte white STAL - Aluminum STB - Matte black STCF# - Custom finish, specify RAL#	SLS - Sloped ceiling for stem NA - None

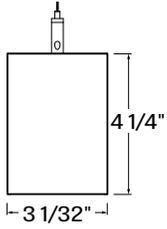
VIA 3 PENDANT

DIRECT/INDIRECT, DIRECT, INDIRECT
STATIC WHITE, BIOS

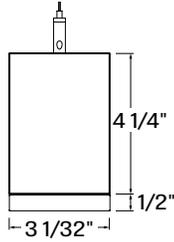


Dimensions

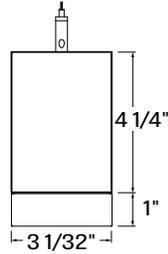
Flush Lens



0.5" Drop Lens¹



1.0" Drop Lens¹



¹Drop lens positions available with HLO direct lens only.

VIA 3 PENDANT

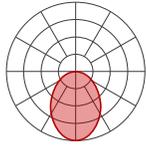
DIRECT/INDIRECT, DIRECT, INDIRECT
 STATIC WHITE, BIOS

Photometrics

Values calculated based on a 4ft fixture at 35K and 80 CRI for all optics.

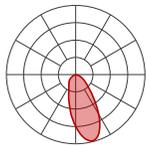
DIRECT OPTICS

HLO (Flush Lens)



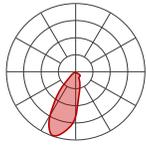
LM/FT	W/FT	LPW
350	2.8	125
500	4.1	123
750	6.3	119
1000	8.6	116
1200	10.6	113

ARO2



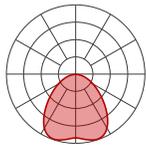
LM/FT	W/FT	LPW
350	3.0	116
500	4.4	113
750	7.0	107
1000	9.7	103
1200	12.1	99

WRO2



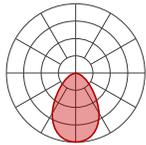
LM/FT	W/FT	LPW
350	3.0	116
500	4.4	112
750	7.0	107
1000	9.8	102
1200	12.1	99

WDO



LM/FT	W/FT	LPW
350	3.0	118
500	4.3	116
750	6.7	113
1000	9.2	109
1200	11.3	106

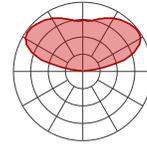
LGO



LM/FT	W/FT	LPW
350	3.2	108
500	4.7	106
750	7.3	102
1000	10.2	98
1200	12.5	96

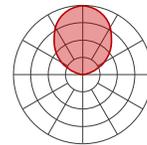
INDIRECT OPTICS

WIO2



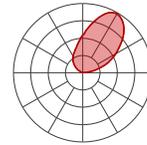
LM/FT	W/FT	LPW
350	2.4	146
500	3.5	142
750	5.5	137
1000	7.6	132
1200	9.4	128

TIO



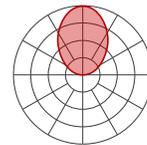
LM/FT	W/FT	LPW
350	2.7	127
500	4.0	124
750	6.3	119
1000	8.8	114
1200	10.9	110

WAI2



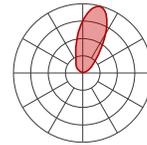
LM/FT	W/FT	LPW
350	2.5	139
500	3.7	135
750	5.8	130
1000	8.0	125
1200	10.0	120

HLO



LM/FT	W/FT	LPW
350	2.8	125
500	4.1	123
750	6.3	119
1000	8.6	116
1200	10.6	113

ARO2



LM/FT	W/FT	LPW
350	3.0	116
500	4.4	113
750	7.0	107
1000	9.7	103
1200	12.1	99

MULTIPLIER TABLES

Use these tables to get results for different color temperatures, CRI, and drop lenses, for all Direct and Indirect photometric tables.

Multiplier - CCT/CRI

CCT (K)	WATTS		LPW	
	CRI 80	CRI 90	CRI 80	CRI 90
2700	1.05	1.27	0.95	0.79
3000	1.02	1.23	0.98	0.81
3500	1.00	1.19	1.00	0.84
4000	1.00	1.19	1.00	0.84
5000	0.96	1.12	1.04	0.89

Multiplier - Drop Lens

DIRECT LENS	WATTS	LPW
Flush Lens	1.00	1.00
Drop Lens 0.5"	0.98	1.02
Drop Lens 1.0"	0.96	1.04

DIRECT/INDIRECT - LPW CALCULATION

For Direct/Indirect performance values, follow the formula.

$$\left(\frac{\text{DIRECT LM/FT} + \text{INDIRECT LM/FT}}{\text{DIRECT W/FT} + \text{INDIRECT W/FT}} \right) = \text{LPW}$$

VIA 3 PENDANT

DIRECT/INDIRECT, DIRECT, INDIRECT
 STATIC WHITE, BIOS



COB

Use these tables to get results for different color temperatures and CRI for all COB photometric tables.

COB Multiplier - CCT/CRI

CCT (K)	CRI 80	CRI 90
2700	1.10	1.36
3000	1.03	1.29
3500	1.00	1.27
4000	1.00	1.22
5000	1.00	1.18

COB Wattage

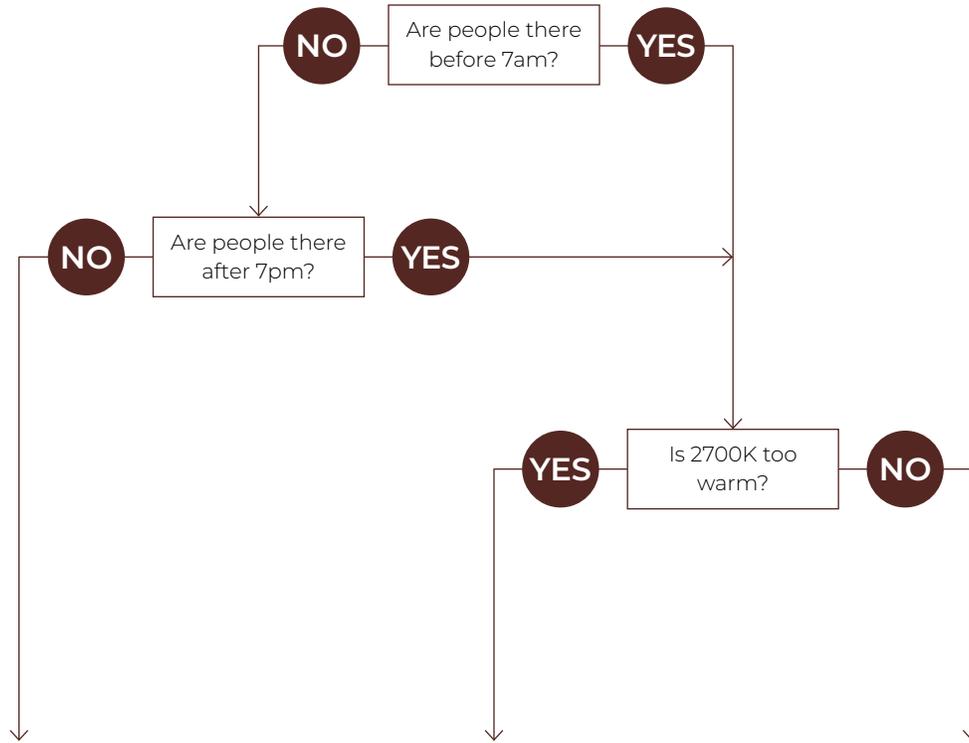
COB ANGLE	CRI 80									CRI 90								
	20			30			40			20			30			40		
Lumen	600	1200	1800	600	1200	1800	600	1200	1800	600	1200	1800	600	1200	1800	600	1200	1800
Wattage	5.8	11.7	18.1	6.0	11.9	18.3	6.4	12.6	19.4	7.3	14.8	22.9	7.7	15.0	23.2	8.2	16.1	24.7

VIA 3 PENDANT

DIRECT/INDIRECT, DIRECT, INDIRECT
 STATIC WHITE, BIOS

BIOS

Three BIOS Circadian LED solutions are offered – Biological Static, Biological Dynamic, and Biological Tunable. Use the decision tree below to identify when and where to use BIOS Wellness LED Lighting Solutions.



Biological Static BIOSST	Biological Dynamic BIOSDY	Biological Tunable BIOSTU
No CCT change when dimmed	500K shift when dimmed	Dims to 2700K
Daytime solution	Daytime + evening solution	Daytime + evening solution
Spaces in operation during daytime hours, between 7am and 7pm	Spaces in operation overnight, after 7pm and before 7am, and when CCT color shift in the evening is not preferred	Suitable for spaces in operation overnight, after 7pm and before 7am, and where people do not sleep (CCT color shift in the evening is preferred)
E.g. offices, medical/dental offices	E.g. hospitals	E.g. offices, shiftwork

VIA 3 PENDANT

DIRECT/INDIRECT, DIRECT, INDIRECT
STATIC WHITE, BIOS



Technical Specifications

DIRECT OPTICS

High-Efficiency Lambertian Optic (HLO)

The High-Efficiency Lambertian Optic (HLO) uses matte white reflectors to distribute LED output across 0.075" acrylic shielding, providing up to 88% transmission and good obscuration.

Available as a flush lens or as a drop lens, the HLO has a spacing criterion of 1.10.

Asymmetric Refractive Optic (ARO2)

The Asymmetric Refractive Optic (ARO2) uses a sophisticated reflector combined with a matte beam-shaping film to create a smooth, effective downward light component without shadows or hot spots. It provides directional Gaussian light distribution with peak intensity at 20° above nadir and a 55° Full Width at Half Maximum (FWHM) beam angle. Microstructure material applied to the snap-in lens provides the precise refractive power and visual comfort, while achieving a high luminous efficacy.

Wall Wash Refractive Optic (WRO2)

The Wall Wash Refractive Optic (WRO2) delivers smooth vertical illumination with a gentle gradient and soft visual cut-off. Its exacting configuration creates a strong downward light component without shadows or hot spots and provides light distribution with peak intensity at 21° above nadir. Microstructure material applied to the snap-in lens provides the precise refractive power and visual comfort, while achieving a high luminous efficacy.

Widespread Direct Optic (WDO)

The Widespread Direct Optic (WDO) is designed to distribute light far and wide. As such, it has an excellent luminous efficacy, a light span that is 40% farther than that of our traditional HLO, and it maximizes spacing distance while still creating a sense of uniformity. The lens snaps into place and utilizes nano prismatic optics to mask the diodes that are actually emitting the light.

Low-Glare Optic (LGO)

The Low-Glare Optic (LGO) is designed to cut off high-angled light and control glare. The carefully crafted lens refracts light downward through its center from which it then disperses into a wide conical distribution that negates any illumination at about 40°. The LGO provides the visual comfort of a louver in a smooth acrylic lens.

INDIRECT OPTICS

Widespread Indirect Optic (WIO2)

The Widespread Indirect Optic (WIO2) is a horizontal LED array with a widespread indirect micro prismatic optic that offers an impressive 160° spread. WIO2 creates an even illumination for smooth brightness on the ceiling that can achieve uniformity ratios of up to 2:1.

Uniformity [max/min]

Based on 18' continuous runs, in a 20' x 40' room, 10' wall height

Mounting height from ceiling	Spacing (Center to center)		
	8'	10'	12'
12"	5.5	10.0	9.0
18"	6.5	6.0	6.0
24"	2.5	4.0	4.5

Translucent Indirect Optic (TIO)

The Translucent Indirect Optic (TIO) is composed of a horizontal LED array that has a translucent lens to mask pixilation from the diodes. TIO has a 100° spread in the indirect that is ideal when the fixture is mounted farther away from the ceiling.

Widespread Asymmetric Indirect Optic (WAI2)

The Widespread Asymmetric Indirect Optic (WAI2) offers an upward grazing effect with a 45° forward throw. It softly highlights the ceiling in the up-light while distributing the required illumination of the rest of an interior space. For avoiding glare and enjoying visual comfort, WAI2 is an ideal solution.

High-Efficiency Lambertian Optic (HLO)

The High-Efficiency Lambertian Optic (HLO) uses matte white reflectors to distribute LED output across 0.075" acrylic shielding, providing up to 88% transmission and good obscuration. HLO has a spacing criterion of 1.10.

Asymmetric Refractive Optic (ARO2)

The Asymmetric Refractive Optic (ARO2) uses a sophisticated reflector combined with a matte beam-shaping film to create a smooth, effective downward light component without shadows or hot spots. It provides directional Gaussian light distribution with peak intensity at 20° above nadir and a 55° Full Width at Half Maximum (FWHM) beam angle. Microstructure material applied to the snap-in lens provides the precise refractive power and visual comfort, while achieving a high luminous efficacy.

VIA 3 PENDANT

DIRECT/INDIRECT, DIRECT, INDIRECT
STATIC WHITE, BIOS

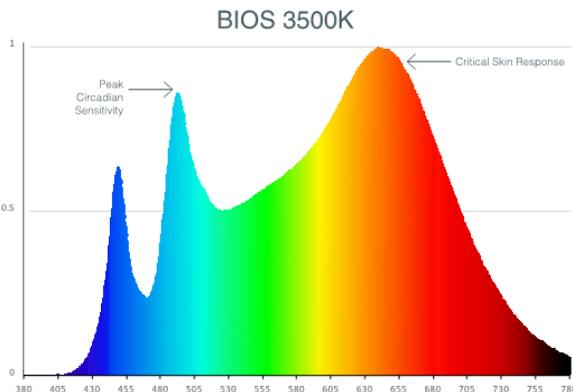


LIGHT SOURCE - STATIC WHITE

Custom linear array of mid-flux LEDs are cartridge-mounted with quick-connect wiring to facilitate service and thermal management. Available in 2700K, 3000K, 3500K, 4000K, and 5000K with a minimum 80 CRI and an option for 90 CRI with elevated R9 value. Color consistency maintained to within 3 SDCM. LEDs operate at reduced drive current to optimize efficacy and lumen maintenance. All LEDs have been tested in accordance with IESNA LM-80-08 and the results have shown L80 lumen maintenance greater than 60,000 hours. Absolute product photometry is measured and presented in accordance with IESNA LM-79, unless otherwise indicated.

LIGHT SOURCE - BIOS

BIOS SkyBlue™ Technology is designed to provide the specific circadian stimulus to improve overall sleep quality, recovery during the night, and overall feelings of well-being. The non-visual light signals that stimulate our circadian system have peak intensity in the "sky blue" region. As the diagram below illustrates, BIOS SkyBlue technology shifts the peak LED spectral intensity (490 nm) to align better with the peak response of circadian stimulus. Also note the enhanced deep-red (near 660 nm) spectrum.



Three BIOS solutions are offered: BIOS Biological Static (BIOSST), BIOS Biological Dynamic (BIOSDY), and BIOS Biological Tunable (BIOSTU). See page 7 for details.

LUMINAIRE LENGTH

Via 3 is available in standard lengths of 2' to 12'. Continuous runs are available for run lengths over 12'. Exact run length must be noted in the product code. The minimum length is 2' for Direct or Indirect fixtures, and 3' for Direct/Indirect fixtures. Lengths can be ordered in 1' and/or 1" increments. All individual sections are joined together onsite using the joiner kits provided. Lumenwerx offers joiner kits that are extremely simple to work with in the field and result in a fixture that appears virtually seamless with no light leak at any connection.

ELECTRICAL

Factory-set, adjustable output current LED driver with universal (120-277VAC) input. Dimmable from 100% to 1% with 0-10V dimming control. Rated life (90% survivorship) of 50,000 hours at 50°C max. ambient (and 70°C max. case) temperature. At maximum driver load: Efficiency>84%, PF>0.9, THD<20%. Other specifiable options include Lutron Hi-Lume 1% Eco, eldoLED 1% ECOdrive 0-10V, eldoLED 0.1% SOLOdrive 0-10V, ELV, TRIAC, and DALI protocol drivers. All of our standard 0-10V drivers are NEMA 410 compliant.

PoE

Depending on the PoE manufacturer selected, Lumenwerx will install the node in factory as either integral to the luminaire or as a remote module. Factory programming of the PoE node may or may not enable the following functionalities: lumen package, Duo (tunable white), Quadro (RGBW) emergency battery backup, and sensor integration. These must be addressed and evaluated on a case-by-case basis.

ELECTRICAL SECTION OPTIONS

Electrical section options are available for fixtures specified as multi circuit (#MC). With MC, specify the total number of circuits (#), including any circuits required for optional electrical sections. A drawing is required to specify the layout. Please consult factory for custom configurations.

Electrical sections

Options include emergency-powered (#EC##), night light (#NL##), daylight (#DL##), and generator transfer device (#GTD##) sections. Specify the quantity (#), as well as the section length in inches (##).

Example 1: A 32' Direct fixture with two 8' emergency-powered sections on a second circuit.
Code: 2MC-2EC96

Example 2: A 16' Direct/Indirect fixture with separate circuits for direct and indirect, and with one 4' night light section on the direct side on a third circuit.
Code: 3MC-1NL48

Example 3: A 24' Direct fixture with one 4' generator transfer device section.
Code: 1MC-1GTD48

Battery

Each emergency battery (#EMB) powers a 4' section. All batteries will be on the same circuit. Specify the number of batteries (#) required.

Factory installed long life, high temperature, maintenance-free Lithium-Ion battery pack with self-test functionality, test switch and charge indicator. Minimum of 90 minutes operation, up to 1000 lumens per 4' (25°C) emergency lighting output and recharge time of 24 hours.

VIA 3 PENDANT

DIRECT/INDIRECT, DIRECT, INDIRECT
STATIC WHITE, BIOS



MOUNTING OPTIONS

Fixtures can be pendant-mounted, using aircraft cables, or stem-mounted. Unless otherwise specified, Lumenwerx provides the following hardware:

Standard aircraft cable option (ACS) - Canopies are white, Ø5" for power canopy, Ø3" for non-power. Power cord is black for black fixtures, and white for all other fixture finishes. Aircraft cable length is 36".

Standard stem option (STS) - Canopies are white, Ø5" for both power and non-power. Stem finish is the same color as fixture. Stem length is 18". Stem is not field adjustable.

Caddy clips, if required specify under OPTIONS

For all other options, see the mounting code on page 3.

FINISH

Interior - 95%, reflective matte powder coated white paint

Exterior - Matte white, matte black, or aluminum powder coating. Custom finishes are also available.

CONTROLS

Lumenwerx offers several options for integrating occupancy and daylight harvesting controls in our luminaires.

For latest information on sensors, click [here](#).



STANDALONE CONTROLS

An integrated standalone sensor controls the luminaire in which it is installed. Depending on the length, more than one sensor may be necessary and may control the entire luminaire, or just a section of it. These controls operate independently. Unless otherwise agreed, sensor location, blank size, and functionality of the sensor within the luminaire are selected by Lumenwerx. See client drawings for details.

Three types are available:

OMS: An integral Passive InfraRed (PIR) sensor turns luminaires on and off automatically with field-adjustable time out period. No wall control is used. Coverage pattern for large motion has a 12' diameter with the sensor mounted 8' above the floor; for small motion, the pattern has an 8' diameter. Typically, one sensor is required for every 10' of a continuous luminaire run.

ODS: An integral, daylight harvesting sensor with closed-loop operation dims the luminaire in which it is installed in order to compensate for available daylight. The sensor measures the combination of daylight and luminaire light reflected from horizontal surfaces below the luminaire. Initial onsite calibration is required via the use of provided remote control.

OCS: Both an occupancy and a daylight sensor are installed in the luminaire.

CONNECTED CONTROLS

With connected controls, sensors or nodes installed in the luminaire form part of a larger control system infrastructure from manufacturers such as: Lutron, Enlighted, Encelium, Cooper Wavelinx, Acuity nLight, Casambi, Legrand, and others. These connected controls allow for a scalable system providing features like occupancy and daylight control, manual control, scheduling and configuration of various zones and scenes. Energy reporting and system monitoring are also possible. Specific capabilities depend on the control system being used.

Lumenwerx installs the components (sensors, nodes, power packs, etc) which may be supplied to us by a third party, or procured directly by Lumenwerx, depending on the control system manufacturer.

Lumenwerx is solely responsible for the installation of specified components; the controls manufacturer is responsible for performance of the control system.

To indicate a Lumenwerx luminaire with connected controls, identify the specific onsite control system to be integrated into the luminaires using the ordering code. Due to the diversity of components, you must contact factory to assure complete compatibility with intended control system and to fully specify the luminaire.

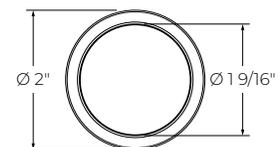
Complete control specifications, sensor/node/power pack layout, and narrative for the control system are required for Lumenwerx to create shop drawings and submittals.

COB

Fixtures with Chip On Board (COB) technology are able to provide a maximum output of 1800 lumens from a discrete 50 mm aperture on 8 inch centers. Standard CRI is 80, for 90 and 97 CRI with elevated R9 values, please consult factory. Standard 20°, 30° and 40° beam angles are available, as are custom angles prior factory approval. All our Chip On Board products have been tested in accordance with IESNA LM-80-08 and the results have shown L80 lumen maintenance greater than 50 000 hours.



Chip On Board (COB)



VIA 3 PENDANT

DIRECT/INDIRECT, DIRECT, INDIRECT
STATIC WHITE, BIOS



CONSTRUCTION

Housing - Extruded aluminum, up to 90% recycled content

Interior brackets - Die-formed cold rolled sheet steel

Joining system - Die-cast zinc

Reflectors - Die-formed cold rolled steel, 95% reflective matte white painted

Lens - Acrylic

Drop lens - Extruded with glued end caps

End caps - Die-cast aluminum

Hanger - Chromed griplock securely attached in end caps and/or joiners with stainless steel hardware

Aircraft cable suspension - Stainless steel $\varnothing 1/16$ " aircraft cable

Stem - 0.5" diameter threaded steel tube matte white or aluminum powder coating. Custom finishes are also available.

WEIGHT

Direct/Indirect	Direct or Indirect
4ft - 13.23 lbs - 6.0 kg	4ft - 11.12 lbs - 5.05 kg
8ft - 26.48 lbs - 12.0 kg	8ft - 22.25 lbs - 10.1 kg
12ft - 39.84 lbs - 18.0 kg	12ft - 33.48 lbs - 15.2 kg

CERTIFICATION

ETL - Rated for Indoor dry/damp locations. Conforms to UL Standard 1598 and certified to CAN/CSA Standard C22.2 No. 250.0.

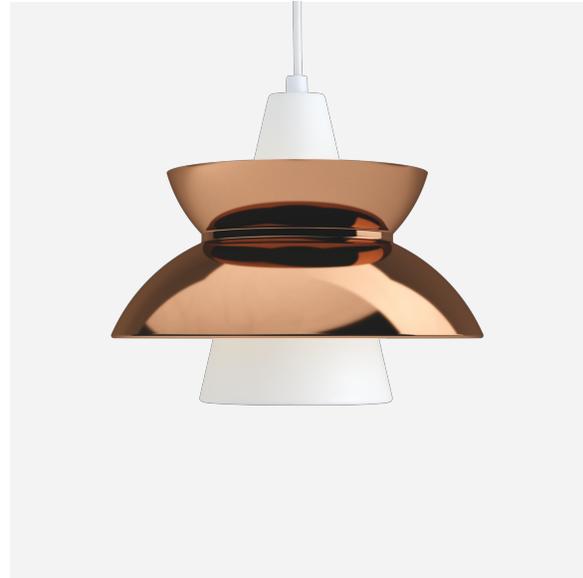
WARRANTY

Lumenwerx provides a five-year limited warranty on electrical and mechanical performance of the luminaires, including the LED boards, drivers, and auxiliary electronics. Lumenwerx will repair or replace defective luminaires or components at our discretion, provided they have been installed and operated in accordance with our specifications. Other limitations apply, please refer to the full warranty on our website.

DOO-WOP

1x15W A-19/medium / 120V / Copper / White fabric cord / - / - / 5741919950

The fixture primarily provides a downward directed soft light by means of the white lacquered inner conical reflector. The outer reflector, the main shade, contributes to directing the light upwards and downwards, while at the same time spreading the soft diffused light. The inside of the main shade is illuminated through an opening in the inner conical reflector.



Carl Hansen & Son Showroom



INGENIØR'NE

Product info

Information

Electrical: System Wattage: 15W LED Wattage: 15W Delivered lumens: 551 Efficacy: 36 lm/W Certifications: cULus, Damp Location Protection class IP20 Controllability: Phase dimming Actual performance dependent upon screw-base lamp used.

Mounting

Canopy: White. Cord type: 3-conductor, 18 AWG white PVC power cord. Cord length: 12'.

Finish

White or Dark Grey, powder coated or polished Brass or Copper. Please note that the brass and copper surfaces are untreated. This means that the surface will change over time and develop a patina. This process may have already begun when the product is delivered.

Materials

Shade: Spun aluminum or spun brass, or copper. Suspension: Spun aluminum. Struts: Stainless steel.

Sizes and weight

Width x Height x Length (in.) | 11.1 x 9.6 x 11.1 Max 4.5 lbs

Compliance

cULus, Damp location.

Specification notes

a. All variants come with white cord and canopy.

Light source

1x15W A-19/medium

Information

Electrical:

System Wattage: 15W

LED Wattage: 15W

Delivered lumens: 551

Efficacy: 36 lm/W

Certifications:

cULus, Damp Location

Protection class IP20

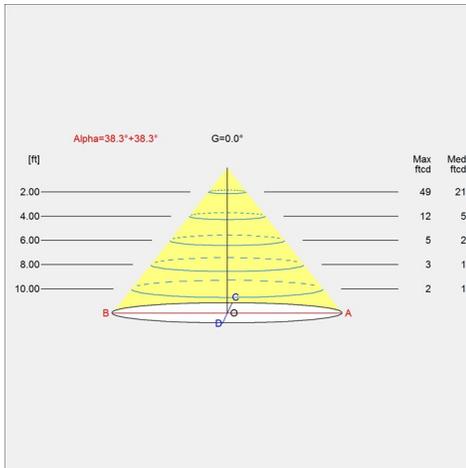
Controllability: Phase dimming

Actual performance dependent upon screw-base lamp used.

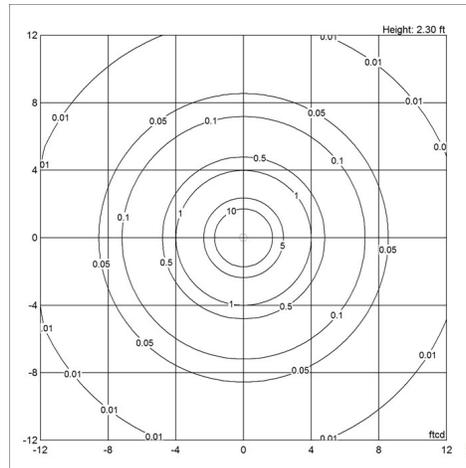


Light distribution diagrams

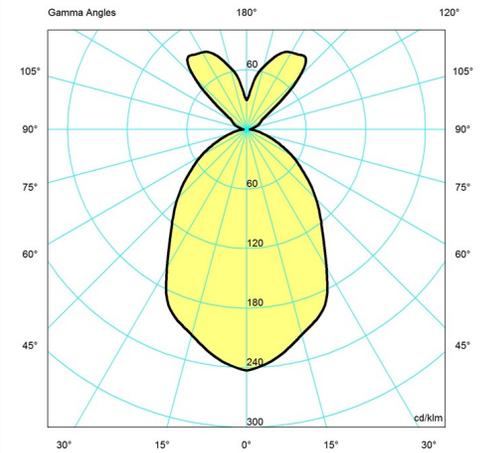
Cartesian



Isolux



Polar



Spare parts & accessories

Product

- Doo-Wop socket + cord suspension
- Small canopy, white
- Small canopy, black
- Canopy White 2-part tophat @

Variant number

- 5741094613
- S0771
- 10000018378
- 5749329034

Data specifications

Colour	Copper	Length	11.1
Width	11.1	Height	9.6
Built-in Height	-	IP class	20
Class	-	Net Weight	4.5

TYPE L8

Doo-Wop

Standby (W)	-
Inrush Current	-
Kelvin	-
SDCM	-
Watt	15
Light control	-
UGR Transversal / Axial	18.7/18.7
Driver life	-

Power Factor (P = 100 % / P = 50 %)	-
Light source	1x15W A-19/medium
CRI	-
Lumen	551
Efficacy	37
Min. Dim Level (%)	-
L80B50 (hours)	-

PH 5-4½ & PH 6½-6

Designed by Poul Henningsen



Technical specifications

Materials

Shades: Spun aluminum. Struts: Rolled aluminum.

Finishes

White.

Mounting

Suspension type: 1x stainless steel aircraft cable (PH 6½-6).
Canopy: White. Cord type: 3-conductor, 18 AWG white PVC power cord. Cord length: 12'. For mounting instructions, see download section on the product detail page.

Information

Electrical:

System Wattage: 22 W - 96 W

LED Wattage: 20 W - 94 W

Delivered lumens: 1,645 - 4,420

Efficacy: 46.0 - 74.7 lm/W

Certifications:

cULus, Damp Location

Protection class IP20

Controllability: Phase dimming or 0-10V dimming.

Color Rendering: Ra≥90 for LED variants. For the E-socket product variants, bulbs are not included. LED light source is part of the product.

SPECIFICATION NOTES

a. 5-4½ available in 1/22W/A-21/120V or 44W LED.

b. 5-4½ available in 44W LED variants available with mains dimming at 120V or 0-10V dimming with 120-277V.

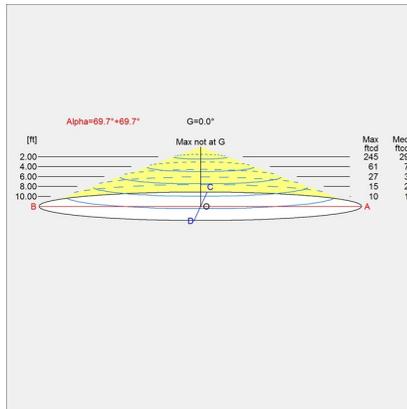
c. 6½-6 available only in 97W LED with 0-10V dimming with 120-277V.

PH 5-4½ & PH 6½-6

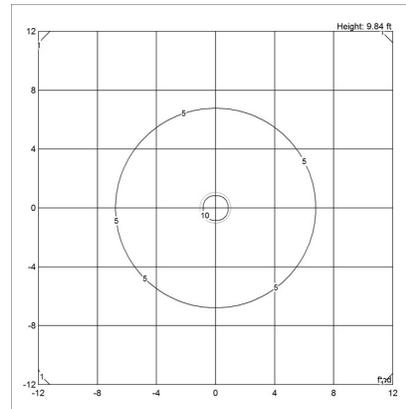
Designed by Poul Henningsen

Light distribution diagrams

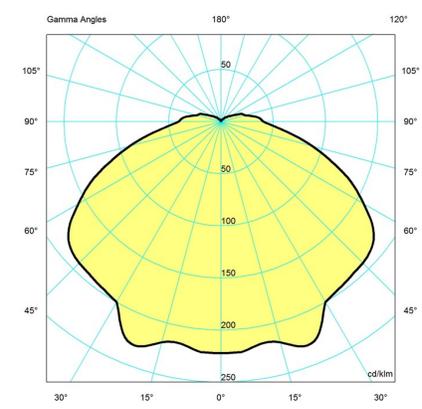
CARTESIAN



ISOLUX



POLAR



Variant Options

For particular variant options, please check our online Product Variants Configurator on the product detail page.

VARIANT NO.	LIGHT SOURCE	VOLTAGE/FRQ	LUMEN	FEATURES	CABLE
10000149867	LED 3000K 44W	120-277V/60HZ	1755	Dim 0-10v	White fabric cord
10000149868	LED 3000K 44W	120V	1755	Phase dimming (mains dimm)	White fabric cord
10000149869	LED 3000-1800K D2W 44W	120-277V/60HZ	1446	Dim 0-10v	White fabric cord
10000149870	LED 3000-1800K D2W 44W	120V	1446	Phase dimming (mains dimm)	White fabric cord
5741928695	LED 2700K 96W	120-277V/60HZ	4420	Dim 0-10v	White fabric cord
5741938698	LED 3000K 96W	120-277V/60HZ	4420	Dim 0-10v	White fabric cord

Variants

VARIANT NUMBER	COLOR, RAL	W / H / L (IN) / W (LB)
10000149867	WHT, 016	18.3 / 12.5 / 18.3 IN / 5.4 LB
10000149868	WHT, 016	18.3 / 12.5 / 18.3 IN / 5.4 LB
10000149869	WHT, 016	18.3 / 12.5 / 18.3 IN / 5.4 LB
10000149870	WHT, 016	18.3 / 12.5 / 18.3 IN / 5.4 LB
5741928695	WHT, 016	25.6 / 16.4 / 25.6 IN / 19.1 LB
5741938698	WHT, 016	25.6 / 16.4 / 25.6 IN / 19.0 LB

Beam Me Up (Max) G1/P1 | Suspended



Housing:

High-quality processed FRP (Fiberglass Reinforced Plastic). LED pendant luminaire with a rebated lens optic in a decorative ring. Direct-indirect or direct-only light distribution. Fully enclosed and damp rated.

Optical System:

Microprismatic screen with optimized glare reduction especially for workplaces. Satin opal diffuser for general lighting with maximum transmittance and homogeneous lighting.

Surface Finish:

Outer housing and Decorative reflector ring available in various finishes and combinations, e.g. white, silver, graphite, black, gold or copper coated. For further surface options see Lightnet-Surface-Collection. RAL or PANTONE of your choice.

Control:

Integral electronic driver dimmable 0-10V. Minimum dimming level 1%. Field replaceable. On request: DALI, DMX, Lutron, Casambi.

LED:

Available color temperatures: 2200K, 2700K, 3000K, 3500K, 4000K, 6500K, or Tunable White. All color temperatures available in CRI>80 or CRI>90. Tolerance within a 3-step MacAdam ellipse. Up to 110lm/W efficacy. Choice of different lumen output levels: Medium or High Power. Custom lumen output upon request. Lifetime minimum 50,000h with 85% of lumen maintenance.

Installation:

Height-adjustable central cord suspension, parallel cord suspension with transparent power supply cable, or rod suspension. Colors ceiling rose and rod suspension match to luminaire body.

Certification & Warranty:

cETLus. 5 Years Warranty.

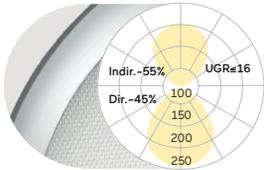
Order Guide

		1 M P1 O A E - 8 30 M - D700 - UG
Product Family	1M: Beam Me Up	
Type	P1: Direct-Indirect, G1: Direct only	
Optical System	A: Microprismatic, O: Opal Diffuser	
Surface Finish	W: Snow White, V: Ivory White, A: Satin Silver, U: Urban Graphite, B: Jet Black, H: Anodic Champagne, K: Satin Copper	
Control Gear	E: On/Off, D: 0-10V	
Color Rendering	8: CRI>80, 9: CRI>90, F: Full Spectrum [except 2200K]	
Color Temperature	22: 2200K, 27: 2700K, 30: 3000K, 35: 3500K, 40: 4000K, 65: 6500K, TW: Tunable White 2700-6500K	
Power	M: Medium Power, H: High Power	
Size	Luminaire Diameter in mm: D400 (15.75"), D700 (27.5"), D1200 (47.25")	
Suspension	U: Central Suspension, P: Tube Suspension [D400- D700], K: Parallel Suspension	
Reflector	W: Snow White, V: Ivory White, A: Satin Silver, U: Urban Graphite, B: Jet Black, H: Anodic Champagne, K: Satin Copper, G: Satin Gold	
On Request	DALI, DMX, Lutron System, Casambi	



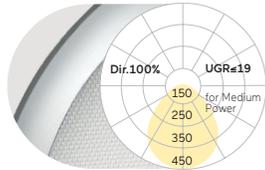
Light Performance

Microprismatic | Direct-Indirect



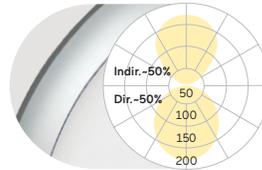
D inch	Lumen/Watt Medium Power	Lumen/Watt High Power
15.75"	2180lm/20W	3190lm/32W
27.5"	5860lm/50W	8590lm/80W
47.25"	19730lm/177W	27150lm/247W

Microprismatic | Direct



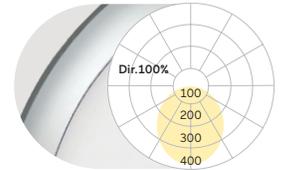
D inch	Lumen/Watt Medium Power	Lumen/Watt High Power
15.75"	1090lm/14W	1600lm/22W
27.5"	2920lm/35W	4290lm/52W
47.25"	8580lm/104W	11220lm/139W

Opal Diffuser | Direct-Indirect



D inch	Lumen/Watt Medium Power	Lumen/Watt High Power
15.75"	2230lm/20W	3270lm/32W
27.5"	6000lm/50W	8790lm/80W
47.25"	20130lm/177W	27680lm/247W

Opal Diffuser | Direct



D inch	Lumen/Watt Medium Power	Lumen/Watt High Power
15.75"	1140lm/14W	1680lm/22W
27.5"	3060lm/35W	4490lm/52W
47.25"	8980lm/104W	11750lm/139W

Lumen Values: Luminaire luminous flux at 4000K/CRI>80. Other configurations on request.

Dimensions

Tube Suspension



Parallel Suspension



Central Suspension



Surfaces



H Anodic Champagne
H Anodic Champagne



U Urban Graphite
U Urban Graphite



K Satin Copper
K Satin Copper



H Anodic Champagne
B Jet Black



B Jet Black
G Satin Gold



B Jet Black
W Snow White

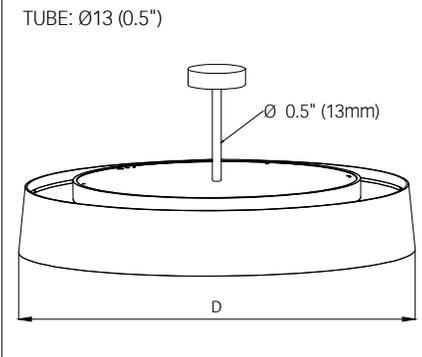
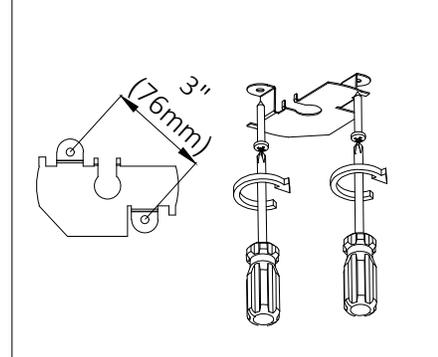
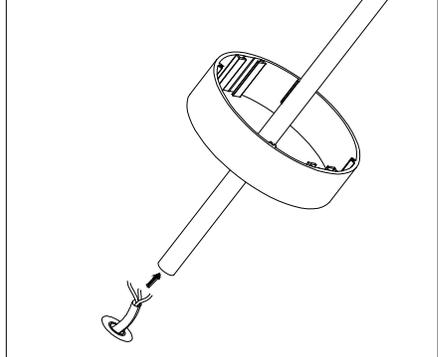
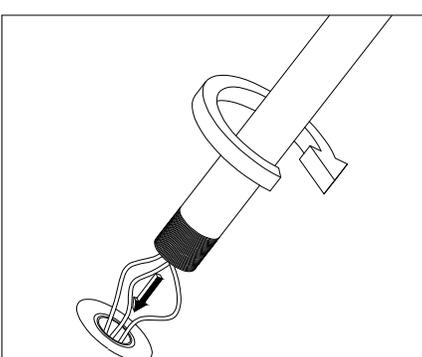
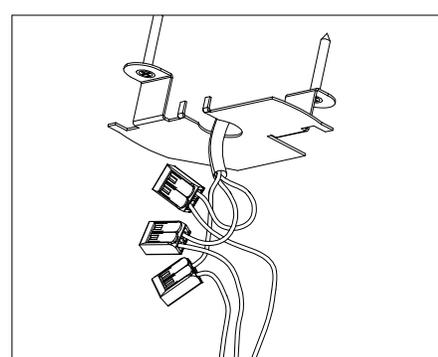
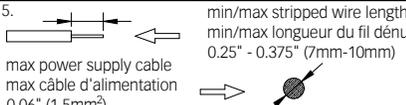
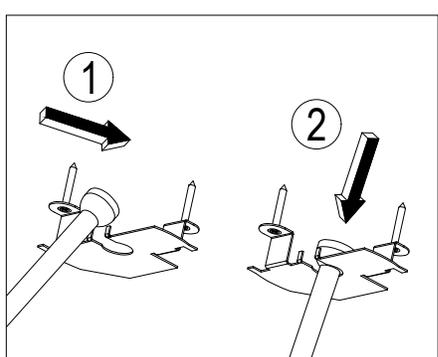
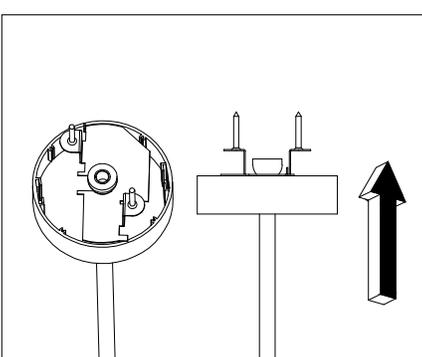
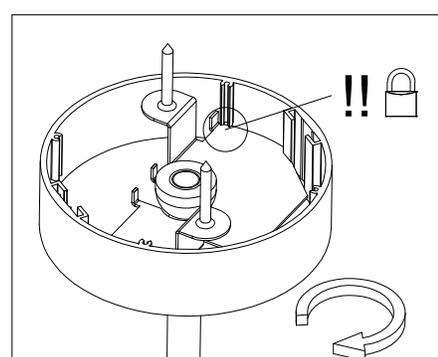
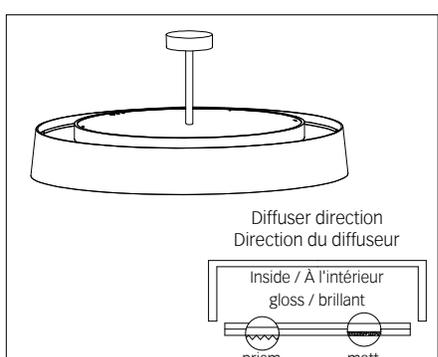


RAL on demand

Beam Me Up (Max) G1/P1 | Suspended

TUBE SUSPENSION (D400 - D700)

1. MOUNTING AND INSTALLATION | MONTAGE ET INSTALLATION:

<p>TUBE: Ø13 (0.5")</p>  <p>1. Use gloves when handling the fixture. Merci de porter des gants durant la totalité de l'installation.</p> 	 <p>2. Installation openings. Perçage pour l'installation</p>	 <p>3.</p>
 <p>4.</p>	 <p>5.  min/max stripped wire length min/max longueur du fil dénudé 0.25" - 0.375" (7mm-10mm) max power supply cable max câble d'alimentation 0.06" (1,5mm²)</p>	 <p>6.</p>
 <p>7.</p>	 <p>8.</p>	 <p>Diffuser direction Direction du diffuseur</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;"> <p style="text-align: center;">Inside / À l'intérieur gloss / brillant</p>  <p style="text-align: center;">prism matt</p> <p style="text-align: center;">Outside / À l'extérieur</p> </div> <p>9.</p>

WARNING: RISK OF FIRE AND ELECTRICAL SHOCK. FIXTURE MUST BE INSTALLED BY A QUALIFIED ELECTRICIAN ONLY IN ACCORDANCE WITH NATIONAL, LOCAL BUILDING AND ELECTRICAL CODES. DISCONNECT POWER AT ELECTRICAL PANEL BEFORE SERVICING.

IMPORTANT: EXACT DIMENSIONS IN MM!

ATTENTION: RISQUE D'INCENDIE ET D'ÉLECTROCUTION. LE LUMINAIRE DOIT ÊTRE INSTALLÉ PAR UN ÉLECTRICIEN QUALIFIÉ, CONFORMÉMENT AUX NORMES NATIONALES EN VIGUEUR, CODES DE CONSTRUCTION ET D'ÉLECTRICITÉ LOCAUX. DÉBRANCHEZ L'ALIMENTATION AU PANNEAU ÉLECTRIQUE AVANT DE PROCÉDER À L'ENTRETIEN.

IMPORTANT: LES DIMENSIONS EXACTES SONT EN MM!

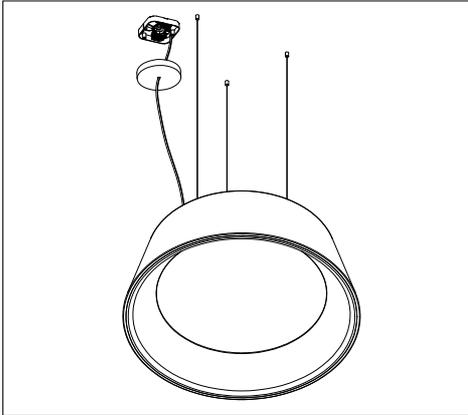
lightnet

BEAM ME UP (MAX) G1/P1 | SUSPENDED PARALLEL SUSPENSION

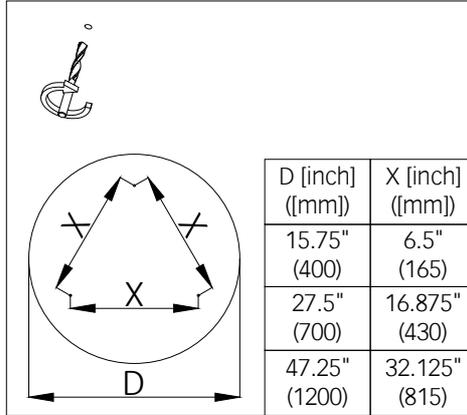
1. MOUNTING AND INSTALLATION | MONTAGE ET INSTALLATION:

TYPE L10

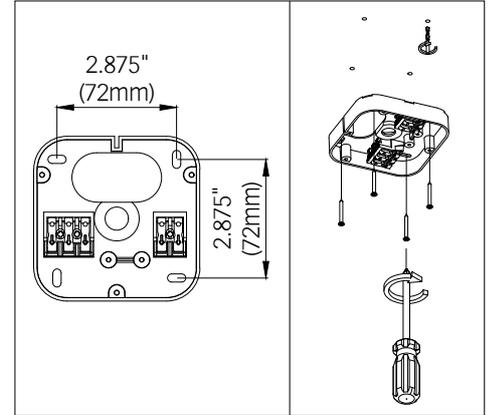
GREVE FOREST PLAZA
2937 SW 27th Avenue, Suite 305
Miami, FL 33133
Tel.: +1 (800) 940 9092
E-Mail: info@lightnet.us
www.lightnet.us



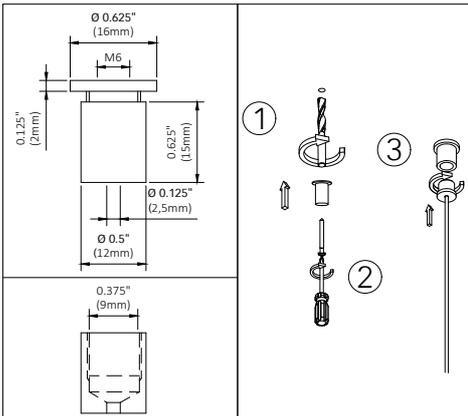
1. Use gloves when handling the fixture.
Merci de porter des gants durant la totalité de l'installation.



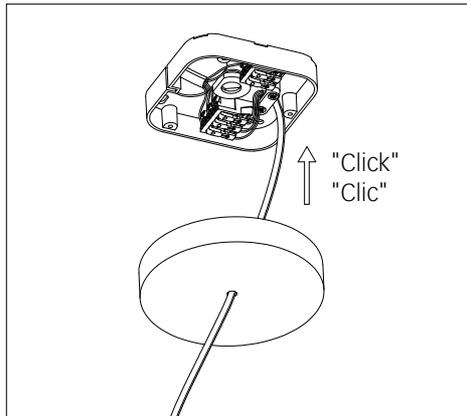
2. Installation openings.
Perçage pour l'installation



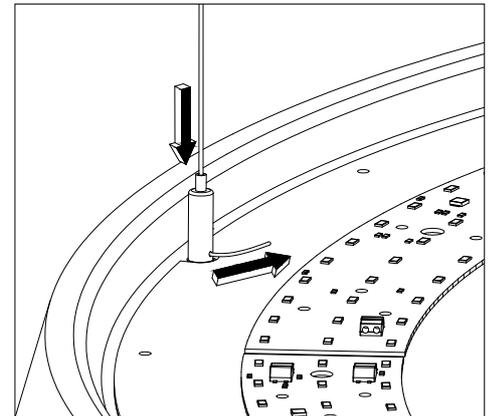
3. This luminaire must be mounted or supported independently of an outlet box.
Ce luminaire doit être installé ou supporté indépendamment de la boîte de jonction.



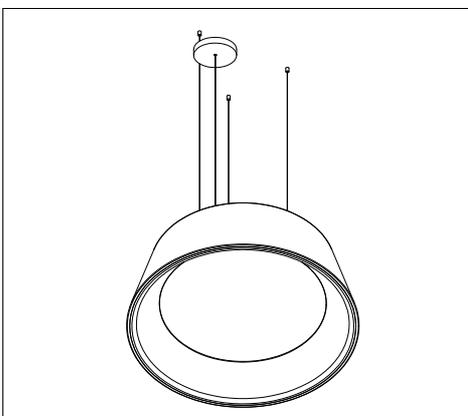
4. Please note: The cap has a thread M6-metric!



5. min/max stripped wire length
min/max longueur du fil dénudé
0.25" - 0.375" (7mm-10mm)
max power supply cable
max câble d'alimentation
0.06" (1,5mm²)



6.



7.

WARNING: RISK OF FIRE AND ELECTRICAL SHOCK. FIXTURE MUST BE INSTALLED BY A QUALIFIED ELECTRICIAN ONLY IN ACCORDANCE WITH NATIONAL, LOCAL BUILDING AND ELECTRICAL CODES. DISCONNECT POWER AT ELECTRICAL PANEL BEFORE SERVICING.

IMPORTANT: EXACT DIMENSIONS IN MM!

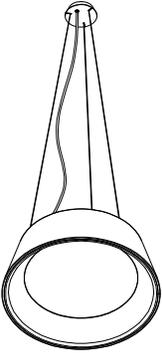
ATTENTION: RISQUE D'INCENDIE ET D'ÉLECTROCUTION. LE LUMINAIRE DOIT ÊTRE INSTALLÉ PAR UN ÉLECTRICIEN QUALIFIÉ, CONFORMÉMENT AUX NORMES NATIONALES EN VIGUEUR, CODES DE CONSTRUCTION ET D'ÉLECTRICITÉ LOCAUX. DÉBRANCHEZ L'ALIMENTATION AU PANNEAU ÉLECTRIQUE AVANT DE PROCÉDER À L'ENTRETIEN.

IMPORTANT: LES DIMENSIONS EXACTES SONT EN MM!

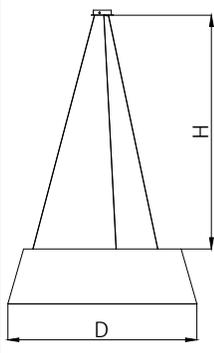
Beam Me Up (Max) G1/P1 | Suspended

CENTRAL SUSPENSION

1. MOUNTING AND INSTALLATION | MONTAGE ET INSTALLATION:



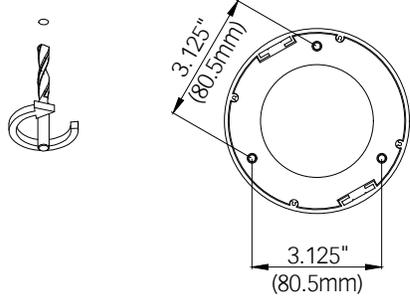
1. Use gloves when handling the fixture.
Merci de porter des gants durant la totalité de l'installation.

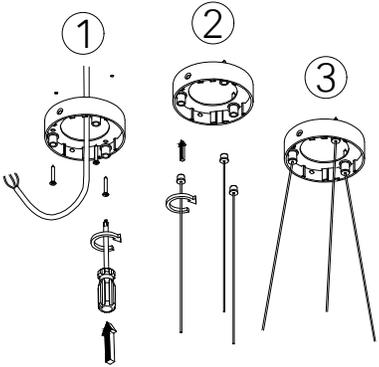
H:
Minimal suspension high.
Longueur minimale de la suspension.

D [inch] ([mm])	H [inch] ([mm])
15.75" (400)	11.75" (300)
27.5" (700)	23.625" (600)
47.25" (1200)	43.25" (1100)

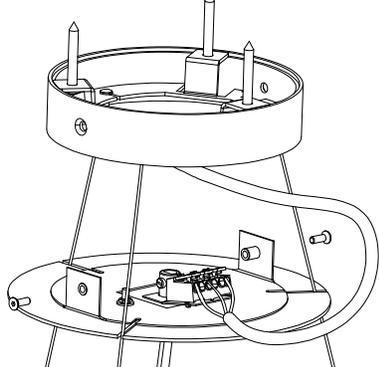
2. Installation openings.
Perçage pour l'installation



3.



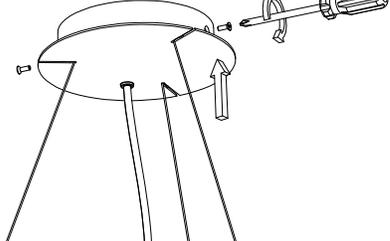
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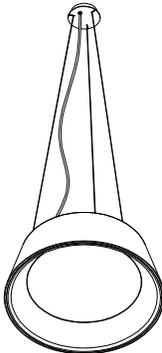
5.

min/max stripped wire length
min/max longueur du fil dénudé
0.25" - 0.375" (7mm-10mm)

max power supply cable
max câble d'alimentation
0.06" (1,5mm²)



6.



7.

WARNING: RISK OF FIRE AND ELECTRICAL SHOCK. FIXTURE MUST BE INSTALLED BY A QUALIFIED ELECTRICIAN ONLY IN ACCORDANCE WITH NATIONAL, LOCAL BUILDING AND ELECTRICAL CODES. DISCONNECT POWER AT ELECTRICAL PANEL BEFORE SERVICING.

IMPORTANT: EXACT DIMENSIONS IN MM!

ATTENTION: RISQUE D'INCENDIE ET D'ÉLECTROCUTION. LE LUMINAIRE DOIT ÊTRE INSTALLÉ PAR UN ÉLECTRICIEN QUALIFIÉ, CONFORMÉMENT AUX NORMES NATIONALES EN VIGUEUR, CODES DE CONSTRUCTION ET D'ÉLECTRICITÉ LOCAUX. DÉBRANCHEZ L'ALIMENTATION AU PANNEAU ÉLECTRIQUE AVANT DE PROCÉDER À L'ENTRETIEN.

IMPORTANT: LES DIMENSIONS EXACTES SONT EN MM!

Beam Me Up (Max) G1/P1 | Suspended



Housing:

High-quality processed FRP (Fiberglass Reinforced Plastic). LED pendant luminaire with a rebated lens optic in a decorative ring. Direct-indirect or direct-only light distribution. Fully enclosed and damp rated.

Optical System:

Microprismatic screen with optimized glare reduction especially for workplaces. Satin opal diffuser for general lighting with maximum transmittance and homogeneous lighting.

Surface Finish:

Outer housing and Decorative reflector ring available in various finishes and combinations, e.g. white, silver, graphite, black, gold or copper coated. For further surface options see Lightnet-Surface-Collection. RAL or PANTONE of your choice.

Control:

Integral electronic driver dimmable 0-10V. Minimum dimming level 1%. Field replaceable. On request: DALI, DMX, Lutron, Casambi.

LED:

Available color temperatures: 2200K, 2700K, 3000K, 3500K, 4000K, 6500K, or Tunable White. All color temperatures available in CRI>80 or CRI>90. Tolerance within a 3-step MacAdam ellipse. Up to 110lm/W efficacy. Choice of different lumen output levels: Medium or High Power. Custom lumen output upon request. Lifetime minimum 50,000h with 85% of lumen maintenance.

Installation:

Height-adjustable central cord suspension, parallel cord suspension with transparent power supply cable, or rod suspension. Colors ceiling rose and rod suspension match to luminaire body.

Certification & Warranty:

cETLus. 5 Years Warranty.

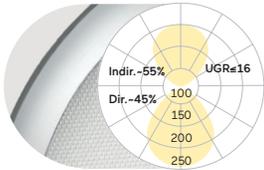
Order Guide

		1 M P1 O A E - 8 30 M - D700 - UG
Product Family	1M: Beam Me Up	
Type	P1: Direct-Indirect, G1: Direct only	
Optical System	A: Microprismatic, O: Opal Diffuser	
Surface Finish	W: Snow White, V: Ivory White, A: Satin Silver, U: Urban Graphite, B: Jet Black, H: Anodic Champagne, K: Satin Copper	
Control Gear	E: On/Off, D: 0-10V	
Color Rendering	8: CRI>80, 9: CRI>90, F: Full Spectrum [except 2200K]	
Color Temperature	22: 2200K, 27: 2700K, 30: 3000K, 35: 3500K, 40: 4000K, 65: 6500K, TW: Tunable White 2700-6500K	
Power	M: Medium Power, H: High Power	
Size	Luminaire Diameter in mm: D400 (15.75"), D700 (27.5"), D1200 (47.25")	
Suspension	U: Central Suspension, P: Tube Suspension [D400- D700], K: Parallel Suspension	
Reflector	W: Snow White, V: Ivory White, A: Satin Silver, U: Urban Graphite, B: Jet Black, H: Anodic Champagne, K: Satin Copper, G: Satin Gold	
On Request	DALI, DMX, Lutron System, Casambi	



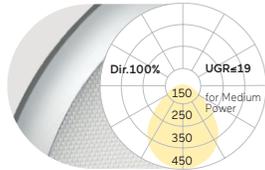
Light Performance

Microprismatic | Direct-Indirect



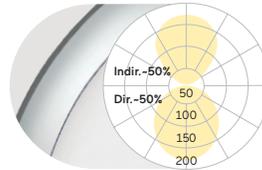
D inch	Lumen/Watt Medium Power	Lumen/Watt High Power
15.75"	2180lm/20W	3190lm/32W
27.5"	5860lm/50W	8590lm/80W
47.25"	19730lm/177W	27150lm/247W

Microprismatic | Direct



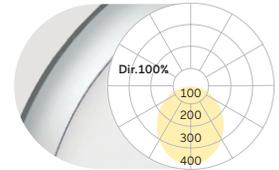
D inch	Lumen/Watt Medium Power	Lumen/Watt High Power
15.75"	1090lm/14W	1600lm/22W
27.5"	2920lm/35W	4290lm/52W
47.25"	8580lm/104W	11220lm/139W

Opal Diffuser | Direct-Indirect



D inch	Lumen/Watt Medium Power	Lumen/Watt High Power
15.75"	2230lm/20W	3270lm/32W
27.5"	6000lm/50W	8790lm/80W
47.25"	20130lm/177W	27680lm/247W

Opal Diffuser | Direct



D inch	Lumen/Watt Medium Power	Lumen/Watt High Power
15.75"	1140lm/14W	1680lm/22W
27.5"	3060lm/35W	4490lm/52W
47.25"	8980lm/104W	11750lm/139W

Lumen Values: Luminaire luminous flux at 4000K/CRI>80. Other configurations on request.

Dimensions

Tube Suspension



Parallel Suspension



Central Suspension



Surfaces



H Anodic Champagne
H Anodic Champagne



U Urban Graphite
U Urban Graphite



K Satin Copper
K Satin Copper



H Anodic Champagne
B Jet Black



B Jet Black
G Satin Gold



B Jet Black
W Snow White

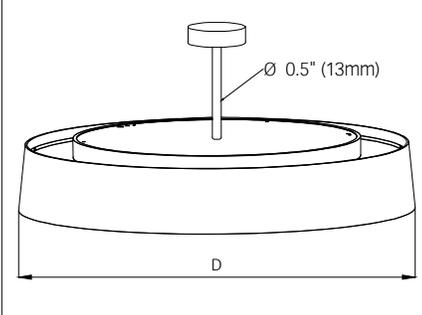
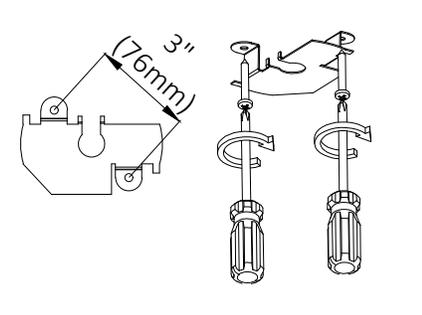
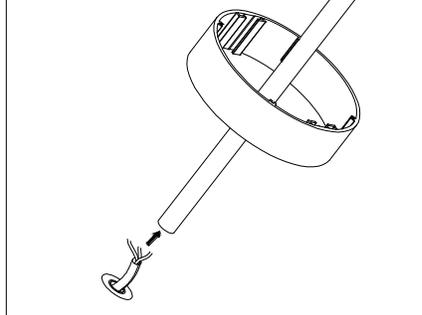
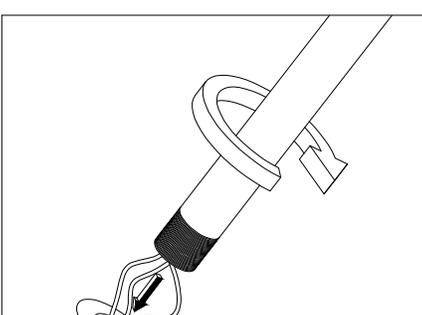
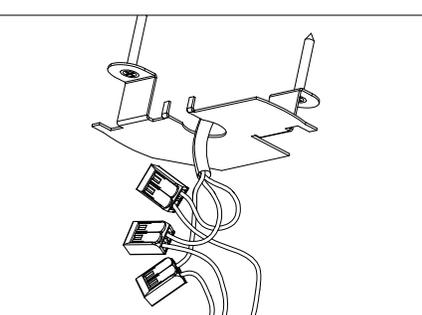
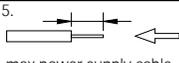
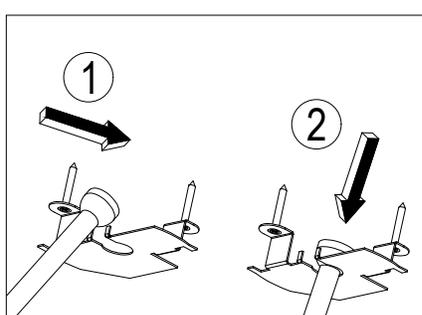
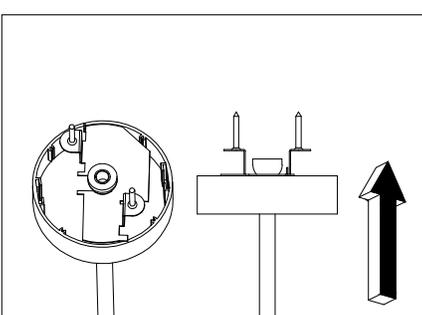
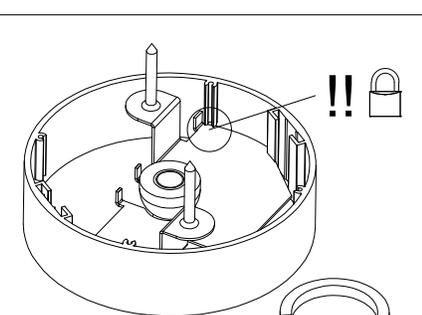
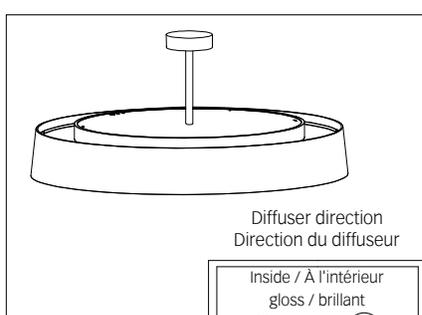


RAL on demand

Beam Me Up (Max) G1/P1 | Suspended

TUBE SUSPENSION (D400 - D700)

1. MOUNTING AND INSTALLATION | MONTAGE ET INSTALLATION:

<p>TUBE: Ø13 (0.5")</p>  <p>1. Use gloves when handling the fixture. Merci de porter des gants durant la totalité de l'installation.</p> 	 <p>2. Installation openings. Perçage pour l'installation</p>	 <p>3.</p>
 <p>4.</p>	 <p>5.  min/max stripped wire length min/max longueur du fil dénudé 0.25" - 0.375" (7mm-10mm) max power supply cable max câble d'alimentation 0.06" (1,5mm²) </p>	 <p>6.</p>
 <p>7.</p>	 <p>8.</p>	 <p>Diffuser direction Direction du diffuseur</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;"> <p style="text-align: center;">Inside / À l'intérieur gloss / brillant</p>  <p style="text-align: center;">prism matt</p> <p style="text-align: center;">Outside / À l'extérieur</p> </div> <p>9.</p>

WARNING: RISK OF FIRE AND ELECTRICAL SHOCK. FIXTURE MUST BE INSTALLED BY A QUALIFIED ELECTRICIAN ONLY IN ACCORDANCE WITH NATIONAL, LOCAL BUILDING AND ELECTRICAL CODES. DISCONNECT POWER AT ELECTRICAL PANEL BEFORE SERVICING.

IMPORTANT: EXACT DIMENSIONS IN MM!

ATTENTION: RISQUE D'INCENDIE ET D'ÉLECTROCUTION. LE LUMINAIRE DOIT ÊTRE INSTALLÉ PAR UN ÉLECTRICIEN QUALIFIÉ, CONFORMÉMENT AUX NORMES NATIONALES EN VIGUEUR, CODES DE CONSTRUCTION ET D'ÉLECTRICITÉ LOCAUX. DÉBRANCHEZ L'ALIMENTATION AU PANNEAU ÉLECTRIQUE AVANT DE PROCÉDER À L'ENTRETIEN.

IMPORTANT: LES DIMENSIONS EXACTES SONT EN MM!

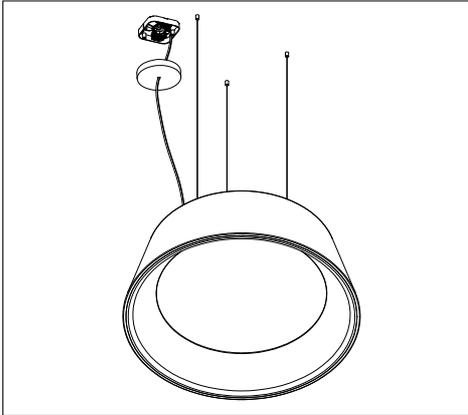
lightnet

BEAM ME UP (MAX) G1/P1 | SUSPENDED PARALLEL SUSPENSION

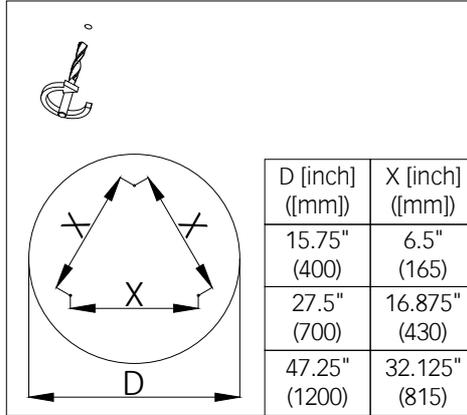
1. MOUNTING AND INSTALLATION | MONTAGE ET INSTALLATION:

TYPE L11

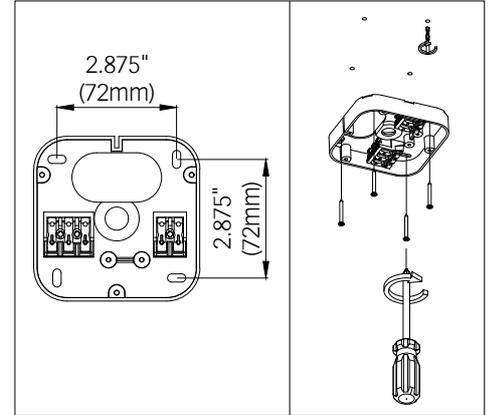
Grove Forest Plaza
2937 SW 27th Avenue, Suite 305
Miami, FL 33133
Tel.: +1 (800) 940 9092
E-Mail: info@lightnet.us
www.lightnet.us



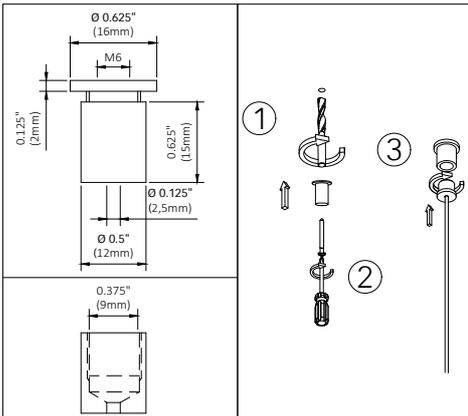
1. Use gloves when handling the fixture.
Merci de porter des gants durant la totalité de l'installation.



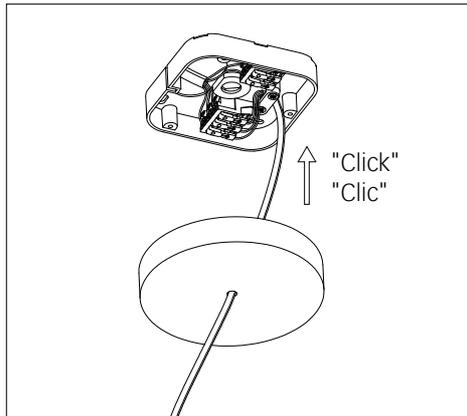
2. Installation openings.
Perçage pour l'installation



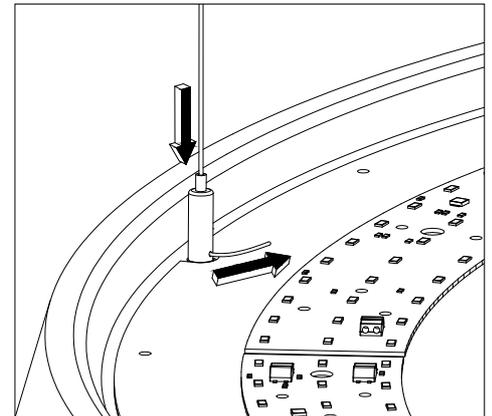
3. This luminaire must be mounted or supported independently of an outlet box.
Ce luminaire doit être installé ou supporté indépendamment de la boîte de jonction.



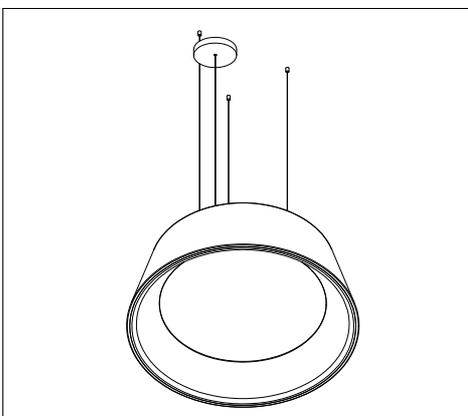
4. Please note: The cap has a thread M6-metric!



5. min/max stripped wire length
min/max longueur du fil dénudé
0.25" - 0.375" (7mm-10mm)
max power supply cable
max câble d'alimentation
0.06" (1,5mm²)



6.



7.

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IMPORTANT: EXACT DIMENSIONS IN MM!

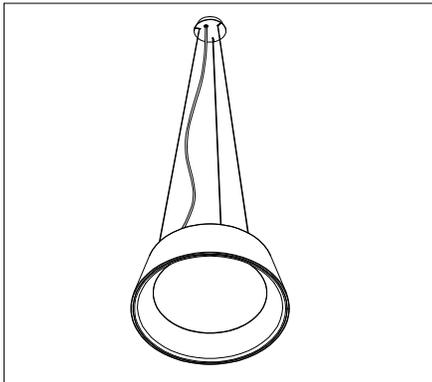
ATTENTION: RISQUE D'INCENDIE ET D'ÉLECTROCUTION. LE LUMINAIRE DOIT ÊTRE INSTALLÉ PAR UN ÉLECTRICIEN QUALIFIÉ, CONFORMÉMENT AUX NORMES NATIONALES EN VIGUEUR, CODES DE CONSTRUCTION ET D'ÉLECTRICITÉ LOCAUX. DÉBRANCHEZ L'ALIMENTATION AU PANNEAU ÉLECTRIQUE AVANT DE PROCÉDER À L'ENTRETIEN.

IMPORTANT: LES DIMENSIONS EXACTES SONT EN MM!

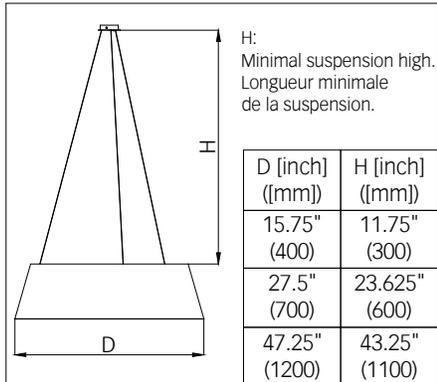
Beam Me Up (Max) G1/P1 | Suspended

CENTRAL SUSPENSION

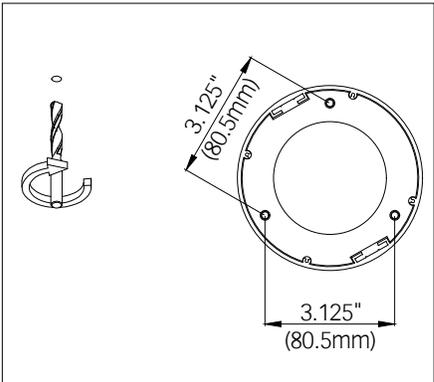
1. MOUNTING AND INSTALLATION | MONTAGE ET INSTALLATION:



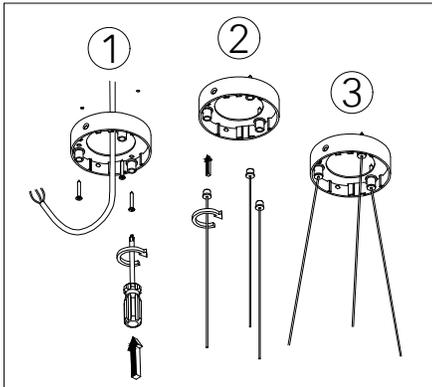
1. Use gloves when handling the fixture.
Merci de porter des gants durant la totalité de l'installation.

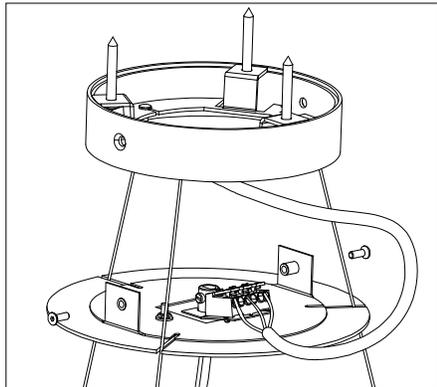
2. Installation openings.
Perçage pour l'installation



3.

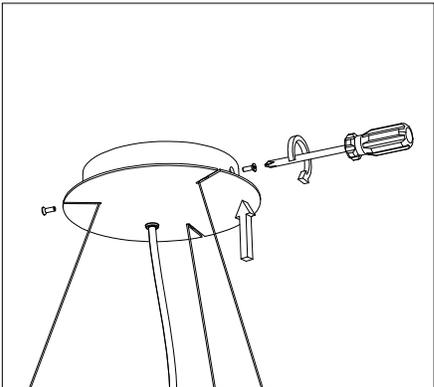


4.

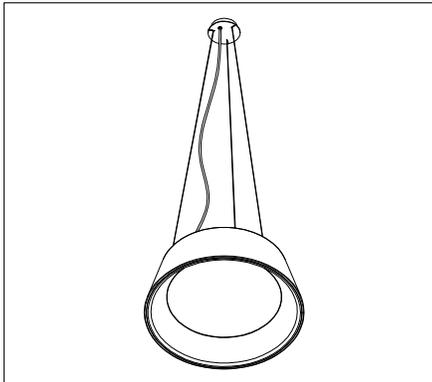


5. min/max stripped wire length
min/max longueur du fil dénudé
0.25" - 0.375" (7mm-10mm)

max power supply cable
max câble d'alimentation
0.06" (1,5mm²)



6.



7.

WARNING: RISK OF FIRE AND ELECTRICAL SHOCK. FIXTURE MUST BE INSTALLED BY A QUALIFIED ELECTRICIAN ONLY IN ACCORDANCE WITH NATIONAL, LOCAL BUILDING AND ELECTRICAL CODES. DISCONNECT POWER AT ELECTRICAL PANEL BEFORE SERVICING.

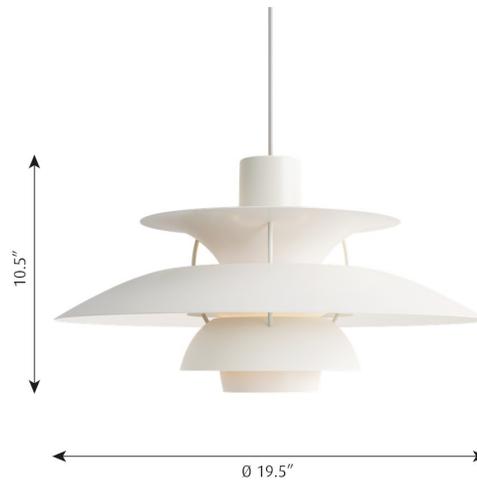
IMPORTANT: EXACT DIMENSIONS IN MM!

ATTENTION: RISQUE D'INCENDIE ET D'ÉLECTROCUTION. LE LUMINAIRE DOIT ÊTRE INSTALLÉ PAR UN ÉLECTRICIEN QUALIFIÉ, CONFORMÉMENT AUX NORMES NATIONALES EN VIGUEUR, CODES DE CONSTRUCTION ET D'ÉLECTRICITÉ LOCAUX. DÉBRANCHEZ L'ALIMENTATION AU PANNEAU ÉLECTRIQUE AVANT DE PROCÉDER À L'ENTRETIEN.

IMPORTANT: LES DIMENSIONS EXACTES SONT EN MM!

PH 5

Designed by Poul Henningsen



Technical specifications

Materials

Lower shade: Spun steel.
Other shades and anti-glare disc: Spun aluminium, spun copper or spun brass. Struts: Rolled aluminium.
Diffuser: Frosted glass.

Finishes

Matt powder coated or Matt wet painted.

Powder coated: White Classic, White Modern and Metal finishes.

Wet painted: Monochromes, Pastels and Hues Of finishes.
Raw: The metal surface is raw after being stripped of previous paint. As a result of the stripping process, the finish of the aluminum surface naturally varies between darker and lighter tones. The lower shade is made of steel and has a different surface that may encounter occasional rust.

Please note that the copper and brass surface is untreated. This means that the surface will change over time and develop a patina.

Mounting

Canopy and cord: Black for Monochrome Black, White for all other colors. Cord type: 3-conductor, 18 AWG cloth-covered power cord. Cord length: 12 feet. For mounting instructions, see download section on the product detail page.

Information

Color of anti-glare disc:
Blue: White Classic, Monochrome Blue and Hues of Orange.
Green: Hues of Red and Hues of Rose.
Red: Hues of Green and Hues of Blue.
Rose: Pastel Blue Rose Peach, Hues of Grey and White Modern.
Peach: Pastel Oyster Blue Rose.
Raw: Raw.
Same color/material as main shade on Monochrome and Metal variants.

Color of struts:
Purple: White Classic.
Bronze colored: White Modern and Hues of colors.
White: Copper, Brass and Pastels.
Raw: Raw.
Same color as main shade on Monochrome variants.

Cable and canopy:
Monochrome Black: Black cable and canopy.
All others: White cable and canopy.

Please note that the copper and brass surface is untreated. This means that the surface will change over time and develop a patina. This process may have already begun when the product is delivered. For the E-socket product variants, bulbs are not included. LED light source is part of the product.

SPECIFICATION NOTES

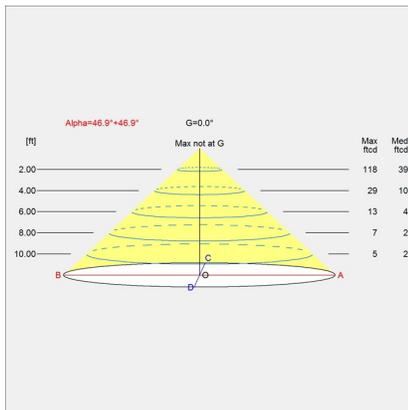
PH 5

Designed by Poul Henningsen

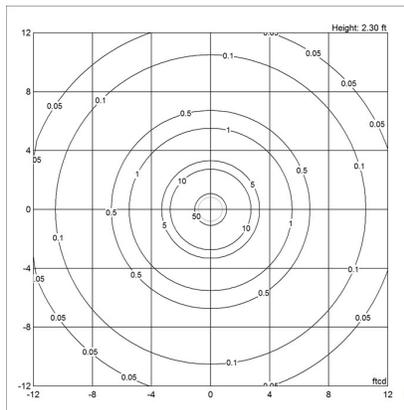
For the Raw version please notice the shades may appear with small irregularities, crookedness, and dents. Please note that the metal surface is treated with a dry lubricant to prevent further patination. The lower steel shade will corrode over time unless it is treated further. If preferred, applying a dry lubricant every now and then will help maintain the original raw- metal finish.

Light distribution diagrams

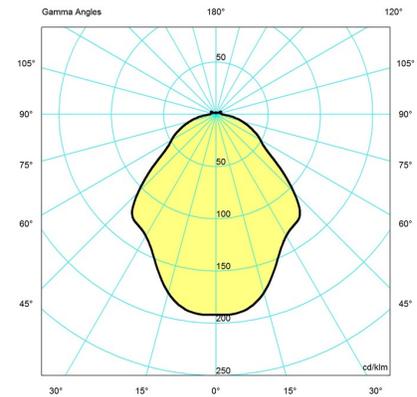
CARTESIAN



ISOLUX



POLAR



PH 5

Designed by Poul Henningsen

Variant Options

For particular variant options, please check our online Product Variants Configurator on the product detail page.

VARIANT NO.	LIGHT SOURCE	VOLTAGE/FRQ	LUMEN	FEATURES	CABLE
5741918032	1x22W A-21/medium	120V	1113	-	White fabric cord
5741918045	1x22W A-21/medium	120V	1075	-	White fabric cord
5741918058	1x22W A-21/medium	120V	1113	-	White fabric cord
5741918061	1x22W A-21/medium	120V	1113	-	White fabric cord
5741918074	1x22W A-21/medium	120V	1075	-	White fabric cord
5741918087	1x22W A-21/medium	120V	1075	-	White fabric cord
5741918090	1x22W A-21/medium	120V	1002	-	White fabric cord
5741918100	1x22W A-21/medium	120V	1187	-	White fabric cord
5741918113	1x22W A-21/medium	120V	1002	-	White fabric cord
5741919277	1x22W A-21/medium	120V	1002	-	White fabric cord
5741934207	1x22W A-21/medium	120V	891	-	White fabric cord
5741934304	1x22W A-21/medium	120V	1117	-	White fabric cord
5741934854	1x22W A-21/medium	120V	882	-	Black fabric cord
5741940042	1x22W A-21/medium	120V	1002	-	White fabric cord
5741940097	1x22W A-21/medium	120V	1002	-	White fabric cord
5741940149	1x22W A-21/medium	120V	1002	-	White fabric cord
5741940194	1x22W A-21/medium	120V	1002	-	White fabric cord
5741942613		120V		-	White textile
5741944718		120V		-	White fabric cord
5741944763		120V		-	White fabric cord
5741944815		120V		-	Black fabric cord
5741944860		120V		-	Black fabric cord

PH 5

Designed by Poul Henningsen

Variants

VARIANT NUMBER	COLOR, RAL	W / H / L (IN) / W (LB)
5741918032	HUES OF ROSE, 329	19.5 / 10.5 / 19.5 IN / 4.9 LB
5741918045	HUES OF GREY, 333	19.5 / 10.5 / 19.5 IN / 4.9 LB
5741918058	HUES OF ORANGE, 328	19.5 / 10.5 / 19.5 IN / 4.9 LB
5741918061	HUES OF RED, 330	19.5 / 10.5 / 19.5 IN / 4.9 LB
5741918074	HUES OF GREEN, 331	19.5 / 10.5 / 19.5 IN / 4.9 LB
5741918087	HUES OF BLUE, 332	19.5 / 10.5 / 19.5 IN / 4.9 LB
5741918090	COP LAC, 930	19.5 / 10.5 / 19.5 IN / 8.0 LB
5741918100	WHITE MODERN, 337	19.5 / 10.5 / 19.5 IN / 4.9 LB
5741918113	WHITE CLASSIC, 336	19.5 / 10.5 / 19.5 IN / 4.7 LB
5741919277	BRASS, 936	19.5 / 10.5 / 19.5 IN / 7.0 LB
5741934207	MONOCHROME BLUE	19.5 / 10.5 / 19.5 IN / 4.8 LB
5741934304	MONOCHROME WHITE	19.5 / 10.5 / 19.5 IN / 4.9 LB
5741934854	MONOCHROME BLACK	19.5 / 10.5 / 19.5 IN / 4.9 LB
5741940042	MONOCHROME PALE ROSE	19.5 / 10.5 / 19.5 IN / 4.8 LB
5741940097	MONOCHROME OYSTER GREY	19.5 / 10.5 / 19.5 IN / 4.8 LB
5741940149	PASTELS BLUE ROSE PEACH	19.5 / 10.5 / 19.5 IN / 4.9 LB
5741940194	PASTELS OYSTER BLUE ROSE	19.5 / 10.5 / 19.5 IN / 4.9 LB
5741942613	WHITE/BRASS, 220	- / - / - IN / 2.2 LB
5741944718	MONOCHROME PALE PEWTER	- / - / - IN / 4.8 LB
5741944763	MONOCHROME PALE BLUSH	- / - / - IN / 4.8 LB
5741944815	MONOCHROME BURGUNDY	- / - / - IN / 4.9 LB
5741944860	MONOCHROME DUSTY INDIGO	- / - / - IN / 4.9 LB

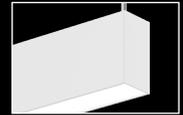
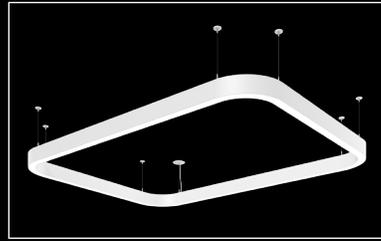
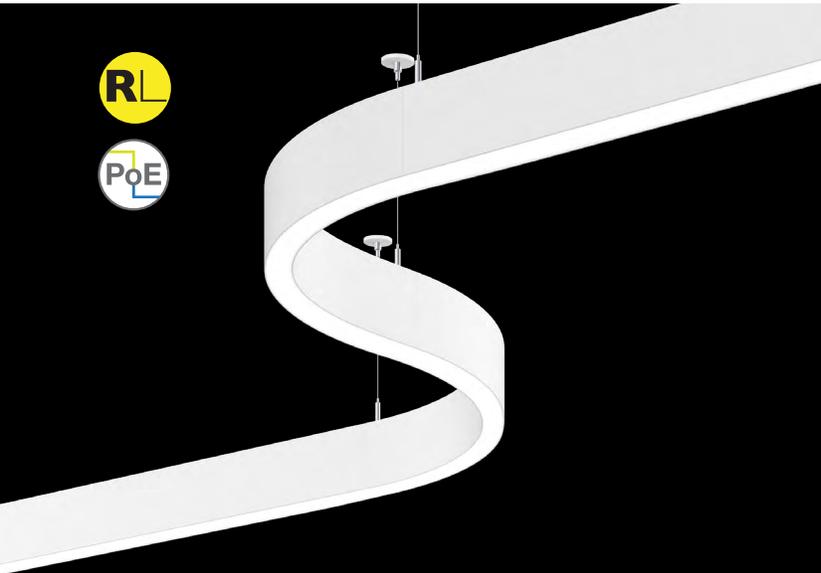
Seem Sweep™ 2

LED DIRECT/INDIRECT

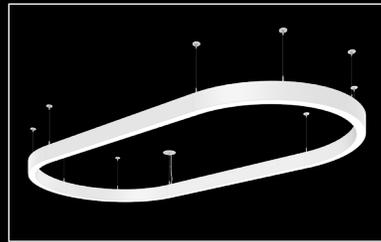
TYPE L13



FOCAL POINT®

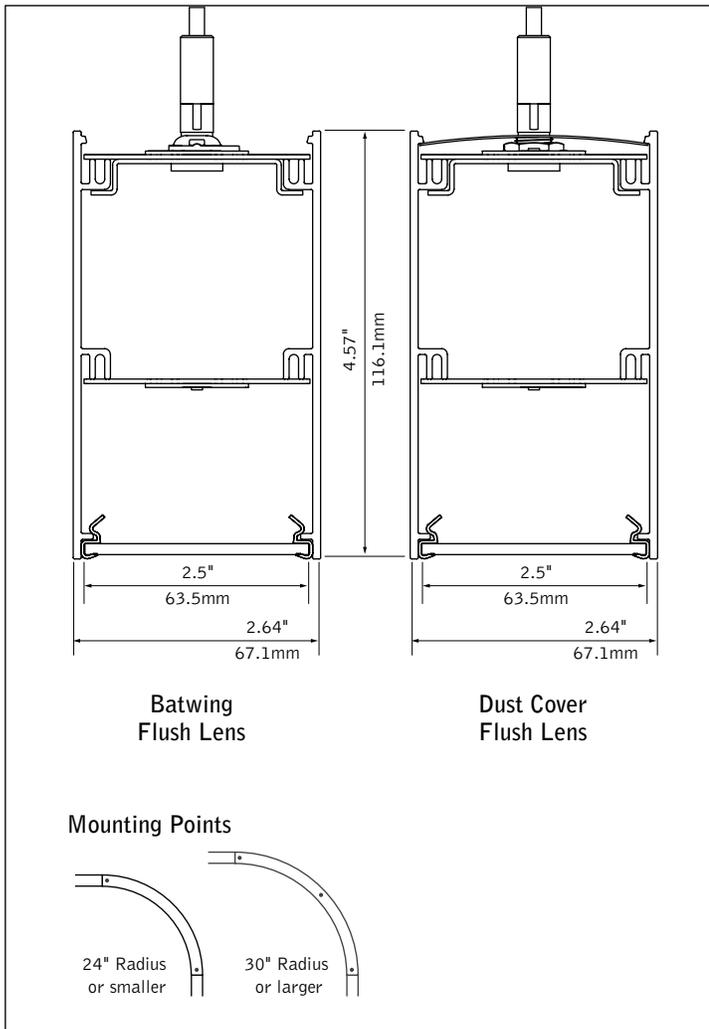


Standard Flat End Cap



Rounded End Cap
Coming fall 2024

DIMENSIONAL DATA



FEATURES

Narrow 2.5" aperture curvilinear suspended and surface mount direct LED luminaire.

Specify standard radii and angles to create unique soft shapes, rounded corners, and flowing lines.

Frosted acrylic lens provides uninterrupted illumination, without pixels or shadows.

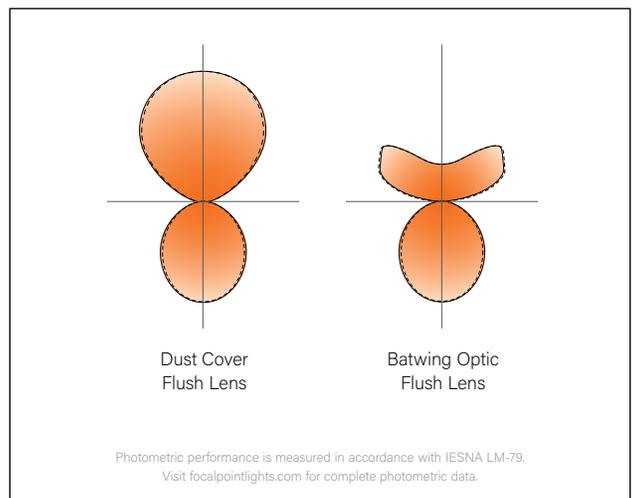
Lambertian direct and indirect or batwing indirect illumination.

PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires.

Cohesive aesthetic when paired with other Seem 2 luminaires within a space.

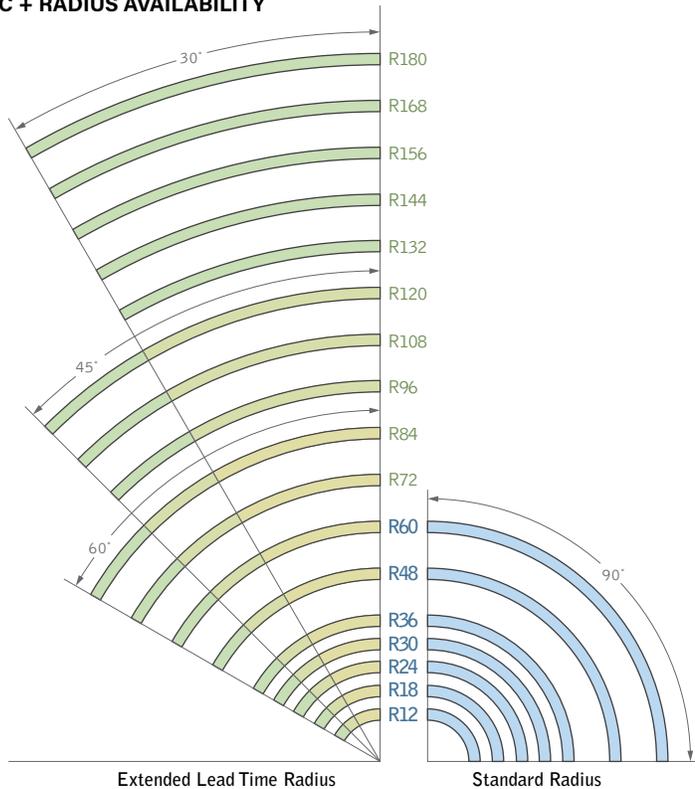
Available for specification now and for orders with standard lead times starting in July 2024.

DISTRIBUTIONS

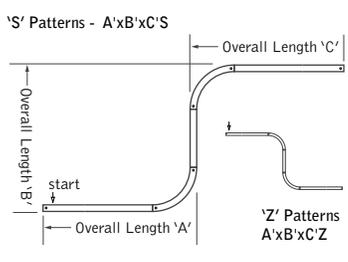
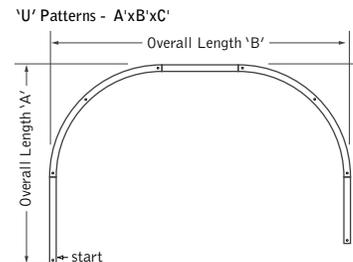
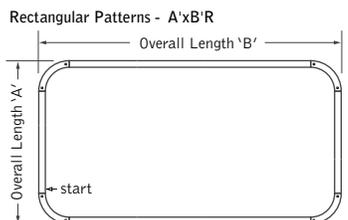
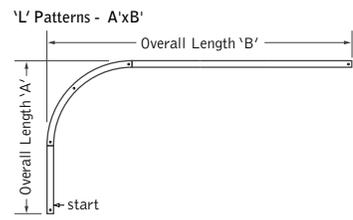


fixture: project:

ARC + RADIUS AVAILABILITY



Radius	Angle			
	30° Arc	45° Arc	60° Arc	90° Arc
12"	✓	✓	✓	✓
18"	✓	✓	✓	✓
24"	✓	✓	✓	✓
30"	✓	✓	✓	✓
36"	✓	✓	✓	✓
48"	✓	✓	✓	✓
60"	✓	✓	✓	✓
72"	✓	✓	✓	✓
84"	✓	✓	✓	✓
96"	✓	✓	✓	✓
108"	✓	✓	✓	✓
120"	✓	✓	✓	✓
132"	✓	✓	✓	✓
144"	✓	✓	✓	✓
156"	✓	✓	✓	✓
168"	✓	✓	✓	✓
180"	✓	✓	✓	✓



Specify clockwise from start of run. Start of run is always at first specified run length.

Focal Point LLC reserves the right to change specifications for product improvement without notification.

ORDERING

See S **TYPE L13**

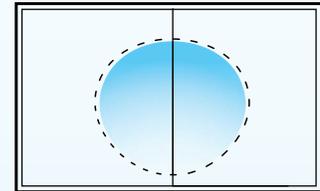
LUMEN OUTPUT OPTIONS <small>(Specify a value for each distribution. Example: 750DN-625UP)</small>	Shielding		
	Batwing Optic top Flush Lens bottom	BWFL	_____
	Dust Cover top Flush Lens bottom	DCFL	_____
	Lumen Output		
	125 Lumens per foot	125	_____
	250 Lumens per foot	250	_____
	375 Lumens per foot	375	_____
	500 Lumens per foot	500	_____
	625 Lumens per foot	625	_____
	750 Lumens per foot	750	_____
875 Lumens per foot	875	_____	
1000 Lumens per foot	1000	_____	
1125 Lumens per foot	1125	_____	
1250 Lumens per foot	1250	_____	
Direct Distribution	_____ DN	_____	_____
<small>(1000 lumens max.)</small>			
Indirect Distribution	_____ UP	_____	_____
<small>(250 lumens min.)</small>			
Color Temperature			
2700K, 80+ CRI or 90+ CRI	27K or 927K	_____	_____
3000K, 80+ CRI or 90+ CRI	30K or 930K	_____	_____
3500K, 80+ CRI or 90+ CRI	35K or 935K	_____	_____
4000K, 80+ CRI or 90+ CRI	40K or 940K	_____	_____
Circuits			
Single Circuit	1C	_____	_____
Dual Circuit	2C	_____	_____
Voltage			
120/277 UNV Volt	UNV	_____	_____
347 Volt (LD1 & L11 only)	347	_____	_____
Low Voltage	LV	_____	_____
Control System & Dimming Level			
0-10V - 10% Dimming	LD1	_____	_____
0-10V - 1% Dimming	L11	_____	_____
Low Voltage, PoE compatible	LVN	_____	_____
<small>(No driver. Not available with EM or EC. LV Voltage only.)</small>			
Lutron Hi-Lume EcoSystem (LDE1) - 1% Dimming	LH1	_____	_____
DALI 1% Dimming (1000LF max.)	D11	_____	_____
Mounting			
24" Cable Suspension	C24	_____	_____
48" Cable Suspension	C48	_____	_____
96" Cable Suspension	C96	_____	_____
<small>(Specify canopy color, see finishes page for options. Example: White = C24WH.) (Specify one of the following in place of "C" J - for J' canopies at non-feed locations. CS - for sloped ceiling applications.)</small>			
Factory Options			
Black Cord	BKCD	_____	_____
Emergency Circuit	_EC	_____	_____
Emergency Battery Pack	_EM	_____	_____
Rounded End Caps	RE	_____	Coming Fall
<small>(Pair, adds 2.64" to overall luminaire length.)</small>			
Finish			
Matte White Housing	WH	_____	WH
<small>(Consult factory for Black (BK) or Titanium Silver (TS))</small>			
Pattern Options			
<small>(Specify lengths in 1ft increments. Consult factory for other.)</small>			
'L' pattern	A' x B' L	_____	_____
'U' pattern	A' x B' x C' U	_____	_____
Rectangular pattern	A' x B' R	_____	_____
<small>(90° Arc only)</small>			
'S' pattern	A' x B' x C' S	_____	_____
<small>(B represents length across radius segments; A and C represent outside leg lengths)</small>			
'Z' pattern	A' x B' x C' Z	_____	_____
<small>(B represents length across radius segments; A and C represent outside leg lengths)</small>			
Angle			
<small>(90° standard, all others extended lead times. See Arc + Radius availability table)</small>			
Standard 90° Arc	A90	_____	_____
30° Arc	A30	_____	_____
45° Arc	A45	_____	_____
60° Arc	A60	_____	_____
Radius			
<small>(See Arc + Radius availability table)</small>			
12" Radius	R12	_____	_____
18" Radius	R18	_____	_____
24" Radius	R24	_____	_____
30" Radius	R30	_____	_____
36" Radius	R36	_____	_____
48" Radius	R48	_____	_____
60" Radius	R60	_____	_____
<small>Consult factory for 72" - 180" Radius</small>			

i2Cove™
Cove System

The smallest true symmetric, fully integrated cove lighting system.



FEATURES & BENEFITS



SYMMETRIC BEAM



LOW PROFILE
Just 1" tall



SMOOTH DISTRIBUTION FOR CLOSE TO WALL OR CEILING APPLICATIONS
2 Step MacAdam Ellipse with tight LED spacing



PLUG & PLAY
120-277 VAC, 12", 18", & 24" fixtures



WIDE OPTICAL WINDOW
Great for backlighting, barnisol™, newmat™, or other stretch fabrics



ONLY 5 WIRES

LiGHTLINK™ Enabled | **EcoSystem™** Enabled

PERFORMANCE

3000K LUMEN DATA

System Watts/Ft	Delivered Lumens/Ft	
	92 CRI	98 CRI
2	135	119
3	228	200
4	286	253
5	401	354
6	504	445
7	606	534
8	733	645
9	970	849
10	1078	945
11	1174	1030
12	1277	1125

LUMEN FACTOR

CCT	Output Factors	
	Multiplier	
1850K	0.70	
2000K	0.70	
2200K	0.81	
2500K	0.86	
2700K	0.96	
3000K	1.00	
3500K	1.05	
4000K	1.05	
4500K	1.05	
5000K	1.05	
5700K	1.05	
6500K	1.05	

MAX CABLE & RUN LENGTH

System Watts/Ft	Length	
	120 VAC	277 VAC
2	144Ft	144Ft
3	120Ft	124Ft
4	108Ft	120Ft
5	92Ft	108Ft
6	80Ft	100Ft
7	72Ft	96Ft
8	64Ft	88Ft
9	56Ft	84Ft
10	52Ft	80Ft
11	48Ft	78Ft
12	44Ft	76Ft

Lumens per foot based on a 4' LED module



[DOWNLOAD IES FILES](#)

[DOWNLOAD TUNABLE SPEC](#)

[DOWNLOAD WARM-DIM SPEC](#)

SPECIFICATION CODE BUILDER

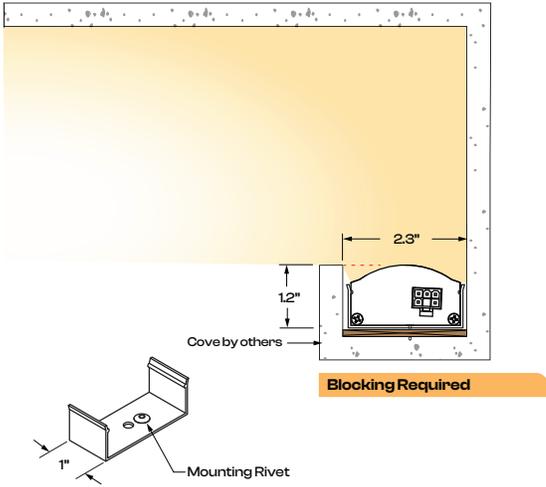
EXAMPLE: CS-08W-30K-H-GF2-L

Series	Power	CCT	Color Quality	Mounting	Controls	Configuration
CS						(Check all that apply)
CS i2 Cove™	02W*	18K - 1850K	H - High (92)	FX - Fixed Clip Mounting	V - 0-10V	<input type="checkbox"/> Corner - Straight
	03W*	20K - 2000K	R Values on pg. 14	GF - Gypsum Flat Front	L - Lutron Ecosystem** 1Address - (Intensity)	<input type="checkbox"/> Curved Corner - Radius
	04W*	22K - 2200K		GF - RA - Gypsum Flat Front Return Air	E - ELV ‡	<input type="checkbox"/> Curved Patterns
	05W	25K - 2500K		GF2 - Gypsum Flat Front Tall	D - DMX	
	06W	27K - 2700K		GF3 - Gypsum Flat Front High Blocking	A - DALI	
	07W	30K - 3000K		GF-4 - Gypsum Flat Front Wide	SensorCONNECT	
	08W	35K - 3500K		K1 - Gypsum Knife Edge 30°	SVL - 0-10V ATHENA †	Geometry Direction
	09W	40K - 4000K		K1-RA - Gypsum Knife Edge 30° Return Air	SAL - DALI - LUTRON ATHENA	Straight
	10W	45K - 4500K		K1-4 - Gypsum Knife Edge 30° Wide	SAE - DALI - ENLIGHTED™	L-Shape
	11W	50K - 5000K		K2 - Gypsum Knife Edge 40°	SVE - 0-10V ENLIGHTED™ †	U-Shape
	12W	57K - 5700K		K3 - Gypsum Knife Edge Infinity		Sq. / Rect.
		65K - 6500K		WF - Wall Mount Flat Front		Custom

*Dims to 1/8" ** Offered in 18" & 48" Lengths ‡ Starting at 6W. Contact i2Systems for dimming levels † Offered in 18" & 48" Lengths ‡ Offered in 18" & 48" Lengths. Coming soon

Surface/Bracket Mounting Systems

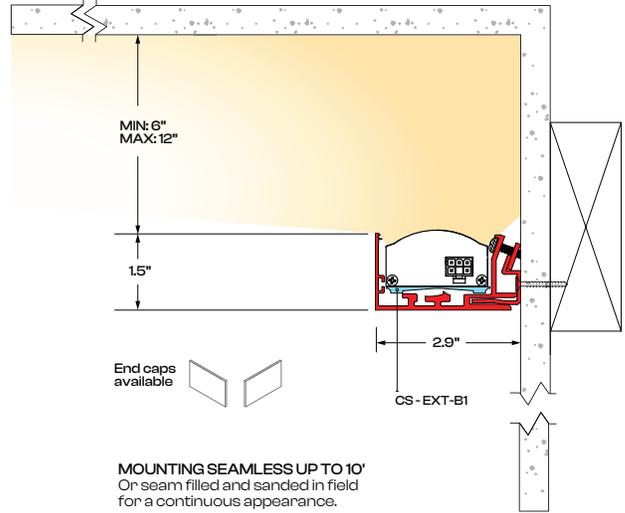
FX | Fixed Clip Mounting*



WF | Wall Mount Flat Front*



Straight Corner



Plaster-In Mounting Systems



All Plaster-In Mounting Systems are shipped unprimed / unpainted and ship with seam filler for a seamless install.

8' Standard Length, Field Cut as Required for Made to Measure Applications

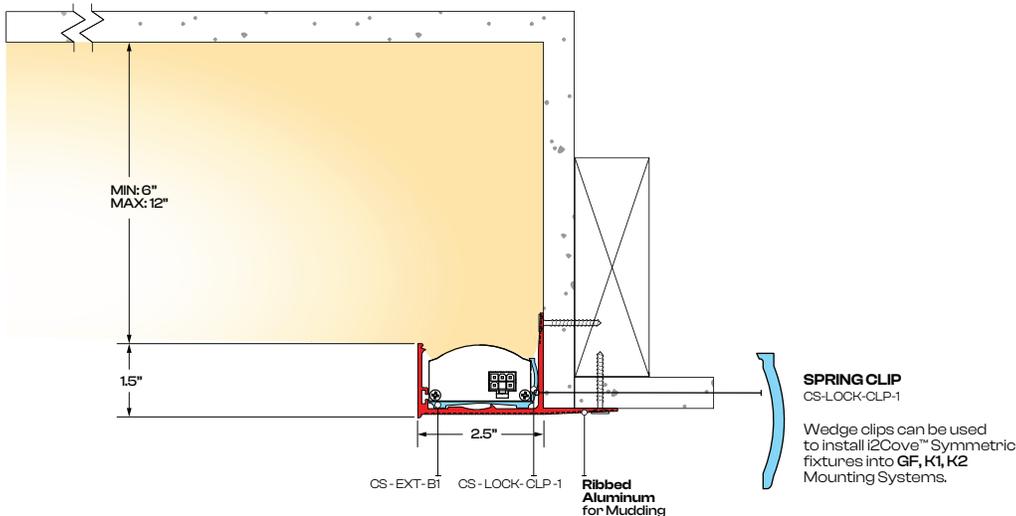
GF | Gypsum Flat Front



Straight Corner



Curved Corner



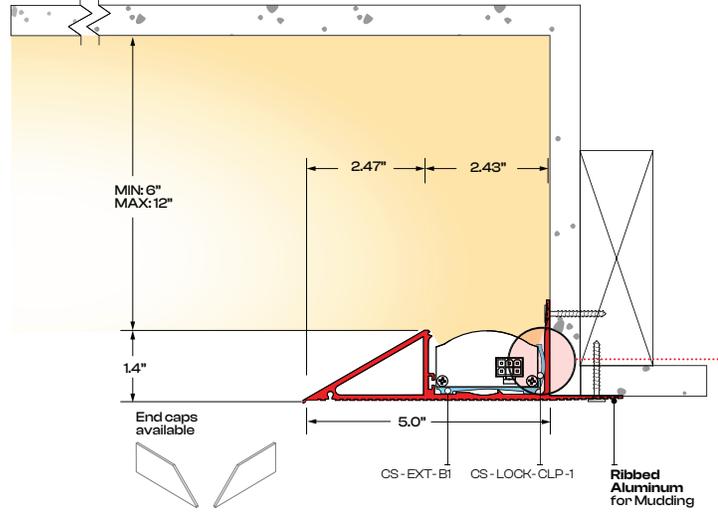
Plaster-In Mounting Systems



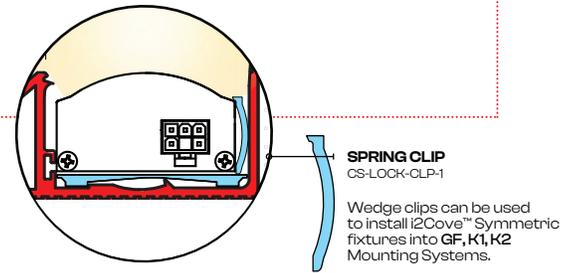
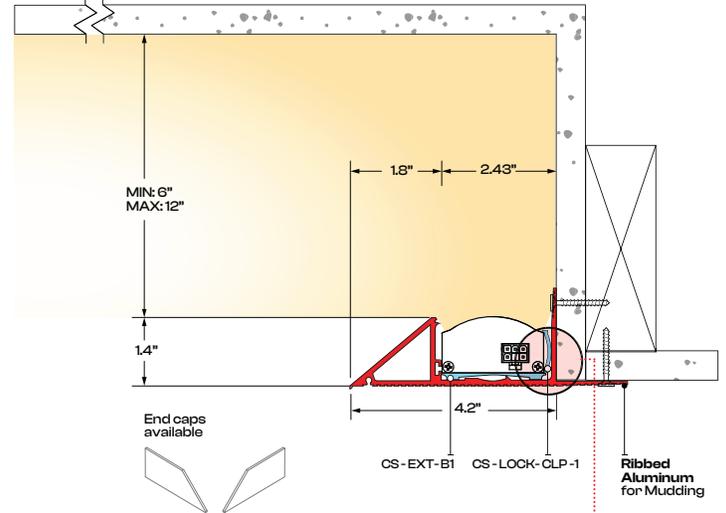
All Plaster-In Mounting Systems are shipped unprimed / unpainted and ship with seam filler for a seamless install.

8' Standard Length, **Field Cut as Required** for Made to Measure Applications

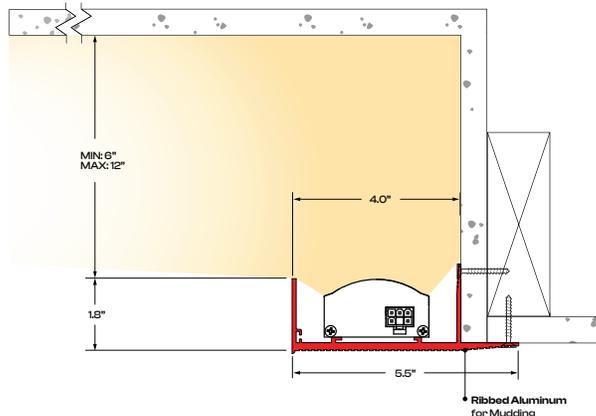
K1 | Gypsum Knife-Edge 30°



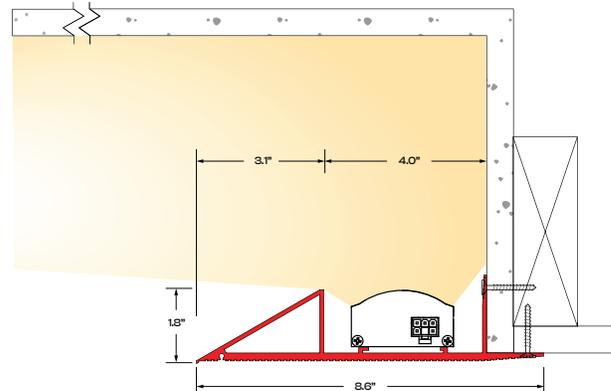
K2 | Gypsum Knife-Edge 40°



GF-4 | Gypsum Flat Front w/4" Wide Extrusion



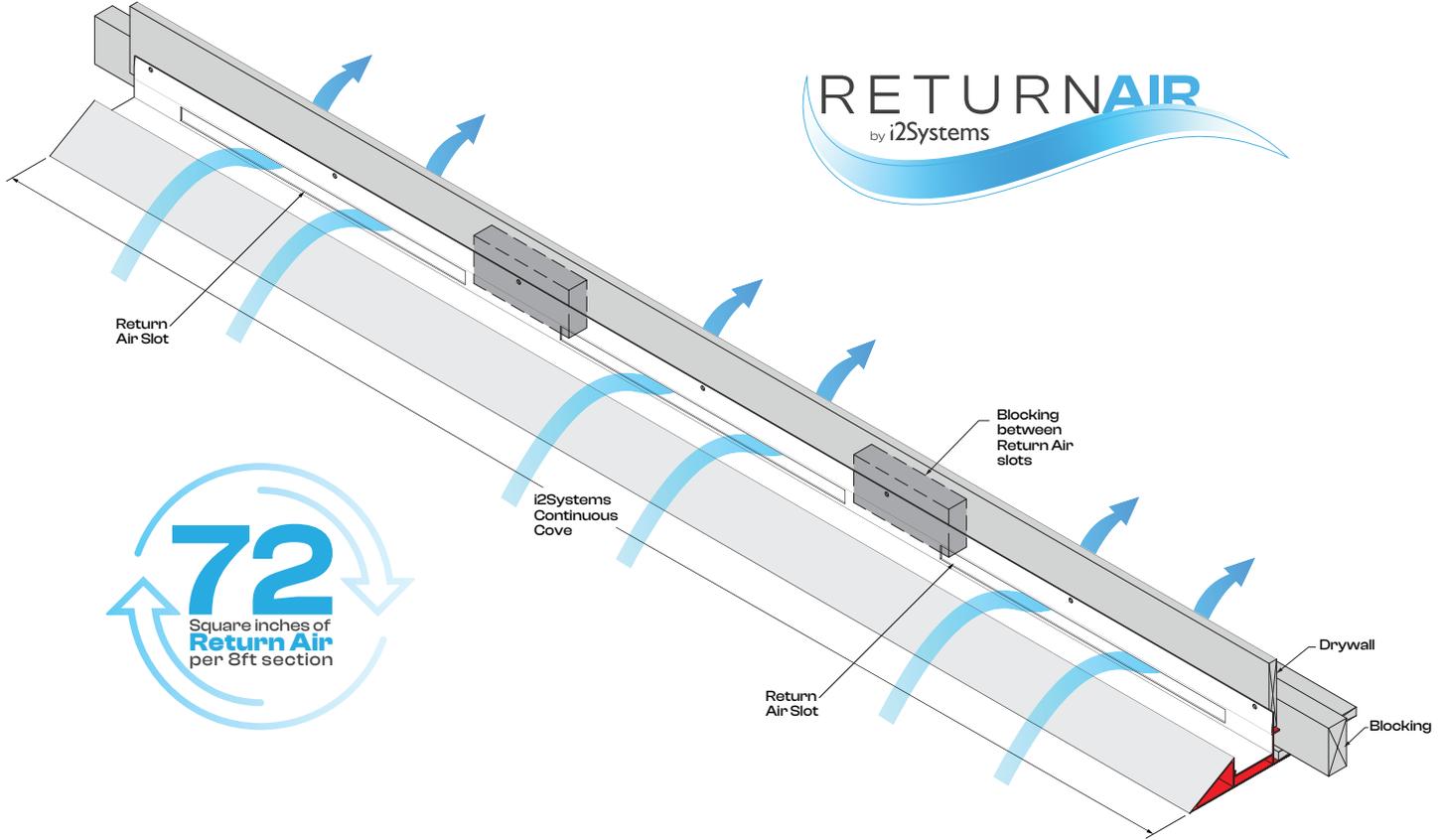
K1-4 | Gypsum Knife-Edge 30° w/4" Wide Extrusion



Plaster-In Mounting Systems

! All Plaster-In Mounting Systems are shipped unprimed / unpainted and ship with seam filler for a seamless install.

8' Standard Length, **Field Cut as Required** for Made to Measure Applications

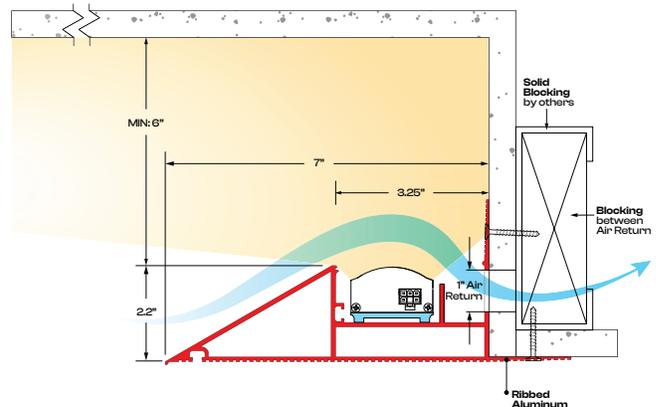
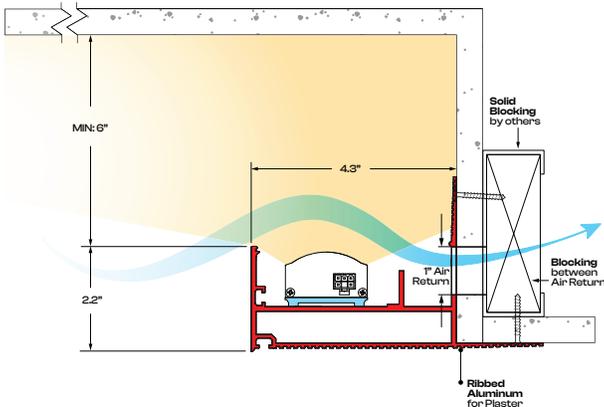


GF-4 | Gypsum Flat Front w/4" Wide Extrusion

K1-4 | Gypsum Knife-Edge 30° w/4" Wide Extrusion

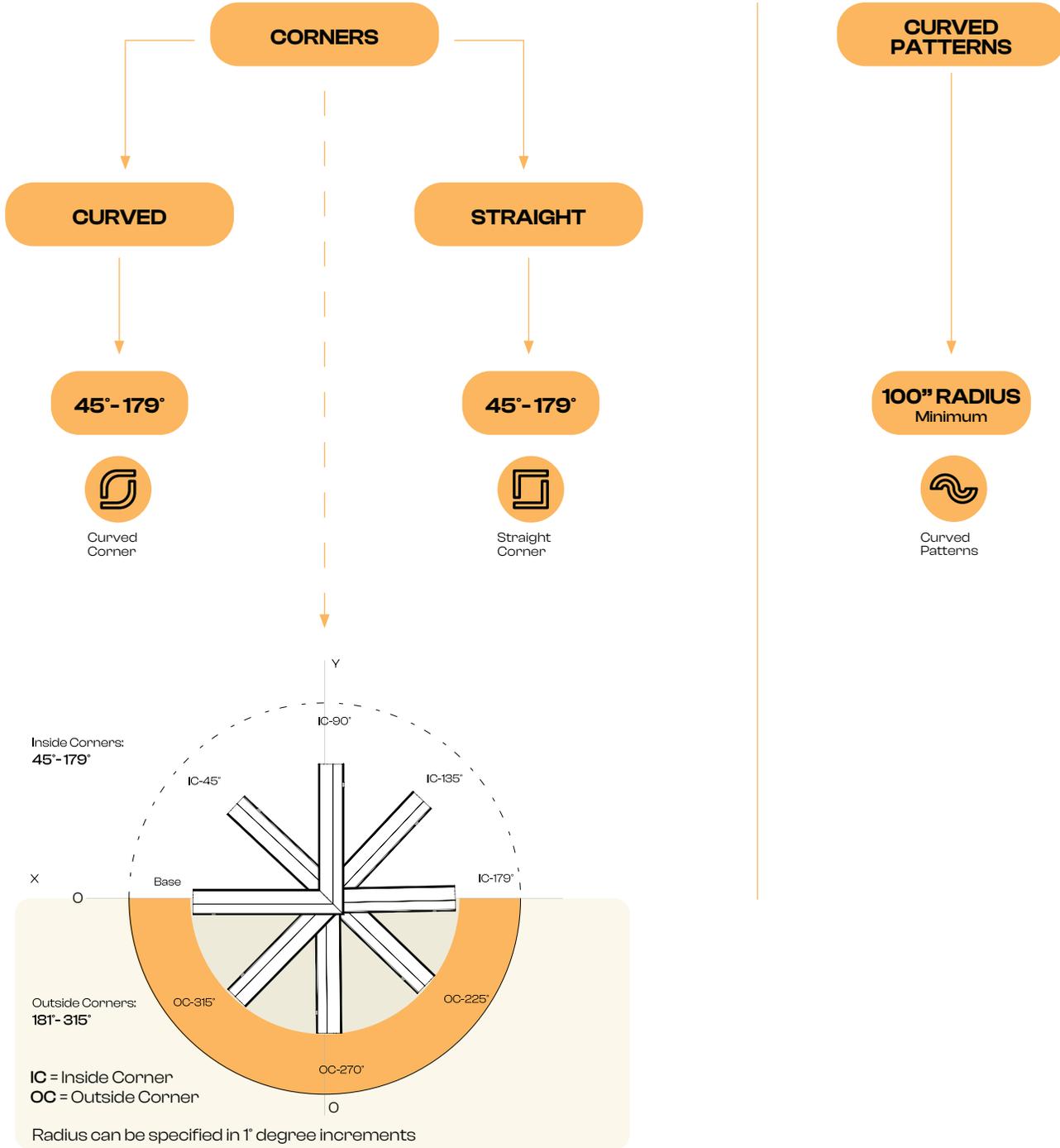
-  Straight Corner
-  Curved Corner
-  Curved Patterns

-  Straight Corner
-  Curved Corner
-  Curved Patterns



PATENT PENDING

CORNERS and CURVES



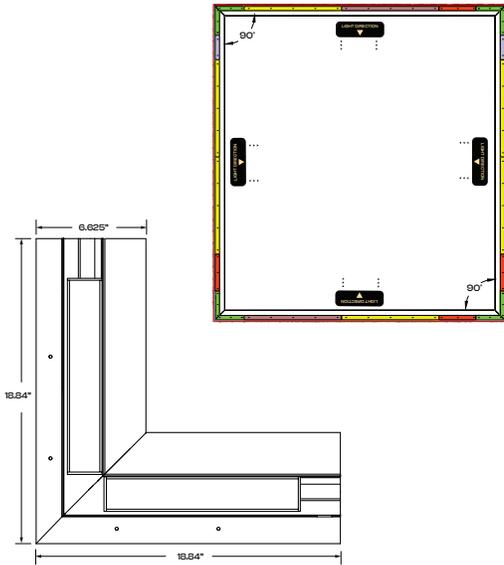
CORNERS

! All Plaster - In Mounting Systems are shipped **unprimed / unpainted** and ship with seam filler for a seamless install.
8' Standard Length, **Field Cut as Required** for Made to Measure Applications

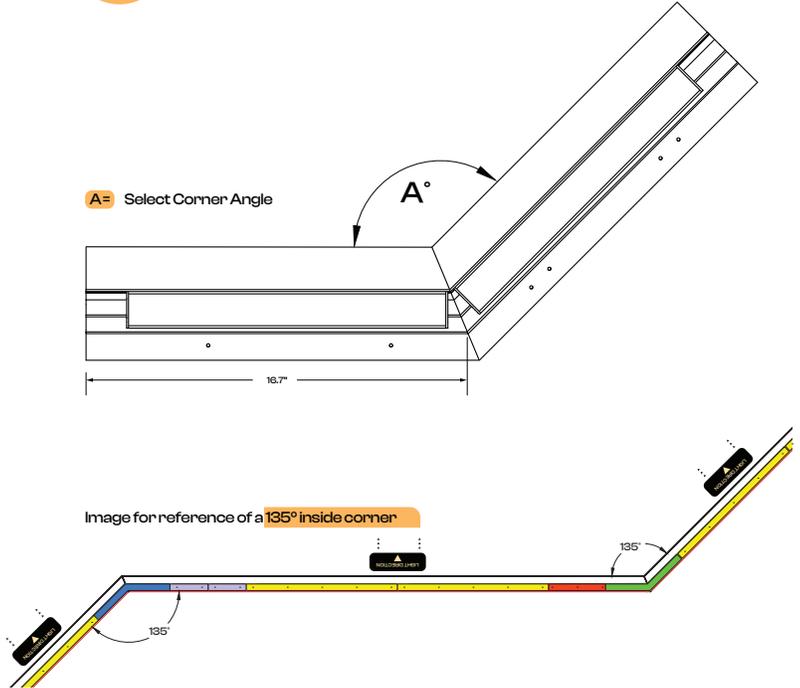
STRAIGHT - Standard (90°)

Offered on:

- GF
- GF2
- GF3
- GF4
- GF-RA
- K1
- K1-RA
- K2
- K3
- K14
- WF



STRAIGHT - (45° - 89° & 91° - 179°)



STRAIGHT INSIDE & OUTSIDE CORNERS SPEC BUILDER

EXAMPLE: CS-GF4-IC-145

Series	Mounting	Configuration	Angle (45° - 89° & 91° - 179°)
CS	<input type="text"/>	<input type="text"/>	<input type="text"/>
	GF Gypsum Flat Front	IC - Inside Corner	Angle - 45° - 179° specify in 1° increments
	GF-2 Gypsum Flat Front Tall	OC - Outside Corner	
	GF-3 Gypsum Flat Front High Blocking		
	GF-4 Gypsum Flat Front Wide		
	GF-RA Gypsum Flat Front Return Air		
i2 Cove™	K1 Gypsum Knife Edge 30°		
	K1-4 Gypsum Knife Edge 30° Wide		
	K1-RA Gypsum Knife Edge 30° Return Air		
	K2 Gypsum Knife Edge 40°		
	K3 Gypsum Flat Front Return Air		
	WF Wall Mount Flat Front		

SOFT CORNER COVES

! All Plaster-In Mounting Systems are shipped unprimed / unpainted and ship with seam filler for a seamless install.

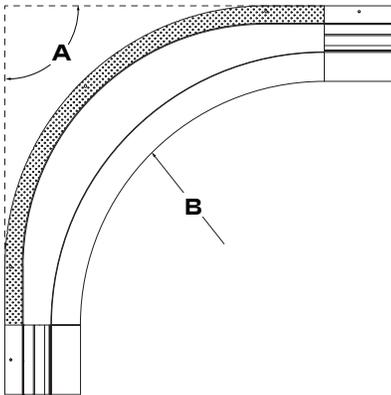
8' Standard Length, **Field Cut as Required** for Made to Measure Applications



Curved Corner

RADIUS: **A**

Offered on: **GF GF4 GF RA K1 K1 RA K2 K3 K14**



A= Select Corner Radius

B= Select Radius



SOFT CORNER COVES SPEC BUILDER

EXAMPLE: CS-GF4-IC-145-24

Series	Mounting	Configuration	Angle (45°- 89° & 91°-179°)	Radius (In Inches)
CS				
i2Cove™	GF Gypsum Flat Front	IC - Inside Corner	Angle - 45° - 179° specify in 1° increments	Radius - specify in 12" - 45" in 1" increments
	GF-4 Gypsum Flat Front Wide	OC - Outside Corner		
	GF-RA Gypsum Flat Front Return Air			
	K1 Gypsum Knife-Edge 30°			
	K1-RA Gypsum Knif- Edge 30° Return Air			
	K1-4 Gypsum Knife-Edge 30° Wide			
	K2 Gypsum Knife-Edge 40°			
K3 Gypsum Knife-Edge Infinity				

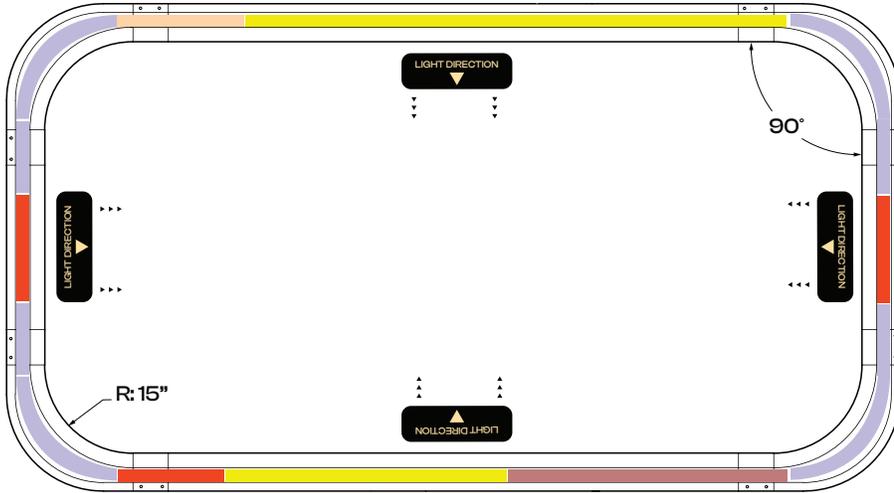
CURVED CORNERS

! All Plaster-In Mounting Systems are shipped **unprimed / unpainted** and ship with seam filler for a seamless install.
8' Standard Length, **Field Cut as Required** for Made to Measure Applications



CURVED CORNER

Offered on: **GF GF2 GF4 SF RA K1 K1 RA K2 K3 K14**

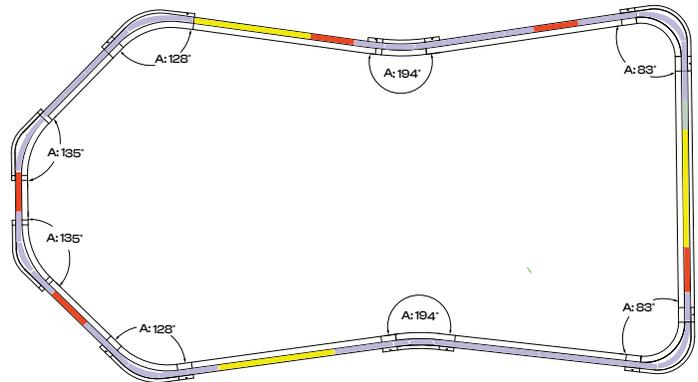
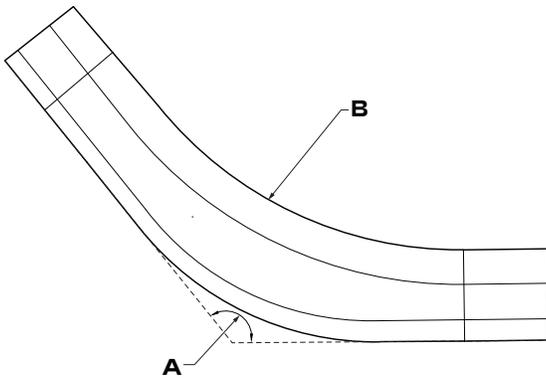


CURVED CORNER - Inside Corner Example

Example shown (dimensions), corner radius, and mounting



CURVED CORNER



CURVED CORNER - Example

A= Select Corner Angle

B= Select Radius

CURVED PATTERNS



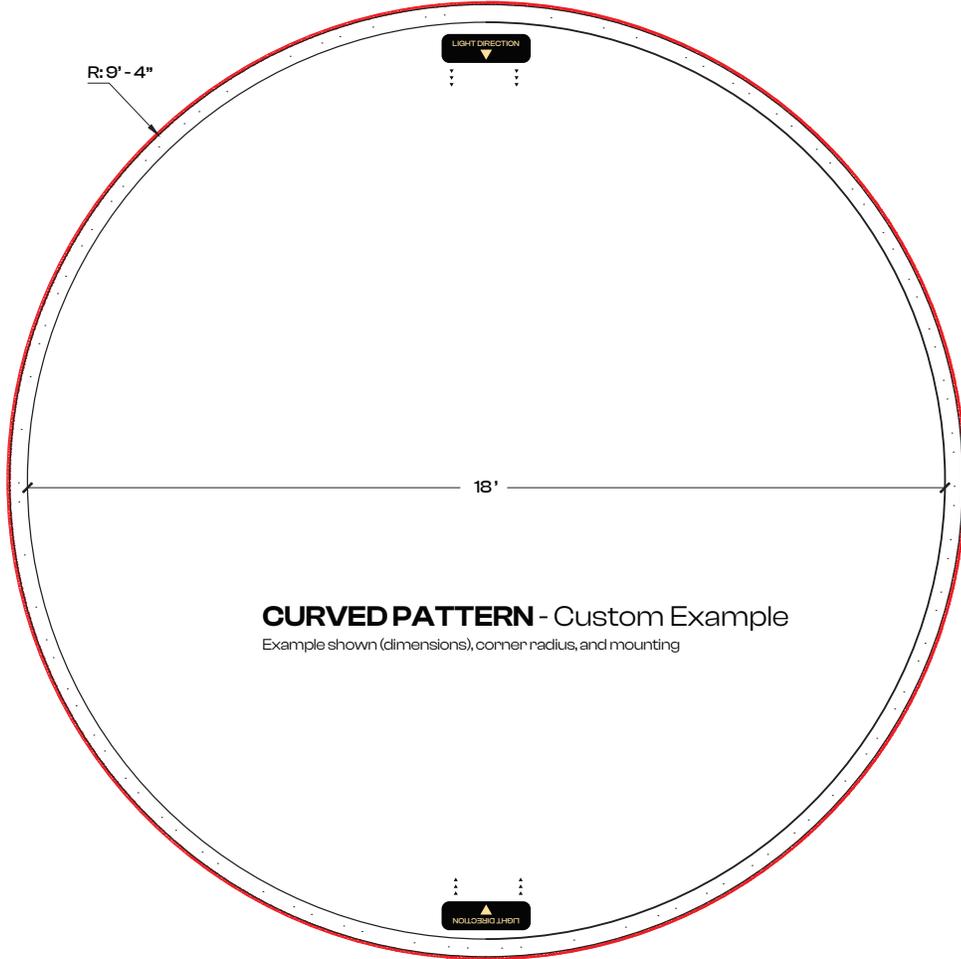
All Plaster-In Mounting Systems are shipped **unprimed / unpainted** and ship with seam filler for a seamless install.

8' Standard Length, **Field Cut as Required** for Made to Measure Applications

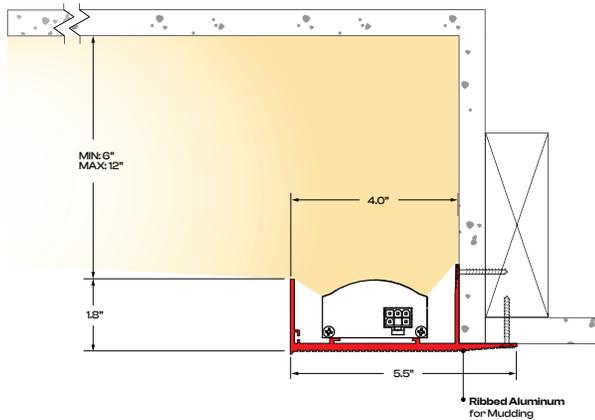


CURVED PATTERNS

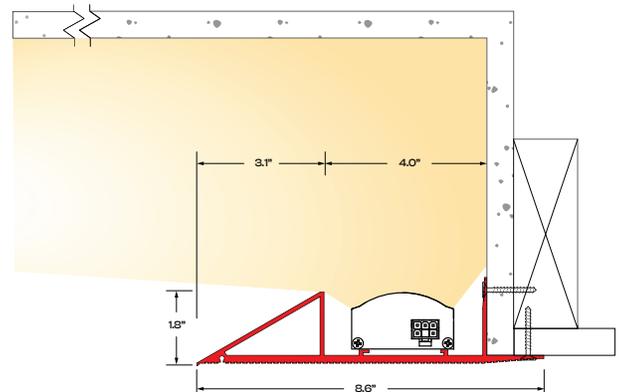
100" RADIUS Minimum



GF-4 | Gypsum Flat Front w/4" Wide Extrusion



K1-4 | Gypsum Knife-Edge 30°w/4" Wide Extrusion



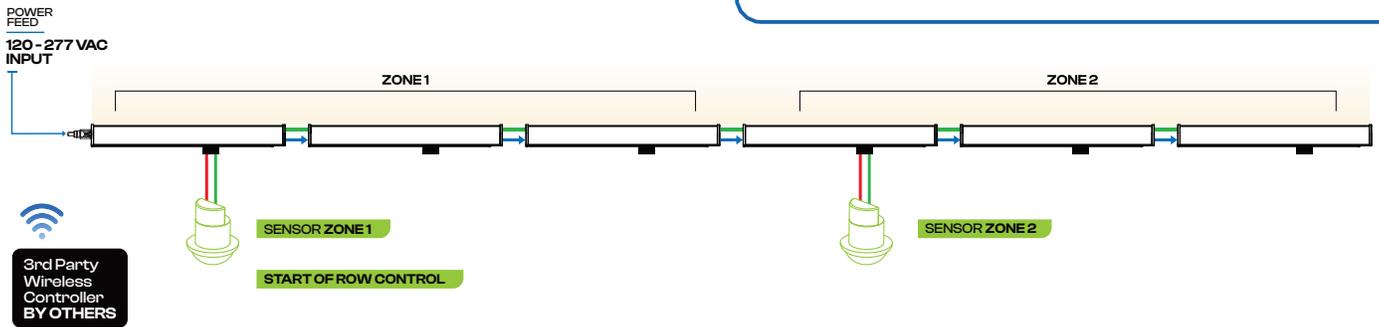
Controls | 0-10V

SensorCONNECT

SVL - 0-10V ATHENA ❗

SVE - 0-10V ENLIGHTED ❗

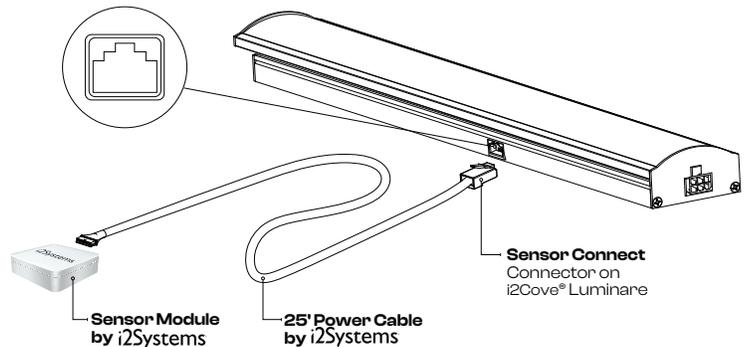
- The Energy Manager provides the lighting command.
- The Sensor controls **ALL LIGHTS** that are connected together up to the next sensor in the same row.
- Multiple sensors provide separate zone control.
- LED Module, Power Cable and Sensor for LUTRON® Athena supplied by i2Systems®. Controls by others.
- **ALL** lights automatically determine if a sensor is plugged into it.
- **Connector not used on Corner LED Modules.**
- The first LED module must include a Sensor.
- Sensor Connect LED modules supplied in **18" & 48"** lengths.



0-10V LUTRON® ATHENA

Control Sensors

LUTRON® Athena	Wireless Node	By i2 SVL-KIT-25-N
LUTRON® Athena	Wireless Node Sensor	By i2 SVL-KIT-25-S



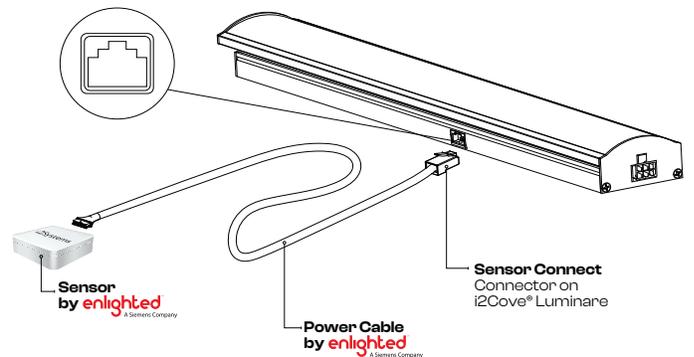
0-10V ENLIGHTED™

Enlighted Cables

Part Number	Length
CBL-5E-CU4-30N	30"
CBL-5E-CU4-7F	7'
CBL-5E-CU4-15F	15'
CBL-5E-CU4-25F	25'
CBL-5E-CU4-50F	50'
CBL-5E-CU4-75F	75'
CBL-5E-CU4-100F	100'

Control Sensor

Enlighted™	Sensor	SU-5E
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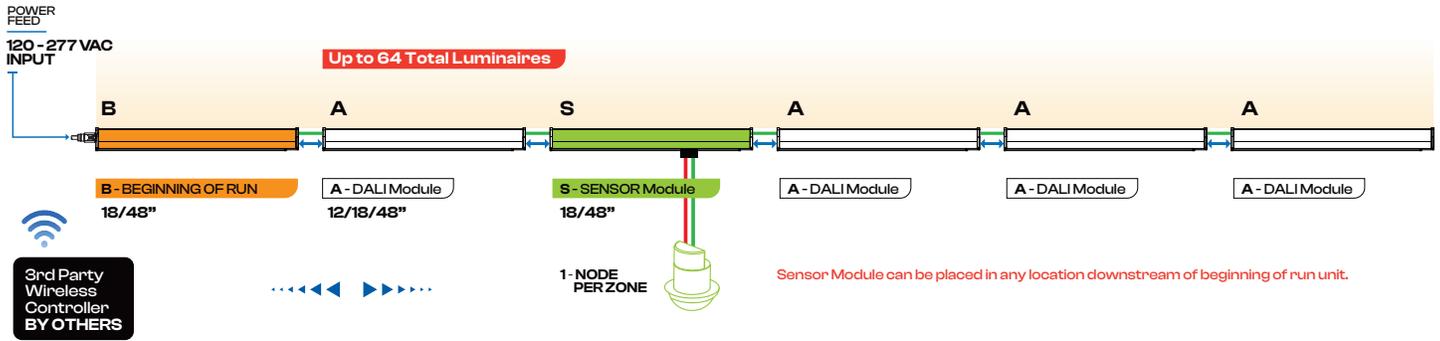
Controls | DALI

SensorCONNECT

SAL - 0-10V ATHENA ❗

SAE - 0-10V ENLIGHTED ❗

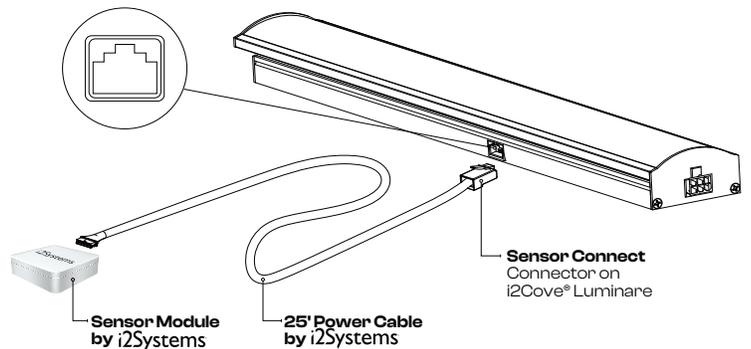
- The Energy Manager provides the lighting command.
- Multiple sensors provide separate zone control.
- LED Module and power cable for LUTRON® Athena supplied by i2Systems®, Controls by others.
- **Connector not used in Corner LED Modules.**
- Sensor Module and Beginning of Run supplied in 18" & 48" lengths.



DALI ATHENA™

Control Sensors

LUTRON® Athena	Wireless Node	By i2 SAL-KIT-25-N
LUTRON® Athena	Wireless Node Sensor	By i2 SAL-KIT-25-S



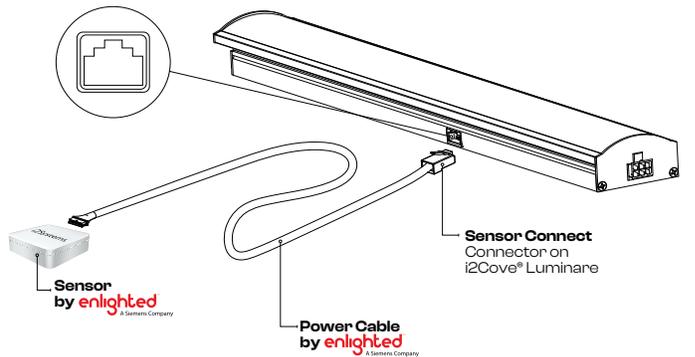
DALI ENLIGHTED™

Enlighted Cables

Part Number	Length
CBL-5E-CU4-30N	30"
CBL-5E-CU4-7F	7'
CBL-5E-CU4-15F	15'
CBL-5E-CU4-25F	25'
CBL-5E-CU4-50F	50'
CBL-5E-CU4-75F	75'
CBL-5E-CU4-100F	100'

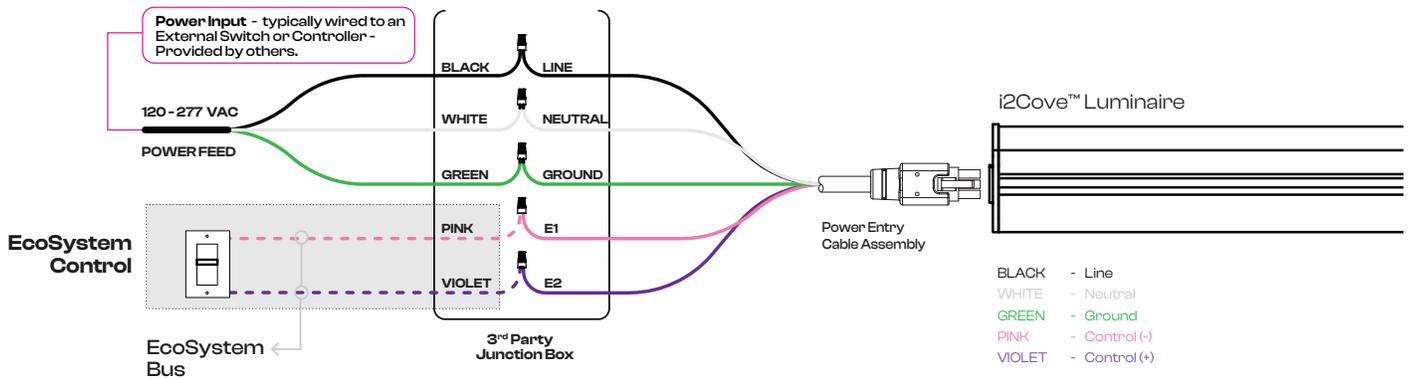
Control Sensor

Enlighted™	Sensor	SU-5E
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CONTROLS

L | LUTRON® EcoSystem®



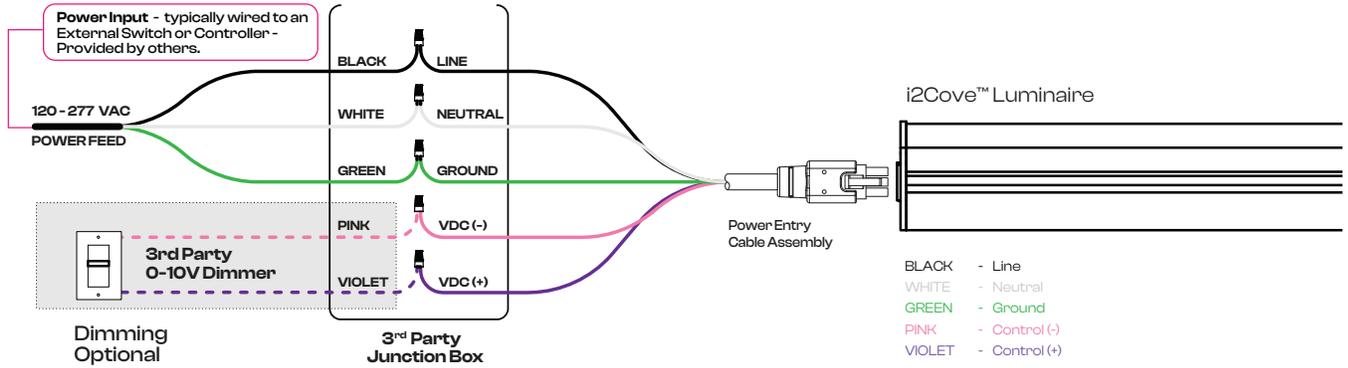
- Up to **64** Addresses per Controller.
- (1) Address is reserved for **INTENSITY** for each light fixture.
- LED Modules for LUTRON® EcoSystem® dimming are **ONLY** offered in 18" and 48" lengths.

LUTRON®

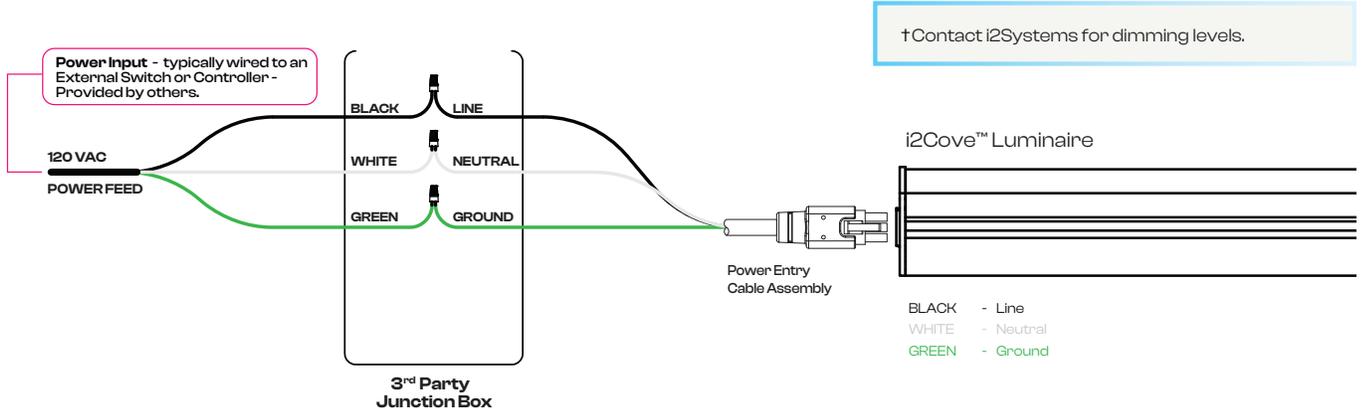
INSTALLATION SIZE	Total Digital Addresses Available	CONTROLLABLE ZONES	iPAD / iPHONE CONTROL	SYSTEM	LINK	WALL CONTROLS
SMALL	64	6	NO	GrafikEyeQS w/Eco #QSGRJ-6E	https://www.lutron.com/TechnicalDocumentLibrary/QSGRJ-xE_Sub.pdf	One 4-button (3-scene) wireless Pico and two wireless Pico #PJ2-2BRL-GWH-L01 for Raise/Lower of CCT & Dimming
SMALL - ADDITIONAL ZONES	64	16	NO	GrafikEyeQS w/Eco #QSGRJ-16E	https://www.lutron.com/TechnicalDocumentLibrary/QSGRJ-xE_Sub.pdf	Wall controls to include one QWS2-5BRLN-WH-EGN
LARGE	128	30+	YES	EnergiSavrNode #QSN-2ECO-S	http://www.lutron.com/TechnicalDocumentLibrary/369-248.pdf	Include the AstronomicTimeClock device needed as part of the basic BOM. Wall controls to include one 4-button (3-scene) wireless Pico and two wireless Pico #PJ2-2BRL-GWH-L01 for Raise/Lower of CCT & Dimming per room.
ENTERPRISE	Lutron Quantum/Athena with EcoSystem – Contact your local Lutron Representative for assistance.					

CONTROLS

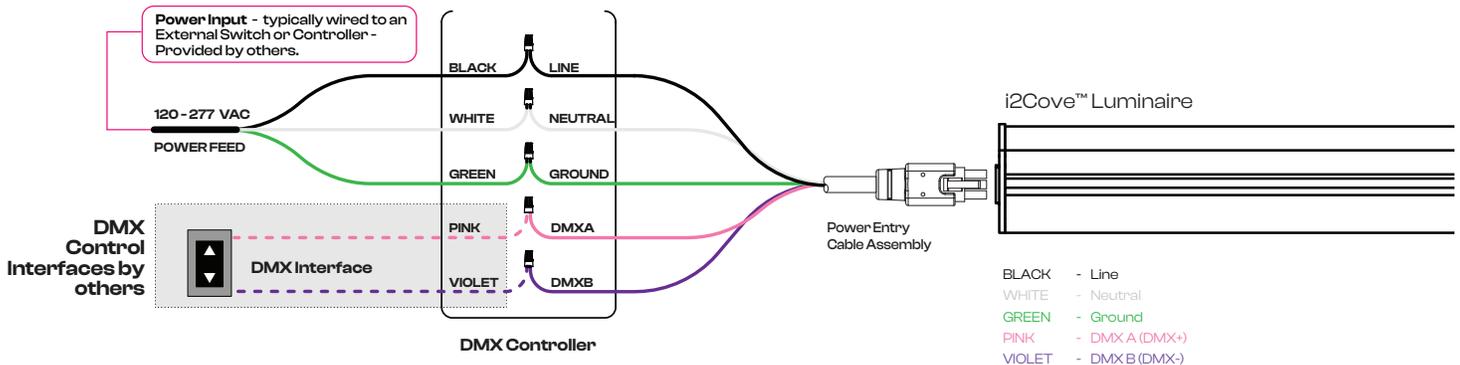
V | 0-10V



E | ELV / PHASE+



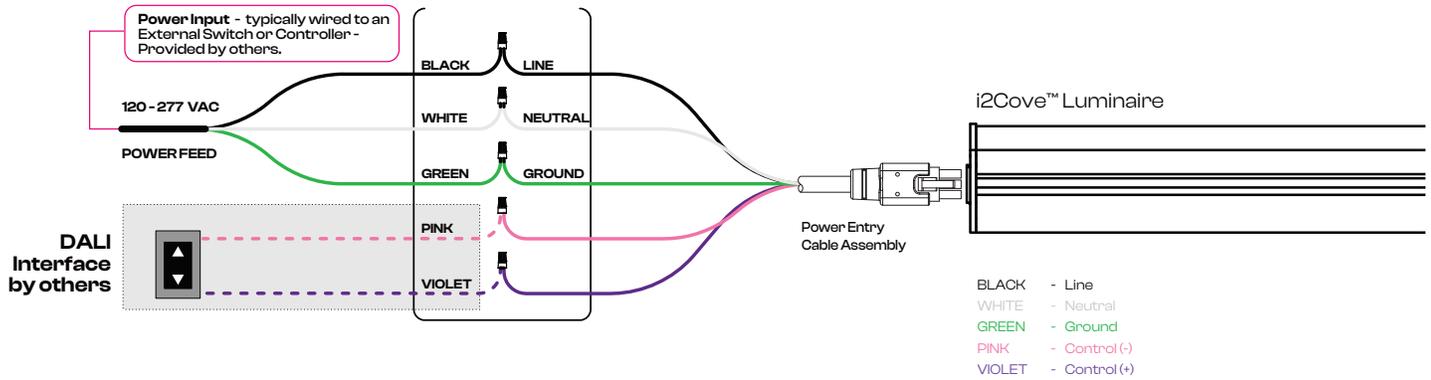
D | DMX



- Up to **512** Addresses per Controller.
- For Static White, use only (1) one control channel per light fixture.
(The same Address can be used for multiple lights)

CONTROLS

A | DALI



- Up to **64** Addresses per Controller, one light per address.
- For Static White, use only (1) one control channel per light fixture.

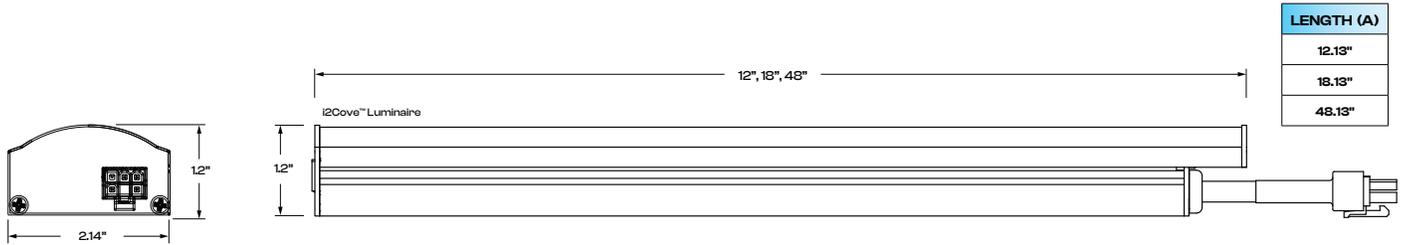
COLOR QUALITY

R Values

CRI- 83 and 92 (Standard)

Color Temp.	Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
1850K	85	85	95	93	81	85	97	81	63	32	90	82	92	87	97	78
2000K	83	82	92	97	80	81	90	84	61	18	81	79	72	84	99	75
2200K	84	82	92	97	81	82	91	83	62	23	82	81	79	84	99	76
2500K	84	82	92	96	81	82	93	82	61	23	84	82	82	85	99	75
2700K	91	92	92	91	93	91	88	94	86	55	81	92	60	93	95	89
3000K	96	98	97	93	94	99	94	96	94	80	92	89	72	99	96	98
3500K	93	95	94	94	95	94	92	96	88	62	86	93	66	95	96	90
4000K	96	98	97	95	97	97	95	96	90	71	92	93	71	98	97	94
4500K	96	95	99	97	92	96	95	98	96	88	97	85	81	95	97	98
5000K	96	97	98	99	97	97	93	94	89	75	97	91	78	97	99	96
5700K	94	95	97	98	91	94	90	94	89	75	92	82	91	94	98	97
6500K	92	96	96	95	93	94	87	91	85	69	90	83	85	94	98	95

LED Module End Views



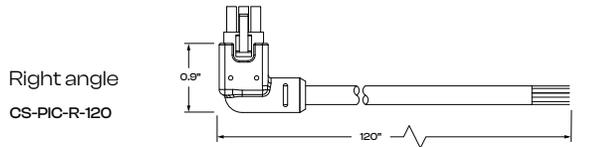
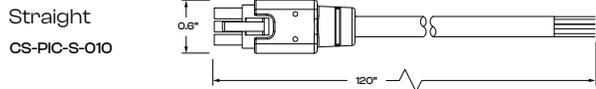
LENGTH (A)
12.13"
18.13"
48.13"

LED Module Technical Properties

- E ENVIRONMENT:**
FOR INDOOR USE ONLY.
Ambient operating temperature:
(0°C) - (+40°C)

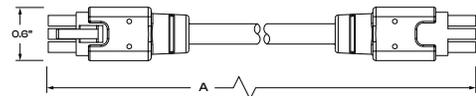
0% to 90% humidity,
non-condensing
- IP PROTECTION:**
IP50 -
suitable for
Damp locations
- H HOUSING:**
Aluminum Housing &
Diffused Polycarbonate
Optic Lens
- W WEIGHT:**
12" - 0.87lb
18" - 1.31lb
48" - 3.10lb
Corners - 1.95lb
- V INPUT VOLTAGE:**
120-277 VAC 60 Hz
- S STORAGE TEMPERATURE:**
Range: (-20°C) - (+65°C)
- L LIFE:**
60,000hrs to L70

Power Input cables



Contact i2Systems for Custom Lengths

Jumper Cables



Jumper Cable Length (A)	
CS-JMP-W-003N	3"
CS-JMP-W-006N	6"
CS-JMP-W-001	12"
CS-JMP-W-002	24"
CS-JMP-W-003	36"
CS-JMP-W-004	48"
CS-JMP-W-006	72"

Certifications

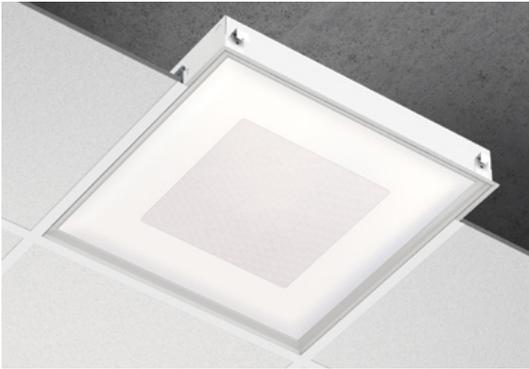


PRIMO 2x2 LED

RECESSED



LUMENWERX
WWW.LUMENWERX.COM



Shown with CMO Square optics



Shown with CMO Round optics



Shown with PMO optics

DESCRIPTION

Primo is the fresh face of recessed LED lighting. The unique concentric micro optic creates a subtle, yet distinctive, graphical appearance appropriate for important spaces, large and small.

The precise, square-base-prism design achieves both luminous consistency and overall visual comfort from all viewing angles. Using advanced LED engines and optics, Primo provides comfortable and efficient illumination where it's needed, while integrating cleanly into the architecture. See separate spec sheets for other available mountings.

PROJECT: _____

APPROVED BY: _____

SIGNATURE: _____

TYPE	QTY



up to 104 lm/w performance

IC RATED

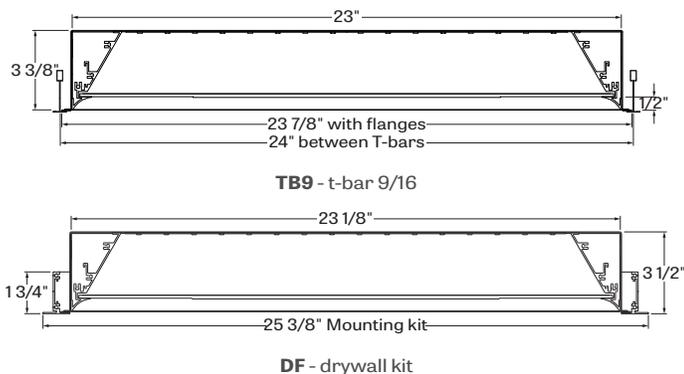
ORDER GUIDE

PRIR	22		LED			
LUMINAIRE ID	SIZE	OPTICS	LIGHT SOURCE	CRI	LUMEN PACKAGES	COLOR TEMP.
PRIR - primo recessed	22 - 2'x2'	CMO(S) - Concentric Micro-Prism Optic - square CMO(R) - Concentric Micro-Prism Optic - round PMO - Precision Micro-Prism Optic	LED - high performance LED	80 - 80CRI 90 - 90CRI	2000 - min. low output 2000lm 3200 - medium output 3200lm 4200 - high output 4200lm 5000 - max. ultra high output 5000lm #### - other required lm	27 - 2700k 30 - 3000k 35 - 3500k 40 - 4000k

VOLTAGE	DRIVER	ELECTRICAL	MOUNTING	FINISH	OPTIONS
120 - 120V 277 - 277V UNV - 120V-277V 347 - 347V (not available with Lutron)	D1 - 1% dimming 0-10V DA - Dali LTEA2W - Lutron 1% - 2 wire FF 120V LDE1 - Lutron Hi-Lume 1% Eco LDE5 - Lutron 5% EcoSystem	1 - 1 circuit +EB - emergency battery pack +GTD### - generator transfer device, 120V or 277V +M - master (consult factory) +S - satellite (consult factory)	TG9 - tegular 9/16" TG15 - tegular 15/16" TB9 - t-bar 9/16" TB15 - t-bar 15/16" ST - screw slot t-bar DF - drywall kit	W - matte white	FU - fuse FWC - flexible whip cable (6' std) CP - Chicago Plenum CU - custom

See page 4 for ordering code detailed information

CROSS SECTION



OPTICS



CMO - Concentric Micro-Prism Optic



PMO - Precision Micro-Prism Optic

RECOGNIZED BY

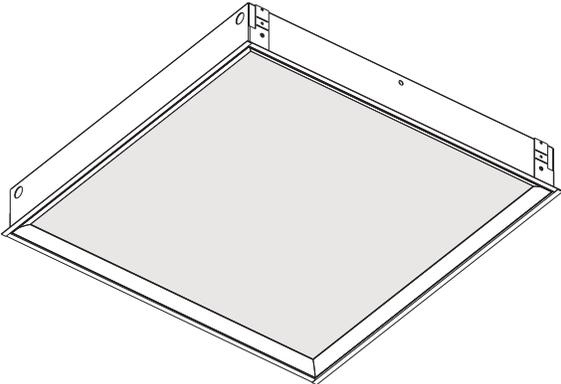


PRIMO 2x2 LED

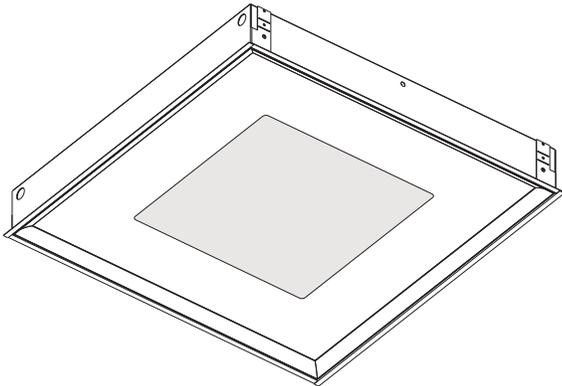
RECESSED

LUMENWERX
WWW.LUMENWERX.COM

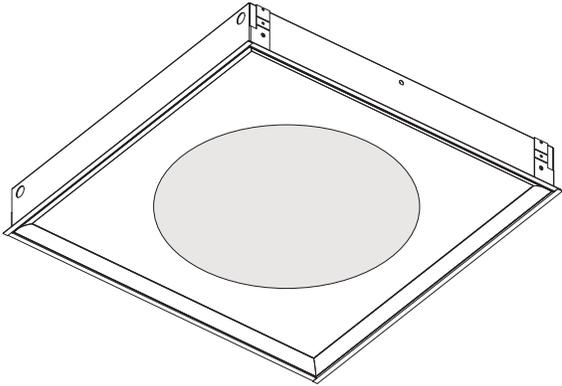
PRIMO PMO



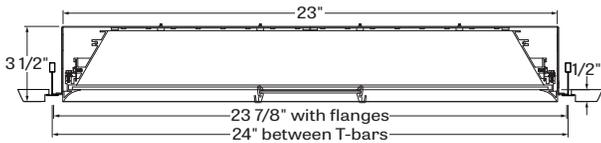
PRIMO CMO(S)



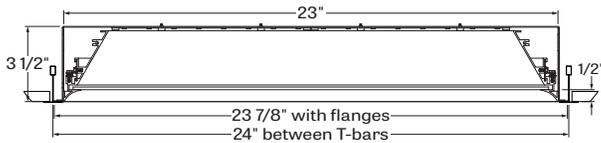
PRIMO CMO(R)



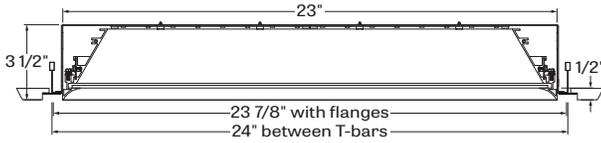
PRIMO - TG9 - tegular 9/16"



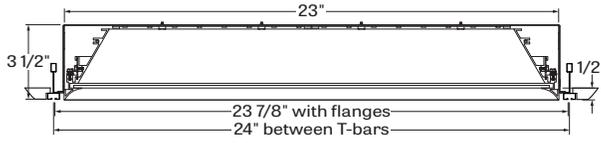
PRIMO - TB15 - t-bar 15/16"



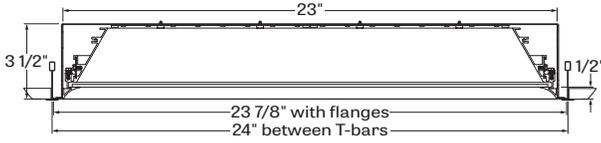
PRIMO - TG15 - tegular 15/16"



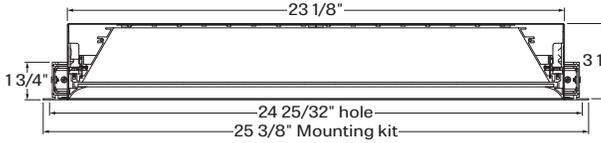
PRIMO - ST - screw slot t-bar



PRIMO - TB9 - t-bar 9/16"



PRIMO - DW - drywall kit



PRIMO 2x2 LED

RECESSED

ELECTRICAL CIRCUITS

DIMMING 0-10V -
1 Circuit

1 CIRCUIT	BLK	HOT (CIRCUIT-1)
	WHT	NEUTRAL (CIRCUIT -1)
	GRN	GROUND
	PPL	DIM(+) 0-10V
	GRY	DIM(-) 0-10V

NOTE: MUST FOLLOW WIRE SIZE AND MAXIMUM LENGTH FOR DIMMING APPLICATIONS.

LUTRON 1% 2-wire FF 120V -
1 Circuit

1 CIRCUIT	BLK	HOT
	WHT	NEUTRAL
	GRN	GROUND

NOTE: MUST FOLLOW WIRE SIZE AND MAXIMUM LENGTH FOR DIMMING APPLICATIONS.

LUTRON LDE1 1%/LDE5 5% EcoSystem -
1 Circuit

1 CIRCUIT	BLK	HOT
	WHT	NEUTRAL
	GRN	GROUND
	PPL	E1 To EcoSystem
	GRY	E2 Digital Link

NOTE: MUST FOLLOW WIRE SIZE AND MAXIMUM LENGTH FOR DIMMING APPLICATIONS.

DIMMING 0-10V -
1 Circuit + Emergency Battery

1 CIRCUIT+EB	BLK	HOT (CIRCUIT-1)
	WHT	NEUTRAL (CIRCUIT -1)
	GRN	GROUND
	RED	UNSWITCHED HOT
	PPL	DIM(+) 0-10V
	GRY	DIM(-) 0-10V

NOTE: MUST FOLLOW WIRE SIZE AND MAXIMUM LENGTH FOR DIMMING APPLICATIONS.

LUTRON 1% 2-wire FF 120V -
1 Circuit + Emergency Battery

1 CIRCUIT+EB	BLK	HOT
	WHT	NEUTRAL
	GRN	GROUND
	RED	UNSWITCHED HOT

NOTE: MUST FOLLOW WIRE SIZE AND MAXIMUM LENGTH FOR DIMMING APPLICATIONS.

LUTRON LDE1 1%/LDE5 5% EcoSystem -
1 Circuit + Emergency Battery

1 CIRCUIT+EB	BLK	HOT
	WHT	NEUTRAL
	GRN	GROUND
	RED	UNSWITCHED HOT
	PPL	E1 To EcoSystem
	GRY	E2 Digital Link

NOTE: MUST FOLLOW WIRE SIZE AND MAXIMUM LENGTH FOR DIMMING APPLICATIONS.

PRIMO 2x2 LED

RECESSED

OPTICS

PRECISION MICRO-PRISM-OPTIC (PMO) / CONCENTRIC MICRO -OPTIC (CMO) - utilizes a specially designed catadioptric lens that combines refraction and internal reflection. The square-base prism is 24% the size of those used in a high-performance fluorescent lens.

The acrylic material itself is untinted, relying entirely on catadioptric control for effective source obscuration. A highly efficient TIR process at the acrylic-air interface on the prism surfaces redirects incident light with less than a 0.1% loss per reflection. As a result, these LumenWerx optics attain a high optical efficiency greater than 90%, while maintaining visual comfort at normal viewing angles and presenting a pleasing luminous appearance.

PRECISION MICRO-PRISM-OPTIC (PMO) - The exclusive two-dimensional array of prisms is designed to eliminate the glare found at higher viewing angles and as such, enables a glare cut-off at a 45° viewing angle.

CONCENTRIC MICRO-PRISM-OPTIC (CMO) - With the smaller prisms of the outer optic giving way to the larger prisms found in the inner optic, the exclusive pyramidal forms provide an outstanding level of control over high angle brightness as well as a gentle brightness gradient from different viewing angles.

LIGHT SOURCE - LED

Custom Linear array of mid-flux LED's are mounted directly to the housing for optimal thermal performance. Available in 3000K, 3500K and 4000K with a minimum 80 CRI and an option for 90 CRI with elevated R9 value. Color consistency maintained to within 3 SDCM. LEDs operated at reduced drive current to optimize efficacy and lumen maintenance.

All LEDs have been tested in accordance with IESNA LM-80-08 and the results have shown L80 lumen maintenance greater than 60,000 hours. Absolute product photometry is measured and presented in accordance with IESNA LM-79, unless otherwise indicated.

LED output	Color Temp	Watts	Nominal Delivered Lumens	Efficacy LPW
low output	4000K	19	2000	104
medium output	4000K	32	3200	100
high output	4000K	43	4200	97
ultra high output	4000K	53	5000	95

ELECTRICAL

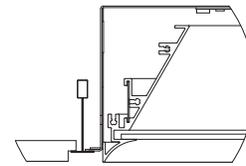
Factory-set, adjustable output current LED driver with universal (120-277VAC) input. Dimmable from 100% to 1% with 0-10V dimming control. Rated life (90% survivorship) of 50,000 hours at 50°C max. ambient (and 70°C max. case) temperature. At maximum driver load: Efficiency>84%, PF>0.9, THD<20%. Other specifiable options include Lutron Hi-Lume 1% (specify 2-wire, or Ecosystem Dim-to-Off), Lutron 5-Series (5% Ecosystem), DMX (RDM compatible) and DALI protocol drivers. All of our standard 0-10V drivers are NEMA 410 compliant.

EMERGENCY

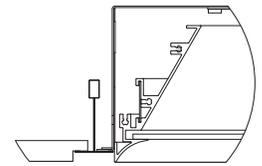
Factory installed long life high temperature recyclable Ni-Cad battery pack with test switch and charge indicator; minimum of 90 minutes operation, up to 1300 lumens (25°C) emergency lighting output. Recharge time of 24 hours.

MOUNTING OPTIONS

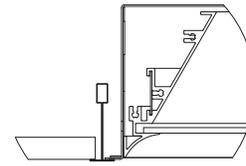
Recess mount into exposed or concealed T-Bar or Tegular grid ceiling



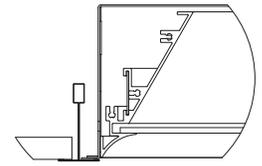
TG9 - tegular 9/16"



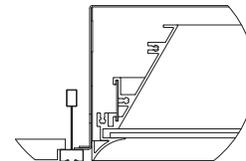
TG15 - tegular 15/16"



TB9 - t-bar 9/16"

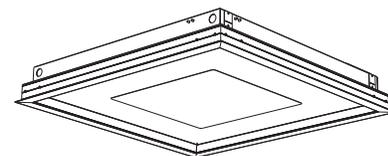
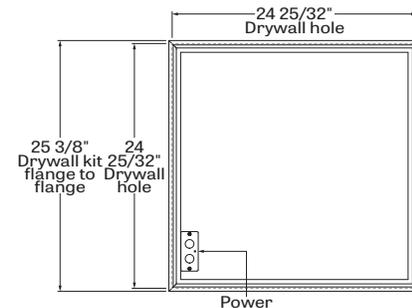


TB15 - t-bar 15/16"



ST - screw slot t-bar

A separate kit for mounting fixtures into drywall ceilings



DF - drywall kit

PRIMO 2x2 LED

RECESSED

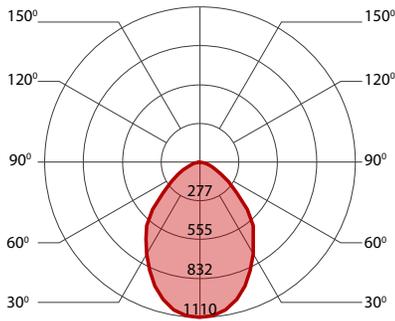
LUMENWERX
WWW.LUMENWERX.COM**FINISH****Interior** - 95% reflective, matte white powder coating**Exterior** - matte white powder coating.**CONSTRUCTION****Housing** - Die formed cold rolled sheet steel 20 gauge thick, matte white powder coating.**Reflectors** - Extruded Aluminum 0.07" nominal, integrated into a door system, 95% reflective matte white painted.**Door system** - integrated frame with no visible attachment, made of extruded Aluminum and lens made in clear PMMA precisely molded into optical prismatic forms offered in different patterns.**Drywall kit** - Extruded Aluminum 0.07" nominal, matte white powder coating.**WEIGHT****Primo 2x2 grid** - 17.84lbs. - 8.1kg**Primo 2x2 drywall** - 19.94lbs. - 9.24kg**CERTIFICATIONS****ETL** - Rated for Indoor Dry/Damp locations. Conforms to UL Standard 1598 and certified to CAN/CSA Standard C22.2 No. 250.0.**DLC** - Testing to DLC requirements, for this product, have been completed by an Accredited Laboratory and certified by DLC.**Lighting facts** - testing products and reporting performance results according to industry standards.**Chicago plenum** - City of Chicago Approved (CCEA)**IC rated** - suitable for direct contact with insulation.**WARRANTY**

LumenWerx provides a five-year limited warranty of electrical and mechanical performance of the luminaires, including the LED boards, drivers, and auxiliary electronics. LumenWerx will repair or replace defective luminaires or components at our discretion, provided they have been installed and operated in accordance with our specifications. Other limitations apply, please refer to the full warranty on our website.

PRIMO 2x2 LED

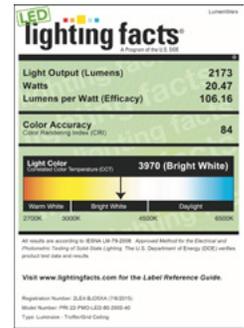
RECESSED

2000 LUMEN AT 80CRI - LOW OUTPUT

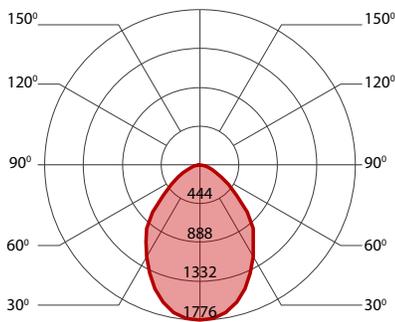


PERFORMANCE

LED output	Color Temp	Watts	Nominal Delivered Lumens	Efficacy LPW
low output	2700K	21	2000	96
low output	3000K	20	2000	98
low output	3500K	20	2000	101
low output	4000K	19	2000	104



3200 LUMEN AT 80CRI - MEDIUM OUTPUT

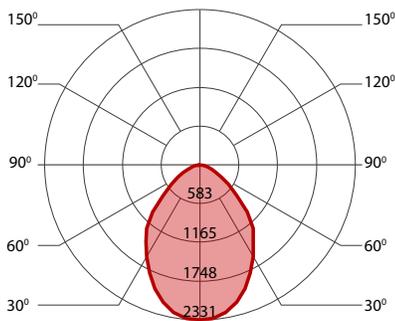


PERFORMANCE

LED output	Color Temp	Watts	Nominal Delivered Lumens	Efficacy LPW
medium output	2700K	35	3200	92
medium output	3000K	34	3200	94
medium output	3500K	33	3200	97
medium output	4000K	32	3200	100



4200 LUMEN AT 80CRI - HIGH OUTPUT

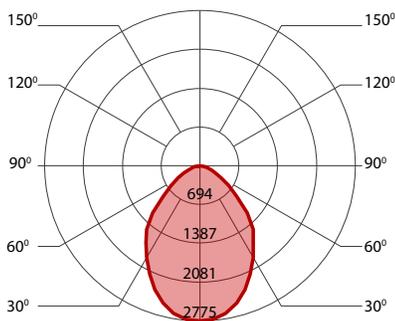


PERFORMANCE

LED output	Color Temp	Watts	Nominal Delivered Lumens	Efficacy LPW
high output	2700K	47	4200	89
high output	3000K	46	4200	91
high output	3500K	45	4200	94
high output	4000K	43	4200	97



5000 LUMEN AT 80CRI - ULTRA HIGH OUTPUT

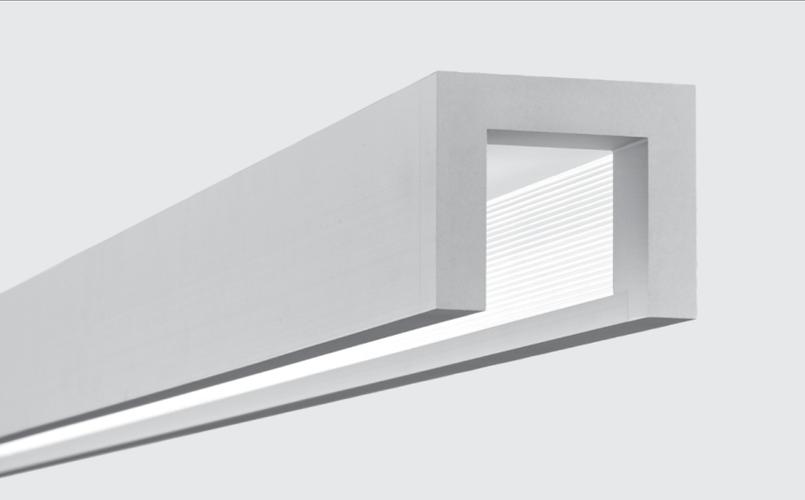


PERFORMANCE

LED output	Color Temp	Watts	Nominal Delivered Lumens	Efficacy LPW
ultra high output	2700K	57.5	5000	87
ultra high output	3000K	56	5000	89
ultra high output	3500K	54	5000	92
ultra high output	4000K	53	5000	95



SPECIFICATION DATA
PROFILE MINI (PM1 | PM3)

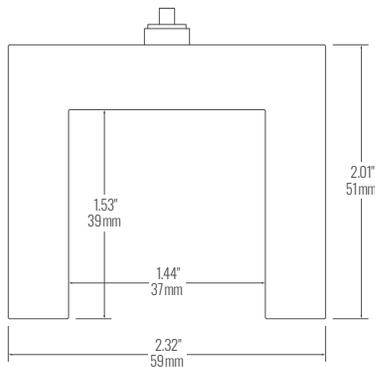


CATALOG #

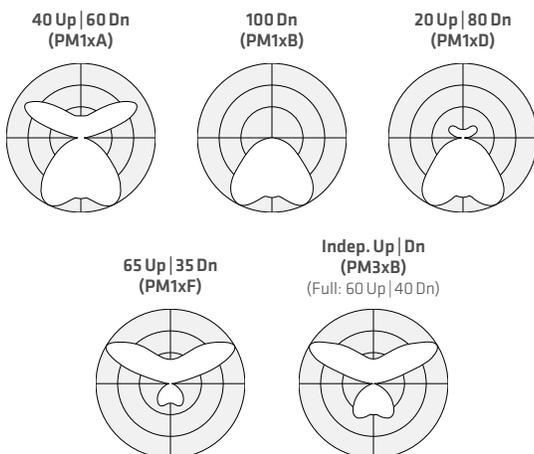
PROJECT

NOTES

CROSS SECTION



DISTRIBUTIONS



PERFORMANCE FOCUS

40 Up | 60 Dn, 80 CRI 4000 K (PM1xAx40)

	Energy (W/4ft)	Light (lm/4ft)	Efficacy (lm/W)
Z (80 Dn, 100 Dn)	14 W	1700	123
A	18 W	2150	128
B	22 W	2750	126
C	28 W	3450	126
D (60 Dn, 35 Dn)	36 W	4350	125
Color Matching (SDCM)	Lumen Maintenance (hr)		Efficacy (lm/W)
	L90 per TM21	L70 Estimate	
< 2	> 60,000	> 200,000	

Nominal values, refer to back pages for full performance data.

FEATURES

- Signature open aperture design with fully luminous interior and no horizontal lenses or diffusers.
- Small-scale cross section, less than half the area of Profile, for minimal luminaire presence.
- Miniaturized Anidolic optics outperform much bigger luminaires – up to 15 ft o.c. spacing, delivering over 40 fc at 0.4 W/ft².
- Efficacies exceeding 135 lm/W with over 115 lm/W direct from a 1.5" aperture.
- Five direct and direct/indirect general area lighting distributions aligned with Profile, including independent up | down control.
- Four endcap styles, preinstalled for perfect fit and finish.
- Precision machined, clear anodized extruded aluminum fixture body in 4', 6' & 8' modules.



ORDER GUIDE

1	2	3	4	5	6	7	8	9	10	11	OPTIONS	CONTROLS

1	FAMILY	2	ENDCAP	3	DISTRIBUTION	4	ENERGY ¹	5	CRI-CCT	6	FINISH ²
PM1	Profile Mini Area	B Bevel F Flat P Capsule S Square		A 40 Up 60 Dn B 100 Dn D 20 Up 80 Dn F 65 Up 35 Dn	Z 14 W ² A 18 W B 22 W C 28 W D 36 W ³			30 80 CRI 3000 K 35 80 CRI 3500 K 40 80 CRI 4000 K 93 90 CRI 3000 K 90 90 CRI 3500 K 94 90 CRI 4000 K	A Clear Anodized B Black Powdercoat S Metallic Silver Powdercoat W White Powdercoat C Custom Color (RAL)		
										PM3 Profile Mini Up Dn	B Independent Up Dn Control

¹ Nominal input power /4 ft. Add 4 W for Battery Pack or 347V.
² Z: 100 Dn (B), 20 | 80 (D) Distributions
³ D: 40 | 60 (A), 65 | 35 (F) Distributions

² Fixture finish only. Canopies are standard white.

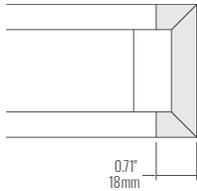
7	LENGTH	8	CEILING TYPE ⁴	9	DRIVER	10	VOLTAGE	11	SUSPENSION
04 4 ft 06 6 ft 08 8 ft XX x ft ³		D Drywall G Grid S Structure R Remote		F1 Non-Dim F2 0-10 V Dim 3% F4 Line Voltage Dim (Fwd/Rev) 3% 120 V E1 eldoLED ECO 0-10 V Dim 1% E2 eldoLED SOLO 0-10 V Dim 0.1% E3 eldoLED ECO DALI-2 DT6 Dim 1% E4 eldoLED SOLO DALI-2 DT6 Dim 0.1% L1 Lutron Hi-Lume 1% EcoSystem (LDE1)		M 120-277 V 1 120 V ⁵ 2 277 V ⁵ 3 347 V ⁶		03 ≤ 3 ft 06 ≤ 6 ft 12 ≤ 12 ft 25 ≤ 25 ft	

³ Specify run length in 2' nominal increments. Important: Row lengths cannot be modified on site (factory installed endcaps & joiners).
⁴ Integrated driver with mounting, power feed, suspension + canopy, except for remote.
⁵ Fixed voltage only for (F4) Line Dim Driver or nLight controls.
⁶ 347 V transformer, not with Up | Dn Control or Drywall ceiling.

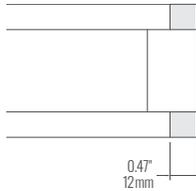
OPTIONS		CONTROLS	
WIRING & EMERGENCY ⁷		ROW LAYOUT	
A# Alternate Wiring Module Qty ⁸ (2nd circuit in 8 ft modules for EM/NL or presentation switching) B# Battery Pack Qty H# Emergency Switch Qty (GTD or Controller)	C Chicago CCEA F 4 ft End Module G 6 ft Modules ⁹ N Non-Power End	SE1 Canopy Integrated Enlighted Smart Sensor ¹⁰ RE1 Remote Enlighted Smart Sensor VN1 Acuity nLight Wired Converter ¹¹	
⁷ BP & GTD available for 120-277 V in Grid (G), Structure (S) and Remote (R) ceilings. ⁸ Alt. Wiring: not with Up Dn Control.		⁹ For 12 ft & 18 ft rows.	
		¹⁰ For Enlighted in drywall ceilings, use Remote (R) ceiling option. Enlighted with Independent Up Dn or 8 ft Alternate Wiring (A) requires 2 sensors per luminaire and only one can be canopy integrated (SE1). ¹¹ For nLight in Drywall (D) and Structure (S) ceilings, contact Fluxwerx.	

ENDCAPS

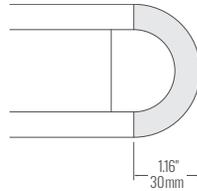
(B) BEVEL



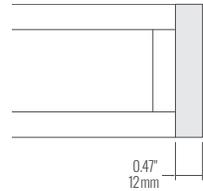
(F) FLAT



(P) CAPSULE

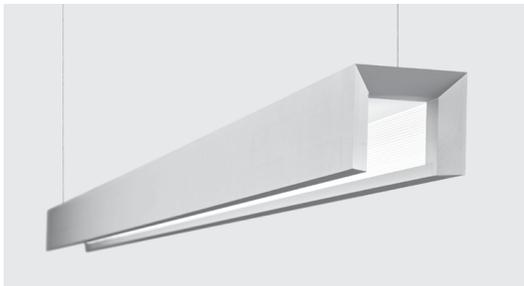


(S) SQUARE

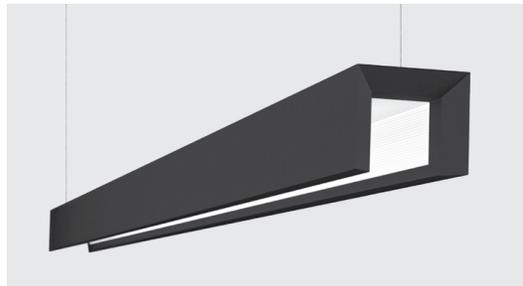


FINISHES

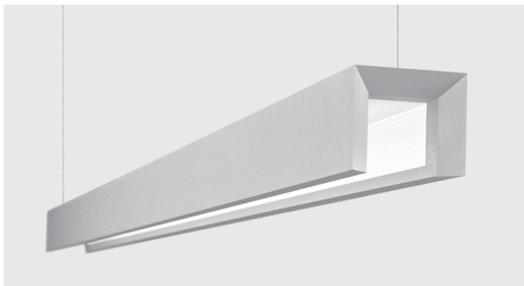
All finishes high temperature powder coated.



(A) CLEAR ANODIZED



(B) BLACK



(S) SILVER



(W) WHITE



CUSTOM

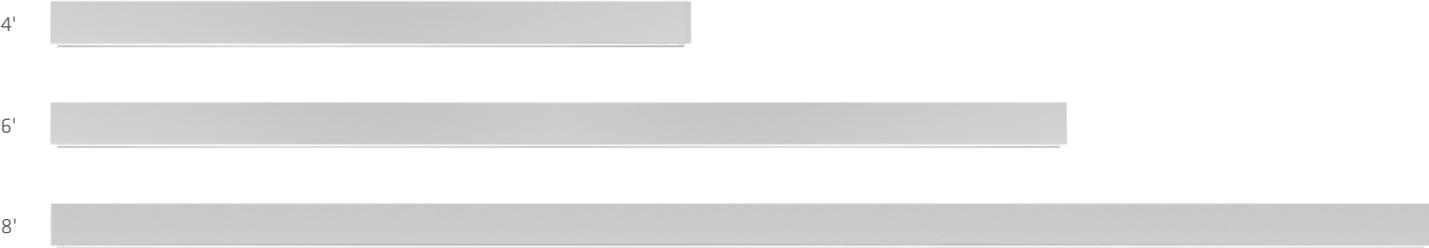
PRODUCT DETAILS



Vertical Anidolic Optic

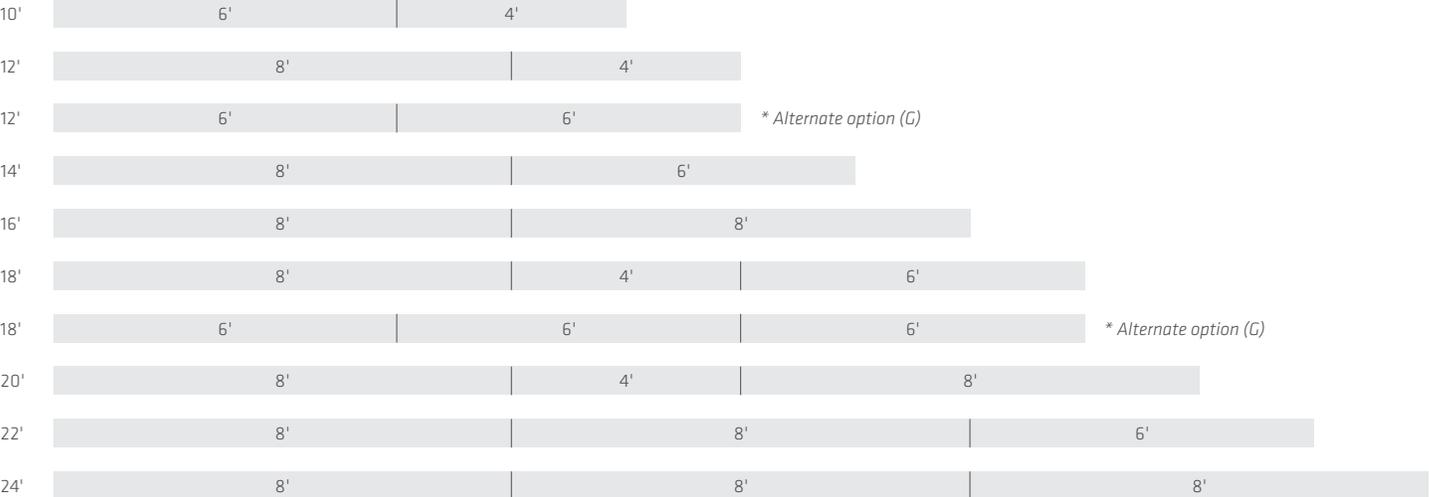
RUN LENGTHS

Standalone fixtures are available in 4', 6' + 8' nominal lengths.



! IMPORTANT
Endcaps and joiners are integral luminaire components. Do not remove them to change run layouts.

Run lengths are available in 2' nominal increments.



INTEGRATED DRIVER, MOUNTING, POWER FEEDS + SUSPENSION

Refer to separate product specification datasheets for detailed dimensions of mounting hardware components, driver enclosures, canopies and wiring.

(D) DRYWALL	New or Retrofit	(G) GRID	ON or OFF Grid	(S) STRUCTURE	Exposed Ceilings	(R) REMOTE
<p>Integrated driver, power feed and mounting suspension points suitable for GWB or plaster thicknesses of < 0.875" (22 mm).</p> <p>Perpendicular or Parallel</p> <p>Retrofit Method</p>		<p>Integrated clip, driver, power feed and mounting suspension points suitable for accessible ceiling grid heights of < 1.75" (44 mm).</p> <p>Horizontal or Vertical</p> <p>Detached Method</p>		<p>Integrated driver with mounting, power feed, suspension + canopy suitable for exposed surface conduit or recessed junction boxes.</p> <p>Power Feed Canopy</p> <p>Suspension Canopy</p> <p>Battery Pack Option</p>		<p>External remote mounted driver. Power feed and suspension points suitable for exposed conduit or recessed junction boxes. See Notes for wire gauge guide.</p> <p>Power Feed</p> <p>Multivolt 120-277 V Driver</p>

DRIVER OPTIONS

<input checked="" type="checkbox"/> 347V	<input checked="" type="checkbox"/> Battery Pack	<input checked="" type="checkbox"/> Emergency Switch	<input checked="" type="checkbox"/> 347V (VM1)	<input checked="" type="checkbox"/> Battery Pack	<input checked="" type="checkbox"/> Emergency Switch	<input checked="" type="checkbox"/> 347V (VM1)	<input checked="" type="checkbox"/> Battery Pack	<input checked="" type="checkbox"/> Emergency Switch
<input checked="" type="checkbox"/> Lutron	<input checked="" type="checkbox"/> eldoLED		<input checked="" type="checkbox"/> Lutron	<input checked="" type="checkbox"/> eldoLED		<input checked="" type="checkbox"/> Lutron	<input checked="" type="checkbox"/> eldoLED	

ENLIGHTED SENSOR OPTION

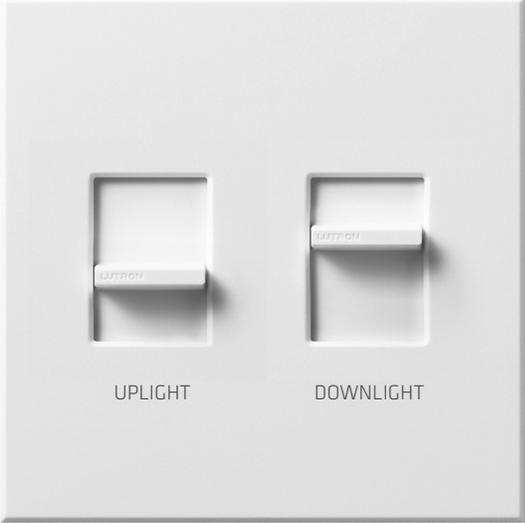
(D) DRYWALL	<input checked="" type="checkbox"/>	(G) GRID	<input checked="" type="checkbox"/>	(S) STRUCTURE	<input checked="" type="checkbox"/>	(R) REMOTE	<input checked="" type="checkbox"/>
<p>For Enlighted Sensors in drywall ceilings, use REMOTE (R) mounting enclosure options.</p>		<p>Canopy Integrated Sensor</p> <p>5.5" round canopy preinstalled with Enlighted wireless sensor and large driver enclosure with Enlighted control unit. Plenum rated cable whips and RJ45 plugs enable quick field connection.</p> <p>RJ45 Coupler</p> <p>Horizontal or Vertical</p>		<p>Canopy Integrated Sensor</p> <p>Large driver enclosure with Enlighted control unit and enclosure shroud preinstalled with Enlighted wireless sensor. Hidden cable whips and RJ45 plugs enable quick field connection.</p> <p>Power Feed Canopy</p>		<p>Canopy Integrated Sensor</p> <p>5.5" round canopy preinstalled with Enlighted wireless sensor for a 4" octagon J-box (by others). Remote mounted, large driver enclosure with Enlighted control unit. Plenum rated cable whips and RJ45 plugs enable quick sensor field connection.</p> <p>Power Feed</p>	
		<p>Remote Sensor</p> <p>Enlighted wireless sensor supplied with tile mount collar for remote sensor placement in a ceiling tile. Plenum rated cable whips and RJ45 plugs enable quick field connection.</p> <p>RJ45 Coupler</p> <p>Tile</p> <p>Horizontal or Vertical</p>		<p>Remote Sensor</p> <p>Enlighted wireless sensor supplied with tile mount collar for remote sensor placement to a horizontal surface or J-box lid (by others). Plenum rated cable whips and RJ45 plugs enable quick sensor field connection.</p> <p>J-box + Lid by others</p> <p>Power Feed Canopy</p>		<p>Remote Sensor</p> <p>Enlighted wireless sensor supplied with tile mount collar for remote sensor placement to a horizontal surface or J-box lid (by others). Plenum rated cable whips and RJ45 plugs enable quick sensor field connection.</p> <p>J-box + Lid by others</p> <p>Power Feed</p>	

CONTROLS & SENSORS

INDEPENDENT UP | DOWN LIGHTING CONTROL

Profile Mini Up | Dn provides fully dimmable or switchable independent control of the indirect and direct distributions. Ideal for multipurpose rooms and spaces with presentation, projection or video conferencing requirements; the separated circuitry allows simple adjustment of the proportions of up | down light to suit the lighting and energy needs of the space and people in the environment.

Profile Mini Up | Dn is available with a native distribution of 60 Up | 40 Dn with a maximum total delivered output of 4450 lumens.



SYSTEMS & SENSORS

Fluxwerx products are designed for simple integration with a wide range of sensors, lighting controls and building management systems. Many projects incorporate occupancy sensing, daylight harvesting, individual or central adjustment of light levels and luminaire or space monitoring in order to save energy, reduce costs and maximize occupant comfort. Fluxwerx offers a number of standard driver and controller options to support various wired and wireless network protocols. In our suspended products, the packaging of drivers and controls in the mounting system maintains clean aesthetics, simplifies installation & maintenance, increases flexibility and supports future system upgrades.

enlighted[™]

Enlighted wireless, networked smart sensor integrates occupancy sensing, daylight harvesting, energy usage, temperature and light level control. Option: Canopy-integrated or remote Enlighted sensor (SE1 or RE1)
Model: SU-5E-CL

nLIGHT

nLight wired, 2-way network supports luminaire light level control as well as occupancy and daylight sensors. Option: Acuity nLight Converter (VN1)
Model: nPS-80-EZ or nPS-80-EZ-ER

eldoLED[®]

EldoLED drivers support common wired protocols, 0-10 V and DALI. They also provide access to finer dimming control, dynamic white and Bluetooth low-energy (BLE) wireless.
Options: ECO 1% (E1), SOLO 0.1% (E2)

LUTRON[®]

Lutron EcoSystem network protocol enables on/off, dimming, occupancy sensing and daylight harvesting. Option: EcoSystem Hi Lume 1% (L1)



NOTES

CONSTRUCTION

- Anodized, extruded + machined architectural grade aluminum
- Precision machined aluminum joints and endcaps are factory preinstalled for seamless fit
- Stainless steel fasteners
- 0.04" (1.0 mm) stainless steel aircraft cable suspensions
- Clear anodized surface finish or powdercoated in white, metallic silver or black, canopies in white as standard

OPTICAL

- Anidolic optical structures with linear light extraction elements
- Precision molded high transmittance clear acrylic lenses
- Long life mid-flux LED system designed for typical TM21 lumen maintenance \geq L90 @ 60,000 h
- Available in 3000K, 3500K, 4000K with CRI \geq 80 and R9 \geq 0, or CRI \geq 90 and R9 \geq 50, all with color accurate binning \leq 2 SDCM

ELECTRICAL

- No electrical connections are required at fixture level for installation; low voltage power cords factory preinstalled
- High efficiency multivolt drivers, integrated with suspension and mounting components, for 50–60 Hz 120–277 V and transformer for 347 V
- Power Factor $>$ 0.90
- Total Harmonic Distortion $<$ 20%
- Dim level: Standard 3%, optional 1% or 0.1%
- Surge Protection: Meets ANSI C82.11 spec and ANSI/IEEE C62.41
- Inrush Current: Meets NEMA 410

EMERGENCY

- Optional Battery Pack delivers 10 W Class 2 rated output for 90 min. Use 12 W input energy to estimate emergency flux, typically 1150–1750 lm (@ 100–150 lm/W).
- Optional GTD (Generator Transfer Switch), 120–277 V, disables 0–10 V control during emergency for full light output

WIRE GAUGE

- Recommended low voltage wire gauge (AWG) for minimal losses over distance when REMOTE mounting:
30 ft | 18 ga
50 ft | 14 ga
80 ft | 12 ga

ENVIRONMENTAL & CARE

- Designed for use in dry or damp indoor locations with ambient temperatures of 0–30°C (32–86°F)
- The luminaire may be damaged by chemicals such as chlorine, solvents, ammonia, alcohol or sulfur in the area of operation or in cleaning products. Damage from contaminants is not covered under warranty.
- Not suitable for natatorium environments, e.g. swimming pools, hot tubs and saunas.
- Clean only by wiping with a slightly water-damp, soft, clean cloth.

WEIGHT

- Fixture only: ~ 1.3lb/ft (1.9 kg/m)

WARRANTY

- 5 year limited warranty on all components and workmanship

INDEPENDENT TESTING

- IESNA LM79
- IESNA LM80 (LED @ 10,000 h)

APPROVALS

- UL Listed (USA + Canada)
- CCEA Chicago Plenum
- Living Building Challenge (LBC) Declared

Protected by one or more US patents: 10215344, 10830415, 9733411, 9823406, D731700, D780971, D891670, D890403, D877953, D877954, D877955, 10077891; EU patents: 002263020-0001, 002263020-0002, 002263020-0003.

DRIVERS + EMERGENCY

STANDARD DRIVER OPTIONS	
	<p>F1 Non-Dim F2 0–10 V Dim 3% F4 Line Voltage Dim 3% (Forward/Reverse) 120 V</p>
	<p>E1 eldoLED ECO 0–10 V Dim 1% E2 eldoLED SOLO 0–10 V Dim 0.1% E3 eldoLED ECO DALI-2 DT6 Dim 1% E4 eldoLED SOLO DALI-2 DT6 Dim 0.1%</p>
	<p>L1 Lutron Hi-Lume 1% EcoSystem (LDE1)</p>

EMERGENCY OPTIONS	
	<p>B Battery Pack Bodine BSL310 (10 W) H Emergency Switching Functional Devices ESRB Emergency Lighting Relay</p>

Driver and emergency selection may be limited by product or version. For further options, contact Fluxwerx.

SPECIFICATION DATA PROFILE MINI (PM1 | PM3)

FAMILY PERFORMANCE

80 CRI

COLOR	4000 K	3500 K	3000 K
Color Rendering (CRI)	83	83	83
Red Index (R9)	6	6	6
Color Matching (SDCM)	< 2		

90 CRI

COLOR	4000 K	3500 K	3000 K
Color Rendering (CRI)	92	92	92
Red Index (R9)	63	63	59
Color Matching (SDCM)	< 2		

Typical colorimetry values.

LUMEN MAINTENANCE

	A 18 W	B 22 W	C 28 W	D 36 W
L90 per TM-21 (hr)	> 60,000			
L70 Estimate (hr)	> 200,000			

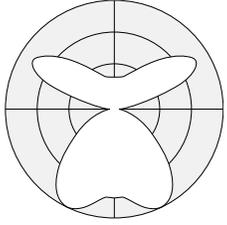
OUTPUT MULTIPLIERS

MULTIPLIER	Applies To	
90 CRI	0.84	All 80 CRI
Battery Pack	0.70	Energy A (18 W)

For 90 CRI, emergency BP or non-white fixtures, use multipliers to scale published Light (lm), Efficacy (lm/W), Intensity (Cd), Luminance (Cd/m²) and IES files.

VERSION PERFORMANCE

PM1xA - 40 Up | 60 Dn, 80 CRI

CONFIGURATION			LIGHT & POWER			VISUAL COMFORT		LIGHT DISTRIBUTION
CCT	ENERGY (NOM.)		LIGHT (lm/4ft)	POWER (W/4ft)	EFFICACY (lm/W)	MAX INTENSITY 45-90° (Cd)	MAX LUMINANCE 45-90° (Cd/m ²)	
PM1xAx40 4000 K	A	18 W	2182	17.03	128.2	364	6,508	 <p>Profile Mini Suspended 42% Up 58% Dn</p>
	B	22 W	2741	21.80	125.7	457	8,177	
	C	28 W	3464	27.60	125.5	577	10,334	
	D	36 W	4387	35.08	125.1	731	13,087	
PM1xAx35 3500 K	A	18 W	2132	17.03	125.2	355	6,359	
	B	22 W	2678	21.80	122.9	446	7,990	
	C	28 W	3385	27.60	122.6	564	10,097	
	D	36 W	4286	35.08	122.2	714	12,786	
PM1xAx30 3000 K	A	18 W	2082	16.88	123.3	347	6,210	
	B	22 W	2615	21.80	120.0	436	7,803	
	C	28 W	3305	27.60	119.8	551	9,860	
	D	36 W	4186	35.08	119.3	698	12,488	

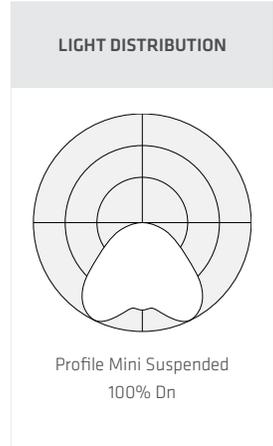
Photometry Reports: 12757824.36 (18 W), 12757824.37 (22 W), 12757824.38 (28 W), 12861772.03 (36 W)

Integrating Sphere and Photometric results at 4000K by an independent accredited testing laboratory per IES LM-79-2008 and ANSI C78.377-2011. Results for 3000K and 3500K scaled based on integrating sphere results at 38W (D). Candlepower Distribution scaled per total lumens of Integrating Sphere results.

VERSION PERFORMANCE

PM1xB - 100 Dn, 80 CRI

CONFIGURATION			LIGHT & POWER			VISUAL COMFORT	
CCT	ENERGY (NOM.)		LIGHT (lm/4ft)	POWER (W/4ft)	EFFICACY (lm/W)	MAX INTENSITY 45-90° (Cd)	MAX LUMINANCE 45-90° (Cd/m²)
PM1xBx40 4000 K	Z	14 W	1629	13.82	117.9	474	8,556
	A	18 W	2023	17.23	117.4	589	10,625
	B	22 W	2556	22.24	115.0	744	13,424
	C	28 W	3195	28.21	113.3	930	16,781
PM1xBx35 3500 K	Z	14 W	1593	13.82	115.2	463	8,364
	A	18 W	1971	17.23	114.4	574	10,351
	B	22 W	2490	22.24	112.0	725	13,078
	C	28 W	3113	28.21	110.3	906	16,347
PM1xBx30 3000 K	Z	14 W	1556	13.78	112.9	453	8,172
	A	18 W	1919	17.23	111.3	558	10,076
	B	22 W	2424	22.24	109.0	705	12,730
	C	28 W	3030	28.04	108.0	882	15,916

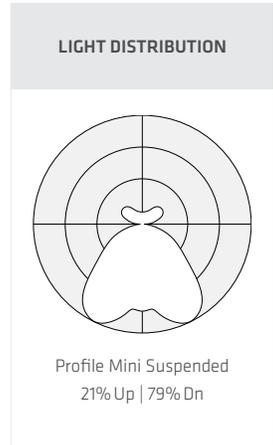


Photometry Reports: 12861772.11 (14 W), 12861772.05 (18 W), 12861772.01 (22 W), 12861772.07 (28 W)

Integrating Sphere and Photometric results at 4000K by an independent accredited testing laboratory per IES LM-79-2008 and ANSI C78.377-2011. Results for 3000K and 3500K scaled based on integrating sphere results at 38W (D). Candlepower Distribution scaled per total lumens of Integrating Sphere results.

PM1xD - 20 Up | 80 Dn, 80 CRI

CONFIGURATION			LIGHT & POWER			VISUAL COMFORT	
CCT	ENERGY (NOM.)		LIGHT (lm/4ft)	POWER (W/4ft)	EFFICACY (lm/W)	MAX INTENSITY 45-90° (Cd)	MAX LUMINANCE 45-90° (Cd/m²)
PM1xDx40 4000 K	Z	14 W	1697	13.82	122.8	384	7,175
	A	18 W	2107	17.23	122.3	477	8,911
	B	22 W	2662	22.24	119.7	603	11,257
	C	28 W	3327	28.21	118.0	753	14,072
PM1xDx35 3500 K	Z	14 W	1653	13.82	119.6	374	6,991
	A	18 W	2052	17.23	119.1	465	8,680
	B	22 W	2593	22.24	116.6	587	10,968
	C	28 W	3242	28.21	114.9	734	13,709
PM1xDx30 3000 K	Z	14 W	1609	13.82	116.4	364	6,804
	A	18 W	1998	17.23	116.0	452	8,449
	B	22 W	2524	22.24	113.5	572	10,676
	C	28 W	3156	28.21	111.9	714	13,347



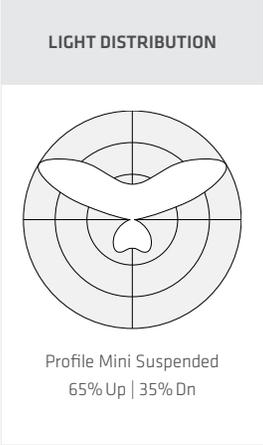
Photometry Reports: xxx (28 W)

Integrating Sphere and Photometric results at 3000K, 3500K and 4000K scaled from PM1xD 38W (D) and PF1xB results from an independent accredited testing laboratory per IES LM-79-2008 and ANSI C78.377-2011. Candlepower Distribution scaled per total lumens of Integrating Sphere results.

VERSION PERFORMANCE

PM1xF - 65 Up | 35 Dn, 80 CRI

CONFIGURATION			LIGHT & POWER			VISUAL COMFORT	
CCT	ENERGY (NOM.)		LIGHT (lm/4ft)	POWER (W/4ft)	EFFICACY (lm/W)	MAX INTENSITY 45-90° (Cd)	MAX LUMINANCE 45-90° (Cd/m²)
PM1xFx40 4000 K	A	18 W	2291	17.03	134.6	232	3,986
	B	22 W	2878	21.80	132.0	291	5,006
	C	28 W	3638	27.60	131.8	368	6,327
	D	36 W	4607	35.16	131.0	466	8,013
PM1xFx35 3500 K	A	18 W	2239	17.03	131.5	226	3,896
	B	22 W	2812	21.80	129.0	284	4,892
	C	28 W	3554	27.60	128.8	359	6,184
	D	36 W	4501	35.16	128.0	455	7,832
PM1xFx30 3000 K	A	18 W	2186	17.03	128.4	221	3,805
	B	22 W	2747	21.80	126.0	278	4,778
	C	28 W	3471	27.60	125.8	351	6,038
	D	36 W	4396	35.16	125.0	444	7,648

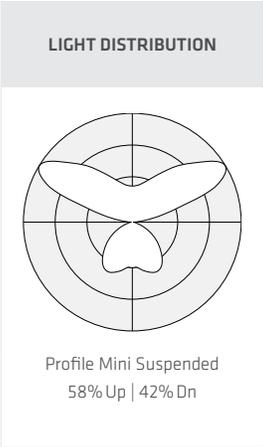


Photometry Reports: 12861772.15 (36 W)

Integrating Sphere and Photometric results at 3000K, 3500K and 4000K scaled from PM1xF 38W (D) and PFTxA results from an independent accredited testing laboratory per IES LM-79-2008 and ANSI C78.377-2011. Candlepower Distribution scaled per total lumens of Integrating Sphere results.

PM3xB - Indep. Up | Dn, 80 CRI

CONFIGURATION			LIGHT & POWER			VISUAL COMFORT	
CCT	ENERGY (NOM.)		LIGHT (lm/4ft)	POWER (W/4ft)	EFFICACY (lm/W)	MAX INTENSITY 45-90° (Cd)	MAX LUMINANCE 45-90° (Cd/m²)
PM3xBx40 4000 K	D	36 W	4474	35.63	125.6	537	9,837
PM3xBx35 3500 K	D	36 W	4371	35.63	122.7	525	9,609
PM3xBx30 3000 K	D	36 W	4269	35.63	119.8	512	9,384



Photometry Reports: 12861772.19 (36 W)

Integrating Sphere and Photometric results at 4000K by an independent accredited testing laboratory per IES LM-79-2008 and ANSI C78.377-2011. Results for 3000K and 3500K scaled based on integrating sphere results at 38W (D) and PM1xA. Candlepower Distribution scaled per total lumens of Integrating Sphere results.

Project:	TYPE L18
Product Code:	Date:

V061324



3" Pendant Mount Cylinder

- Versatile, small diameter pendant mount cylinder
- Field cuttable cord and stem options
- Robust machined aluminum construction
- IP65/Wet Location standard across most configurations

CYLINDER

Mount

Cord, Stem

Size

Diameter: 3.5"
Height: 6.5", 9"

Suspension Length

Standard: 24" or 48"
Custom: Up to 156" (Cord) or 96" (Stem)

Canopy

Standard

Trims

Standard
Snoot
Wall Wash *Coming Soon*
Decorative *Coming Soon*

Finish

White, Black, Brushed Aluminum,
Bronze, Custom

LIGHT OUTPUT & DISTRIBUTION

Lumens (Power)

750 lm (9.5W), 1000 lm (12.5W),
1250 lm (14.3W)

Color Quality

93 CRI, 2-step SDCM

Color Temperature

- 2700K ● 3000K ● 3500K
- 4000K ● Warm Dim (3000K–1800K)
- Tunable White (4000K–1800K)
- Tunable White (6500K–2700K)

Beam Spread

- Spot (25°) Flood (40°)
- Wide Flood (60°)

Lighting Type

- Downlight
- Up and downlight

POWER & CONTROLS

Input Voltage

120 / 277V

Dimming

0-10V (120/277V): 1%
TRIAC/ELV (120V): 1%
DALI-2 (120/277V): 0.1%

RATINGS & CERTIFICATIONS

- Wet Location / IP65 Rated Configurations Available
- NSF Listed (White and Black Finish Only)

WARRANTY

5 year limited warranty; 50,000 hours





TYPE L18

3" Round Cylinder
Pendant Mount

PRODUCT BUILDER

CYLINDER	<input type="checkbox"/>	XCP Pendant Mount Cylinder		
SHAPE	<input type="checkbox"/>	R Round		
SIZE	<input type="checkbox"/>	6 6.5 inch	9 9 inch	
SUSPENSION	<input type="checkbox"/>	C Cord	S Stem	
LENGTH	<input type="checkbox"/>	2 24 inch	4 48 inch	C Custom ¹
CANOPY	<input type="checkbox"/>	S Standard		
LIGHT OPTIONS	<input type="checkbox"/>	D Downlight		
LUMENS DOWN	<input type="checkbox"/>	07 750 lm	10 1000 lm	12 1250 lm
BEAM SPREAD DOWN	<input type="checkbox"/>	SP Spot (25°)	FL Flood (40°)	WF Wide Flood (60°)
SPECIALTY LENS	<input type="checkbox"/>	0 None [Ⓢ]		
LUMENS UP ³	<input type="checkbox"/>	00 None [Ⓢ]	07 750 lm	10 1000 lm 12 1250 lm
BEAM SPREAD UP ³	<input type="checkbox"/>	00 None [Ⓢ]	SP Spot (25°)	FL Flood (40°) WF Wide Flood (60°)
CCT	<input type="checkbox"/>	27 2700K 3W Warm Dim ⁴	30 3000K T1 Tunable White (40K - 18K) ⁵	35 3500K T2 Tunable White (65K - 27K) ⁵ 40 4000K
FINISH	<input type="checkbox"/>	WH White BZ Bronze	BK Black CC Custom Color	BA Brushed Aluminum
DIMMING	<input type="checkbox"/>	O 0-10V	T TRIAC/ELV	D DALI-2 ⁶
EMERGENCY	<input type="checkbox"/>	00 None		
TRIM	<input type="checkbox"/>	S Standard O Decorative: Open <i>Coming Soon</i>	N Snoot Y Decorative: Hyperbolic <i>Coming Soon</i>	W Wall Wash <i>Coming Soon</i> F Decorative: Float <i>Coming Soon</i>

[Ⓢ] Required for Wet Location/IP65 rating

¹ Requires XCPX-CC/SC Custom Length Cord/Stem, minimum length 3", maximum length 156" (Cord), 96" (Stem)

³ Only available in 9" size, Damp Location rated

⁴ Only available in 1000 lm; Not available in Spot beam spread

⁵ Only available in 1000 lm, DALI dimming

⁶ Only available in 1000 lm with Warm Dim or Tunable White CCT or 1250 lm with static CCT

⁷ Not available in Uplight; All drivers utilize EM Kit mounted above ceiling with emergency LED driver



TYPE L18

3" Round Cylinder
Pendant Mount

SUMMARY

	STATIC CCT	WARM DIM	TUNABLE WHITE
CCT	2700K, 3000K, 3500K, 4000K	3000K - 1800K	4000K - 1800K; 6500K - 2700K
LUMENS	750 lm (9.5W), 1000 lm (12.5W), 1250 lm (14.3W)	1000 lm (12.0W)	1000 lm (14.3W)
EFFICACY	79 lm/W, 80 lm/W, 87 lm/W	83 lm/W	70 lm/W
COLOR QUALITY	93 CRI*, 2-step SDCM	93 CRI*, 2-step SDCM	93 CRI*, 3-step SDCM
BEAM SPREAD	Spot (25°), Flood (40°), Wide Flood (60°)	Flood (40°), Wide Flood (60°)	Spot, Flood (40°), Wide Flood (60°)
DIMMING	0-10V (120/277V): 1% TRIAC/ELV (120V): 1% DALI-2 (120/277V): 0.1%	0-10V (120/277V): 1% TRIAC/ELV (120V): 1% DALI-2 (120/277V): 0.1%	DALI-2 (120/277V): 0.1%
LED CHIP	Cree	Bridgelux	Bridgelux
LISTINGS	ENERGY STAR® qualified**, California Title 24 2019 JA8 compliant, UL Listed for Wet Location, UL Certified US-CA, Declare, RoHS compliant, NSF/ANSI 2 listed, suitable for splash-zone***, DALI-2 Compliant		

*Tested in accordance to IESNA LM-79-2008

**Refer to ENERGY STAR Certified light fixtures database

***This product is evaluated in accordance to NSF/ANSI 2 for Splash Zone having designated trim finishes

ADDITIONAL

INPUT VOLTAGE: 120/277V, 50/60Hz

MAX INPUT CURRENT (120V): 0.11 amps

MAX INPUT CURRENT (277V): 0.05 amps

POWER FACTOR: Greater than 0.9

TOTAL HARMONIC DISTORTION: Less than 20%

AMBIENT OPERATING TEMPERATURE: -20°C to 40°C

LIFETIME: 50,000 hours at 70% lumen maintenance

WARRANTY: 5 year limited warranty

CYLINDER: Extruded aluminum

SIZE: 6.5", 9"

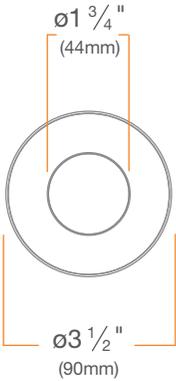
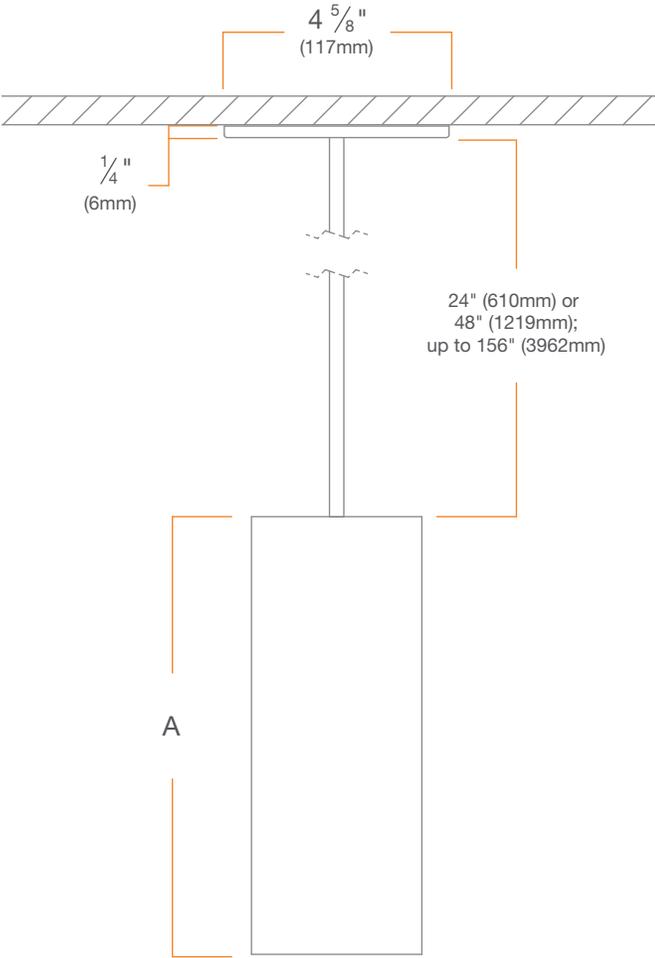
SUSPENSION: 24" or 48" standard length. Cord: Custom length up to 156". White, black or silver. Stem: Custom length up to 96". Painted steel stem with hanging straight endpoint up to 30° tilt (meets CA IR 16-9).

FINISH: White, Black, Bronze, Brushed Aluminum, Custom Color

INSTALLATION: Standard Canopy compatible with most 3" octagonal, 4" octagonal, 3" round and 4" round boxes.

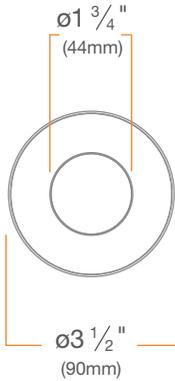
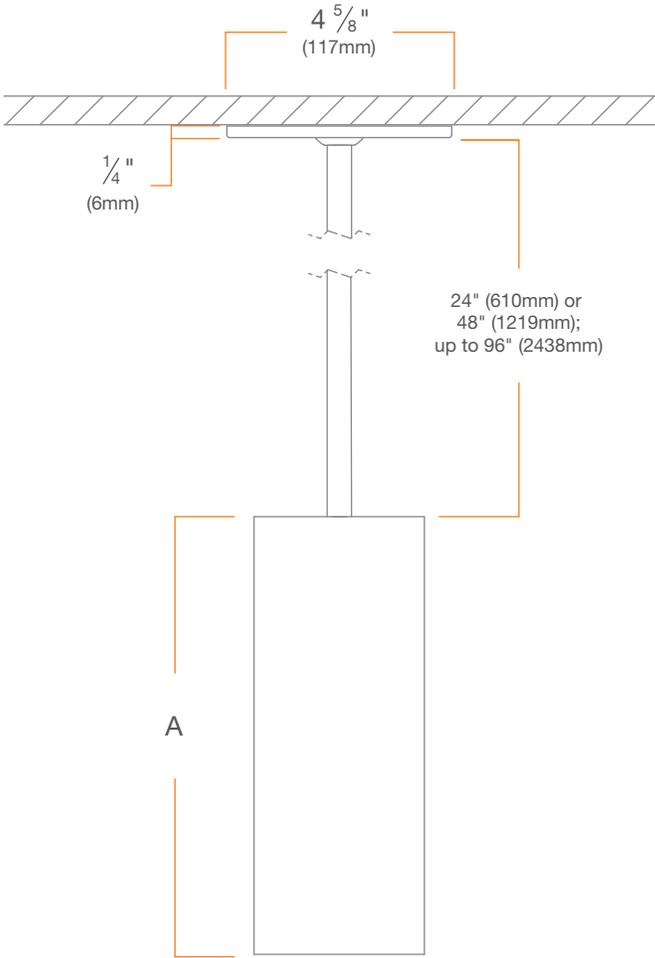
3" Cord Mount

XCPR9C



3" Stem Mount

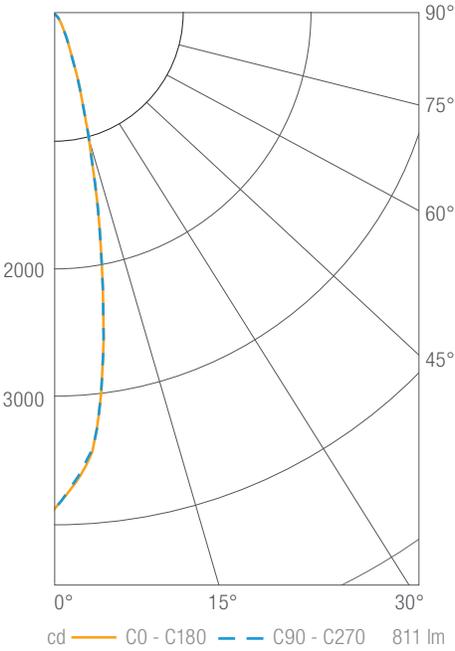
XCPR9S



A
6.5" [165 mm]
9" [229 mm]

PHOTOMETRY

X Series Cylinder 750 lm, 3000K, Spot



Luminous Intensity

Gamma	C 0°
0°	3849
5°	3383
10°	2162
15°	1069
20°	506
25°	260
30°	148
35°	89
40°	56
45°	37
50°	25
55°	17
60°	13
65°	10
70°	7
75°	5
80°	3
85°	2
90°	0

Values in candela

Zonal Lumen Summary

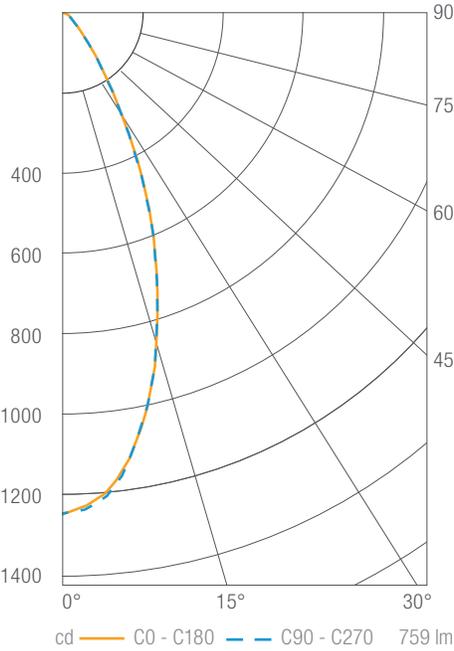
Zone	Lumens	Luminaire %
0-30	700	86
0-40	754	93
0-60	795	98
0-90	810	100
0-180	811	100

Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	428	1.2'
6'	107	2.3'
9'	48	3.5'
12'	27	4.6'

Beam Angle: 22°

X Series Cylinder 750 lm, 3000K, Flood



Luminous Intensity

Gamma	C 0°
0°	1250
5°	1211
10°	1078
15°	890
20°	682
25°	472
30°	288
35°	165
40°	90
45°	53
50°	35
55°	25
60°	20
65°	15
70°	12
75°	8
80°	5
85°	3
90°	0

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	567	75
0-40	670	88
0-60	733	97
0-90	756	100
0-180	759	100

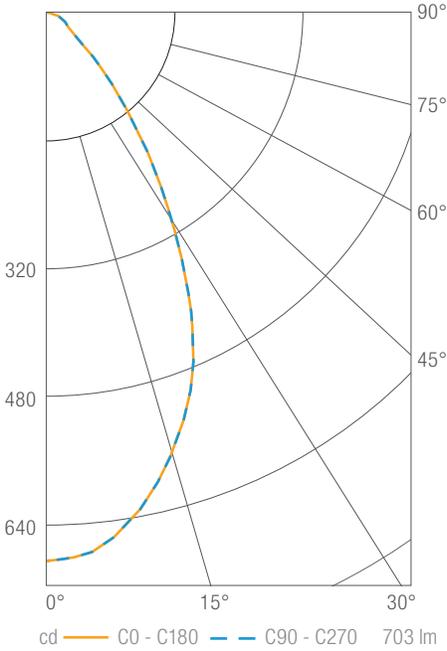
Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	139	2.3'
6'	35	4.7'
9'	15	7.0'
12'	9	9.4'

Beam Angle: 43°

PHOTOMETRY

X Series Cylinder 750 lm, 3000K, Wide Flood



Luminous Intensity

Gamma	C 0°
0°	974
5°	959
10°	907
15°	829
20°	736
25°	616
30°	468
35°	332
40°	221
45°	136
50°	81
55°	54
60°	44
65°	35
70°	26
75°	18
80°	11
85°	5
90°	0

Values in candela

Zonal Lumen Summary

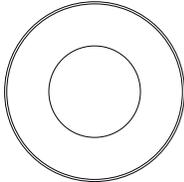
Zone	Lumens	Luminaire %
0-30	417	59
0-40	558	79
0-60	663	94
0-90	699	99
0-180	703	100

Illuminance Chart

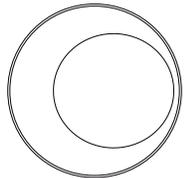
Distance from LED	Foot Candles	Diameter
3'	76	3.4'
6'	19	6.7'
9'	8	10.1'
12'	5	13.5'

Beam Angle: 59°

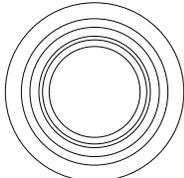
TRIMS



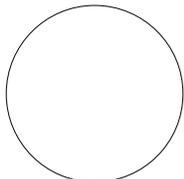
Standard



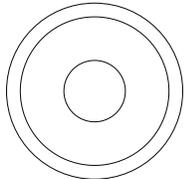
Wall Wash



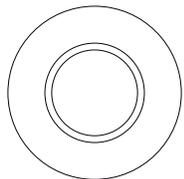
Snoot



**Decorative
Float**



**Decorative
Hyperbolic**



**Decorative
Open**

TRIMS

Standard

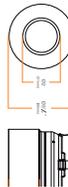
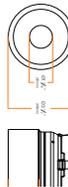
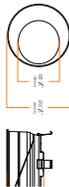
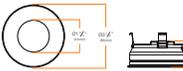
Wall Wash

Snoot

**Decorative
Float**

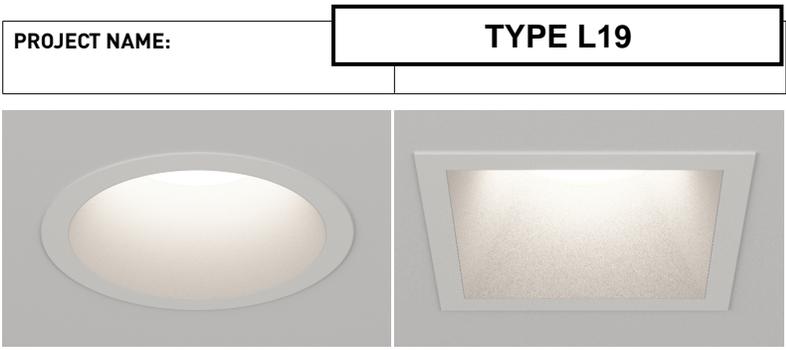
**Decorative
Hyperbolic**

**Decorative
Open**



FRAXION®3 SLIM FIXED

Starting Q4 2024, we will begin shipping our new, enhanced, Fraxion3 family. This update features increased lumen outputs up to 2750lm delivered and the addition of deep regress, and remodel fixtures. See Page 2 for fixture comparison.



ORDERING INFORMATION - DOWNLIGHT / HOUSING



JA8-2022 INDICATED BY SHADING

SHAPE	TRIM	RATING	TYPE	FLANGE FINISH	BAFFLE FINISH	CRI / WATTAGE PACKAGE	CCT	OPTIC (UGR)	INSTALL TYPE	CEILING THICKNESS	DRIVER	MEDIA
F3R Round	M Microflange	1 Dry/Damp	F Fixed	WH White	WH White	STATIC WHITE	24 2400K*	10 10°* (>19)	INTEGRAL DRIVER	1 0.50" - 1.375"	INTEGRAL / REMOTE	STANDARD MEDIA
F3S Square	T Trimless Drywall	2 Wet*		AG Satin Silver	AG Satin Silver	80S06A 80+ CRI, 06 Watts Lumens Divd. - 774	24 2400K* *(90+ CRI only, 15W max)	15 15° (>19)	X IC	2 1.375" - 2.125"	PH Forward / Reverse Phase, 2%, 120V	04 Soft Focus Lens
	W Trimless Millwork	*Suction cup provided for aim & focus)		AU Cashmere Gold	AU Cashmere Gold	80S11A 80+ CRI, 11 Watts Lumens Divd. - 1259	27 2700K	20 20° (<16)	Y NIC	*[Only available for 10° and 15° optic]	SG eldoLED, ECOdrive 1%, 0-10V, LOG, 120V-277V	NL No Lens*
				BB Burnt Bronze	BB Burnt Bronze	80S15A 80+ CRI, 15 Watts Lumens Divd. - 1696	30 3000K	25 25° (<16)	C IC, Airtight*	T 0.50" - 1.375"	SN eldoLED, ECOdrive 1%, 0-10V, LIN, 120V-277V	*[Standard with 10° optic. Not available for Wet location, Warm Dim or Airtight Housings]
				BK Black	BK Black	80S21A 80+ CRI, 21 Watts* Lumens Divd. - 2304	35 3500K	40 40° (>19)	*[CCEA, Airtight & Title 24 compliant housing]	*[Includes adjustable housing height bracket, recommended for T-Grid applications]	EG eldoLED, SOLDrive 0.1% 0-10V, LOG, 120V-277V	ALTERNATE MEDIA
				PR Primer	PR Primer	90S06A 90+ CRI, 6 Watts Lumens Divd. - 665	40 4000K	60 60° (>19)	REMOTE DRIVER		EN eldoLED, SOLDrive 0.1% 0-10V, LIN, 120V-277V	02 Honeycomb Louver*
				00 Trimless*	CF Custom Finish*	90S11A 90+ CRI, 11 Watts Lumens Divd. - 1082		85 85°* (>19)	V IC, Remote		ED eldoLED, SOLDrive 0.1% DALI-2, LOG, 120V-277V	*[Not available for Wet location, 21W, Warm Dim or Airtight Housings]
				*[Required for trimless]	*[Consult Factory]	90S15A 90+ CRI, 15 Watts Lumens Divd. - 1457			W NIC, Remote		LP Lutron, Hi-Lume Premier Ecosystem 0.1% Fade to Black, 120V or 277V*	03 Clear Glass Lens*
				CF Custom Finish*	*[Consult Factory]	90S21A 90+ CRI, 21 Watts* Lumens Divd. - 1979			D IC, Airtight, Remote*		*[Not available for 21W packages in X and C install types]	05 Frosted Glass Lens
						97S06A 97+ CRI, 06 Watts Lumens Divd. - 583			*[CCEA, Airtight & Title 24 compliant housing]		AS1 / Athena Control eldoLED, SOLDrive 0.1%, 120V-277V*	08 Frosted Soft Focus Lens
						97S11A 97+ CRI, 11 Watts Lumens Divd. - 950					ASR eldoLED, SOLDrive 0.1%, 120V-277V*	14 Wide Distribution Lens*
						97S15A 97+ CRI, 15 Watts Lumens Divd. - 1279					*[Includes Athena Node. Extended lead time, consult factory. ASR includes shunt]	*[Required and only available for 85° beam spread]
						97S21A 97+ CRI, 21 Watts* Lumens Divd. - 1738					CS1 / Casambi Control eldoLED, SOLDrive 0.1%, 120V-277V*	26 Frosted Linear Spread Lens
						*[21W Not available for IC housings or with "HCL+SFL" media]					*[Includes Casambi Node. Extended lead time, consult factory. CSR includes shunt]	
						WARM DIM		20 20° (<13)			TUNABLE WHITE REMOTE (120-277V)	
						90W10A 90+ CRI, 10 Watts		25 25° (<16)			DG eldoLED, DUALdrive 0.1% 0-10V, LOG	
						90W15A 90+ CRI, 15 Watts Incandescent Profile 11W Lumens Divd. - 1031 15W Lumens Divd. - 1031	WL 2600K (11W) 2700K (15W) -1800K	40 40° (<19)			DN eldoLED, DUALdrive 0.1% 0-10V, LIN	
						Halogen Profile 11W Lumens Divd. - 1031 15W Lumens Divd. - 1031	WD 2900K (11W) 3000K (15W) -1800K	60 60° (>19)			DD eldoLED, DUALdrive 0.1% DALI-2, LOG	
						SEE PAGE 5 FOR DETAILED WARM DIM PROFILE COMPARISON.		85 85° (>19)			AD1 / Athena Control eldoLED, DUALdrive, 0.1%*	
						TUNABLE WHITE					ADR eldoLED, DUALdrive, 0.1%*	
						90T17A 90+ CRI, 17 Watts* * [Only available for remote housings] Cool Profile Lumens Divd. - 1213	TH 5000K - 2700K	15 15° (>19)			*[Includes Athena Node. Extended lead time, consult factory. ADR includes shunt]	
						Warm Profile Lumens Divd. - 1219	TR 4000K - 1800K	20 20° (<13)			CD1 / Casambi Control eldoLED, DUALdrive, 0.1%*	
						DELIVERED LUMEN OUTPUTS AND T24 COMPLIANCE REFLECT 3000K, 20° OPTIC, AND SOFT FOCUS LENS.		25 25° (<13)			CDR eldoLED, DUALdrive, 0.1%*	
								40 40° (<16)			*[Includes Casambi Node. Extended lead time, consult factory. CDR includes shunt]	
								60 60° (<19)				
								85 85°* (>19)				
									SEE PAGE 4 FOR UGR RATINGS.			



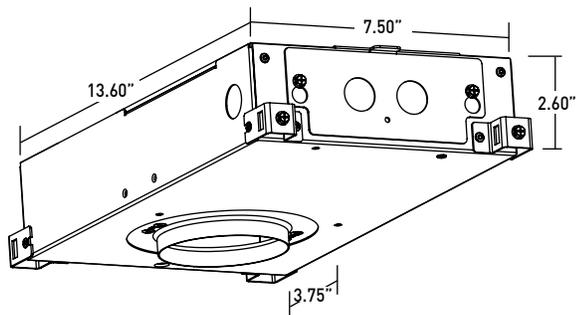
PART NUMBER NOTES

- Fixture ships as e.g., F3RM1F-WHWH-90S11A2-3X1-PH*

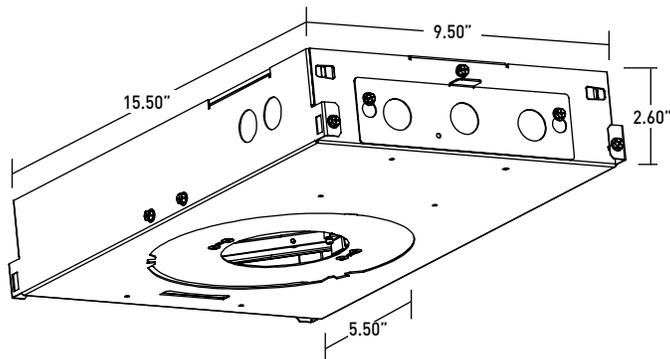


ACCESSORIES

CURRENT FRAXION3



NEW FRAXION3



FIXTURE COMPARISON	CURRENT	NEW
MAX DELIVERED LUMENS	2304	2750
REMODEL	NO	YES
CONCRETE SOLUTION	NO	YES
INTERNATIONAL	NO	YES
DEEP REGRESS	NO	YES
SQUARE TO SQUARE BAFFLE	NO	YES

ACCESSORIES

ROUND SECONDARY MEDIA

Dry / Damp location only

Wet location requires alternate baffle.

- HCL-F3R** Honeycomb Louver w/ Diffusion Lens*
*(Not available for Warm Dim, Wet locations, 21W or Airtight Housings)
- CGL-F3R** Clear Glass Lens*
*(Not available for Warm Dim)
- FGL-F3R** Frosted Glass Lens
- SFL-F3R** Soft Focus Lens
- FSFL-F3R** Frosted Soft Focus Lens
- WDL-F3R** Wide Distribution Lens*
*(For use with 60° optic only)
- FLSL-F3R** Frosted Linear Spread Lens

SQUARE SECONDARY MEDIA

Dry / Damp location only

Wet location requires alternate baffle.

- HCL-F3S** Honeycomb Louver w/ Diffusion Lens*
*(Not available for Warm Dim, Wet locations, 21W, or Airtight Housings)
- CGL-F3S** Clear Glass Lens*
*(Not available for Warm Dim)
- FGL-F3S** Frosted Glass Lens
- SFL-F3S** Soft Focus Lens
- FSFL-F3S** Frosted Soft Focus Lens
- WDL-F3S** Wide Distribution Lens*
*(For use with 60° optic only)
- FLSL-F3S** Frosted Linear Spread Lens

REPLACEMENT OPTICS

Interchangeable optics accessible through fixture aperture.

- | | | |
|---|---|--|
| <p>Static White</p> <ul style="list-style-type: none"> <input type="checkbox"/> RO-50-15-S 15° optic <input type="checkbox"/> RO-50-20-S 20° optic <input type="checkbox"/> RO-50-25-S 25° optic <input type="checkbox"/> RO-50-40-S 40° optic <input type="checkbox"/> RO-50-60-S 60° optic | <p>Warm Dim</p> <ul style="list-style-type: none"> <input type="checkbox"/> RO-50-20-W 20° optic <input type="checkbox"/> RO-50-25-W 25° optic <input type="checkbox"/> RO-50-40-W 40° optic <input type="checkbox"/> RO-50-60-W 60° optic | <p>Tunable White</p> <ul style="list-style-type: none"> <input type="checkbox"/> RO-50-15-T 15° optic <input type="checkbox"/> RO-50-20-T 20° optic <input type="checkbox"/> RO-50-25-T 25° optic <input type="checkbox"/> RO-50-40-T 40° optic <input type="checkbox"/> RO-50-60-T 60° optic |
|---|---|--|

ALTERNATE BAFFLE ASSEMBLY (INCLUDES EFFECTS DEVICE)

ASSEMBLY	SHAPE	RATING	TYPE	BAFFLE FINISH	EFFECTS DEVICE
RBA			F		
REPLACEMENT BAFFLE ASSEMBLY	F3R Round F3S Square	1 Dry / Damp 2 Wet* *(Requires suction cup to service or aim & focus)	F Fixed	WH White BK Black PR Primer AU Cashmere Gold AG Satin Silver BB Burnt Bronze CF Custom Finish * *(Consult Factory)	Leave blank for standard Soft Focus Lens CGL Clear Glass Lens * *(Not available for Warm Dim) FGL Frosted Glass Lens FSFL Frosted Soft Focus Lens WDL Wide Distribution Lens * *(For use with 60° optic only) FLSL Frosted Linear Spread Lens

REPLACEMENT SUCTION TOOL

One included with every six fixtures designated Wet location.

- F4-TOOL-SUCTION** Allows for removal of Wet Location baffles

T-GRID ACCESSORY KIT

Supplied with ceiling thickness "T" and recommended for installations in T-Grid up to 1.5" tall. Available for ceiling thicknesses from 0.50" - 2.125".

- TG-FX3-KIT**

FURRING CHANNEL ACCESSORY KIT

Recommended for installations in furring channel. Available for ceiling thicknesses from 0.50" - 2.125".

- DHA-FC-KIT**

HANGER BAR EXTENDER KIT

Extends hanger bars from 24.0" to 46.0" maximum.

- FRX-HBE-46** Extender, Hanger Bar

EMERGENCY LIGHTING - REMOTE MOUNT ONLY

During disruption of main power, emergency battery inverter provides temporary 120V or 277V to fixture.

- EMB-S-25-120/277-LEDX** 25 watt max capacity, 120 or 277 VAC 60Hz, Non-Dimmable
- EMB-S-100-120-LEDX** 100 watt max capacity, 120 VAC 60Hz, 0-10V Dimmable
- EMB-S-100-277-LEDX** 100 watt max capacity, 277 VAC 60Hz, 0-10V Dimmable
- EMB-S-250-120/277-LEDX** 250 watt max capacity, 120 or 277 VAC 60Hz, 0-10V Dimmable

***SHUNT REQUIRED FOR USE WITH ATHENA AND CASAMBI CONTROLS, CONSULT FACTORY FOR DETAILS.**

REPLACEMENT APPLIQUÉ

- DLA-APP-F3RT** Round
- DLA-APP-F3ST** Square

PERFORMANCE - 3000K

LUMEN PACKAGE	WATT-AGE	10° OPTIC NO SOFT FOCUS LENS		15° OPTIC SOFT FOCUS LENS		20° OPTIC SOFT FOCUS LENS		25° OPTIC SOFT FOCUS LENS		40° OPTIC SOFT FOCUS LENS		60° OPTIC SOFT FOCUS LENS		85° OPTIC WIDE DISTRIBUTION	
		DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW
80S06A	06	-	-	727	121	774	129	745	124	673	112	722	120	585	98
80S11A	11	-	-	1179	107	1259	114	1211	110	1098	100	1172	107	949	86
80S15A	15	1022	93	1594	106	1696	113	1634	109	1476	98	1583	106	1283	86
80S21A	21	-	-	2158	103	2304	110	2216	106	2006	96	2153	103	1731	82
90S06A	06	-	-	624	104	665	111	640	107	578	96	620	103	503	84
90S11A	11	-	-	1013	92	1082	98	1040	95	943	86	1007	92	815	74
90S15A	15	881	80	1369	91	1457	97	1404	94	1268	85	1360	91	1102	73
90S21A	21	-	-	1854	88	1979	94	1904	91	1723	82	1850	88	1487	71
97S06A	06	-	-	548	91	583	97	562	94	508	85	545	91	441	74
97S11A	11	-	-	889	81	950	86	913	83	828	75	884	80	716	65
97S15A	15	760	69	1202	80	1279	85	1233	82	1113	74	1194	80	968	65
97S21A	21	-	-	1628	78	1738	83	1672	80	1513	72	1624	77	1306	62
90W10A (27K-18K)	10	-	-	-	-	737	73	726	72	664	66	709	70	582	58
90W10A (30K-18K)	10	-	-	-	-	736	73	720	72	667	66	714	71	588	58
90W15A (27K-18K)	15	-	-	-	-	1031	69	1001	67	928	62	992	66	814	54
90W15A (30K-18K)	15	-	-	-	-	1031	69	1009	67	934	62	1000	67	823	55
90T17A (50K-27K)	17	-	-	1065	63	1213	71	1204	71	1219	72	1226	72	997	59
90T17A (40K-18K)	17	-	-	1070	63	1219	71	1218	71	1118	65	1231	72	992	59

OUTPUT MULTIPLIER

CCT	CCT SCALE
2400K	0.85
2700K	0.97
3000K	1.00
3500K	1.03
4000K	1.08

MEDIA LIGHT LOSS FACTOR

MEDIA	LIGHT LOSS FACTOR
NO LENS	1.08
CGL	1.00
SFL	1.00
FGL	0.86
FSFL	0.80
FLSL	0.77
WDL	0.81
HCL	0.68

TUNABLE WHITE MULTIPLIER

CCT	5000K-2700K	4000K-1800K
5000K	1.16	-
4000K	1.08	1.14
3500K	1.04	1.07
3000K	1.00	1.00
2700K	0.96	0.92
2400K	-	0.84
1800K	-	0.69

JA8-2022 INDICATED BY SHADING

UNIFIED GLARE RATING

10° OPTIC NO LENS	15° OPTIC SOFT FOCUS LENS	20° OPTIC SOFT FOCUS LENS	25° OPTIC SOFT FOCUS LENS	40° OPTIC SOFT FOCUS LENS	60° OPTIC SOFT FOCUS LENS	85° OPTIC WIDE DISTRIBUTION LENS
>19	>19	<16	<16	<19	>19	>19

WARM DIM PERFORMANCE - SOFT FOCUS LENS - 20° OPTIC

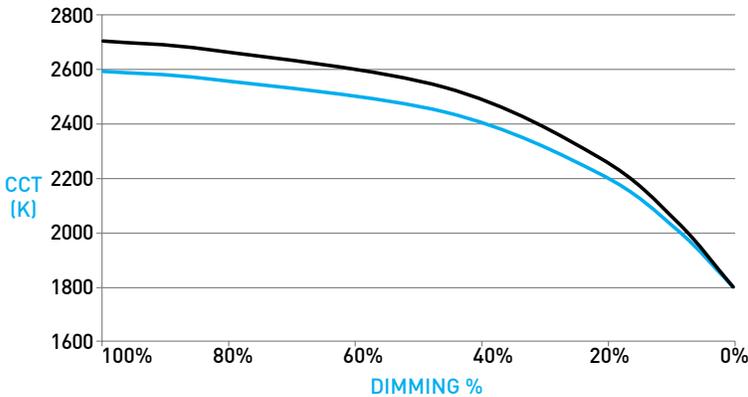
INCANDESCENT PROFILE

90W10AL 2700K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2600	2550	2520	2450	2200	1925	1800
Light Output (Lm)	737	589	515	368	147	73	14
Power (W)	10	8	7	5	2	1	.2
Efficacy (LPW)	73	73	73	73	73	73	73
90W15AL 2700K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2700	2650	2620	2520	2180	1950	1800
Light Output (Lm)	1031	824	721	515	206	103	20
Power (W)	15	12	10.5	7.5	3	1.5	0.3
Efficacy (LPW)	69	69	69	69	69	69	69

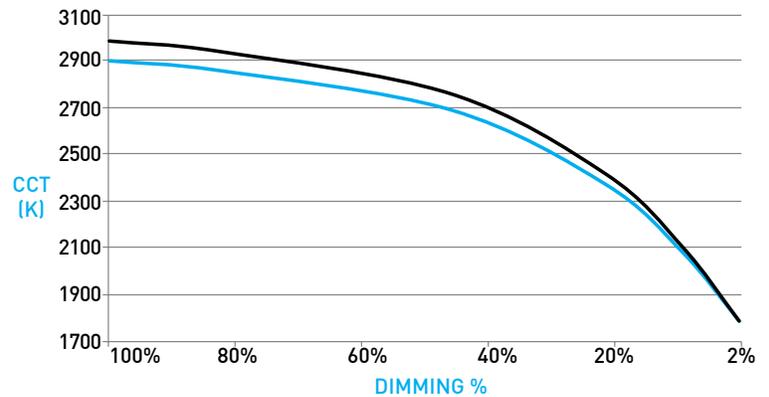
HALOGEN PROFILE

90W10AD 3000K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2900	2850	2800	2720	2350	1975	1800
Light Output (Lm)	736	589	515	368	147	73	14
Power (W)	10	8	7	5	2	1	.2
Efficacy (LPW)	73	73	73	73	73	73	73
90W15AD 3000K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	3000	2950	2920	2775	2375	2000	1800
Light Output (Lm)	1031	824	721	515	206	103	20
Power (W)	15	12	10.5	7.5	3	1.5	0.3
Efficacy (LPW)	69	69	69	69	69	69	69

10W / 15W



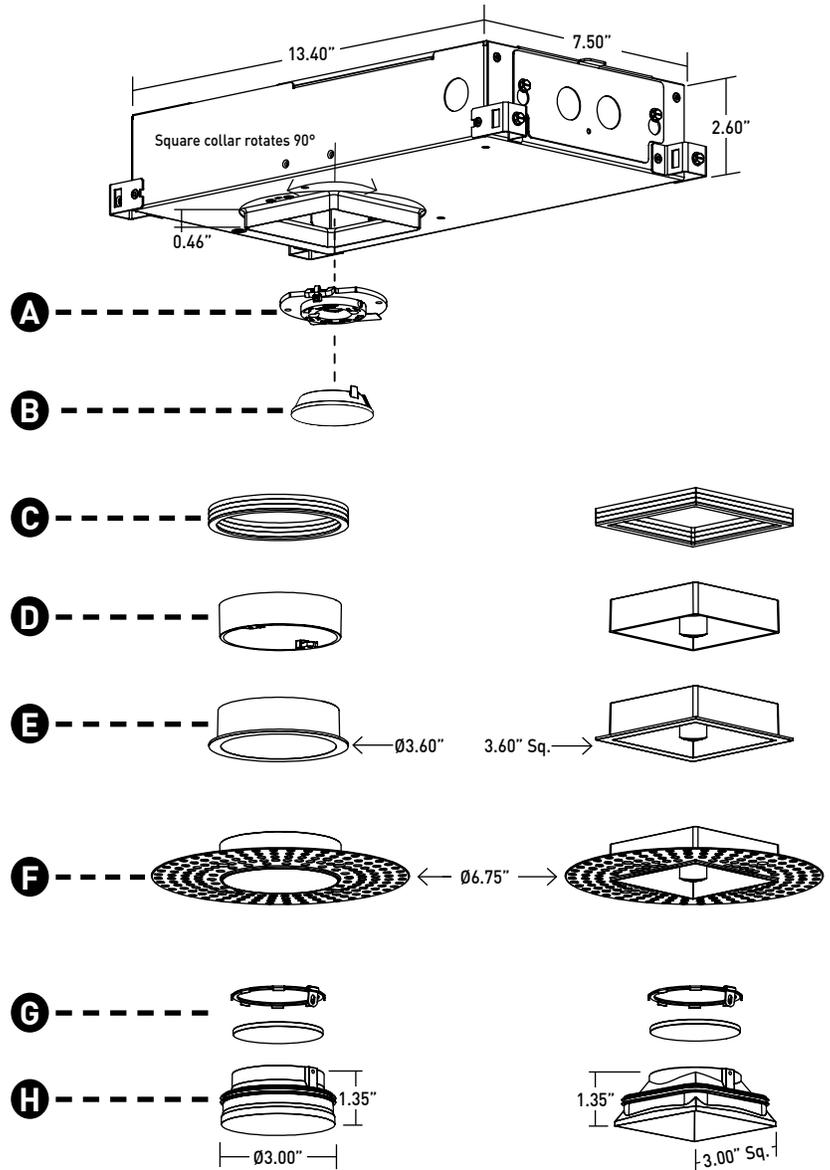
10W / 15W



DOWNLIGHT / HOUSING

- A LED**
Integral LED module design enables field service / replacement through housing aperture.
 - B OPTIC**
Robust light engine with optimized optic pairing integrates Reflection, Refraction, and TIR offering 10°, 15°, 20°, 25°, 40° & 60° beams.
 - C TRIMLESS MILLWORK SPACERS**
Provided for Trimless Millwork installations; includes (1) 1/16" spacer and (5) 1/8" spacers.
 - D TRIM EXTENSION**
Provided for -2 ceiling thickness; accommodates 2.125" max ceiling thickness.
 - E MICROFLANGE PROFILE**
Features 0.30" flange. Thickness measures 0.06". Installed after ceiling is complete. Requires 3.375" diameter cutout. Wet location features integral silicone gasket.
 - F TRIMLESS DRYWALL PROFILE**
Installs totally flush with the ceiling with no visible trim. Appliqué includes screws for mounting and has 0.06" plaster stop. Not recommended for stucco applications.
 - G MEDIA / LENS RETAINER**
Fixture is limited to 1 effects device. Wet location effects device is sealed in place. Suction tool provided for removal of baffle with wet location. Lens retainer allows effects devices to be changed in Dry /Damp locations.
 - H ROUND BAFFLE**
Die-cast removable baffle provides easy access to tilting mechanism and features 62° glare cutoff. Minimizes aperture glare and conceals view into housing; includes gasket.
- SQUARE TRANSITIONAL BAFFLE**
Die-cast removable baffle provides easy access to tilting mechanism and features 62° glare cutoff. Transitions from square aperture at ceiling plane to round aperture at light source. Minimizes aperture glare and conceals view into housing; includes gasket.

DIMENSIONS / DRAWINGS



DOWNLIGHT / HOUSING

- I** **IC HOUSING**
 - For IC ceilings.
 - No setback from polycell spray foam insulation having max R-Value of 60 on all sides and top of housing.
- J** **NIC HOUSING**
 - Minimum 0.50" setback from combustible and non-combustible materials on all sides and top of housing.
 - Minimum 3.00" setback from insulation material having max R-Value 30 on all sides and top of housing.
 - Minimum 6.00" setback from polycell spray foam insulation having max R-Value 60.
- K** **ADJUSTABLE HANGER BAR HEIGHT ACCESSORY**

Provided with ceiling thickness "T" and recommended for installations in T-Grid up to 1.5" tall. Hanger bars are installed to adjustable bracket. Allows housing to be raised and lowered; ceiling thickness remains 0.5" to 1.375" max.
- L** **APPLIQUÉ DETAIL**

Appliqué for plaster floating directly to baffle.
- M** **REMOTE POWER SUPPLY**

Provided with install Types "V", "W" and "D". Remote power supply provides additional driver options. See page 8 for maximum allowable secondary run lengths between PSF3-RMT and fixture. Must be installed in an accessible location.
- N** **ATHENA / CASAMBI CONTROL**

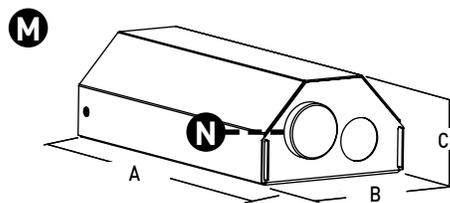
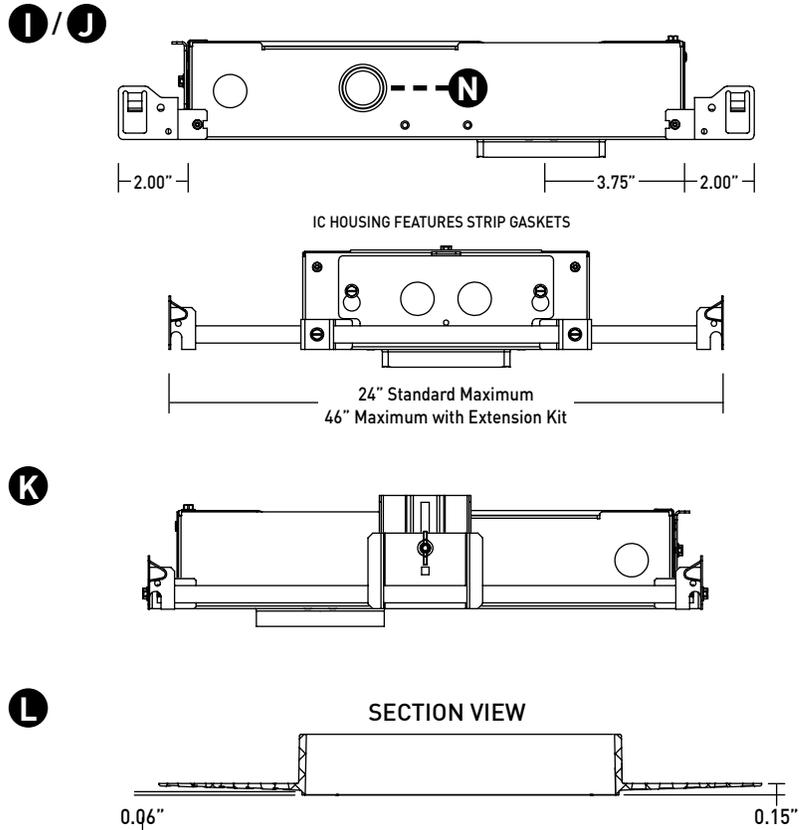
Controls integrated into housing or remote driver assembly. All equipment is serviceable.

Athena Model Numbers: A-WN-D01-RF-BL & DFC-OEM-DBI

Casambi Model Number: BT-S1E1-5400
- O** **ATHENA / CASAMBI EM SHUNT**

Included with drivers specified as ASR, ADR, CSR, or CDR. One required for each wireless EM fixture, requires class 2 control wiring between fixture and shunt. Features integrated test switch.

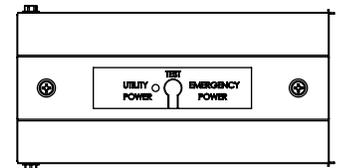
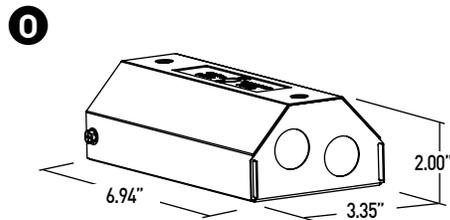
Model Number: PS-RMT-SHUNT



	A	B	C
STATIC WHITE / WARM DIM	6.94"	3.35"	2.00"
TUNABLE WHITE	8.10"	5.00"	2.00"
ATHENA / CASAMBI CONTROLLED	8.10"	5.00"	2.00"

HOUSING NOTES

- Do not install NON-IC housings in environments where ambient temperatures exceed 40°C (104°F). See table below for IC housings.
- Power supply compartment and all splice connections may be serviced from room side.
- Consult factory for spacing requirements for any installations exceeding R-Value 60.
- Hanger bars fitted to short side of housing or long side when TG accessory is specified; extend from 14.0" to 24.0", but may be field cut to accommodate narrow stud spacing. Can be extended up to 46" maximum with FRX-HBE-46 kit.
- Hanger bars and brackets add 4.00" max to the overall dimension, but are exclusive of the setback requirements.
- Housings for round trims feature a round aperture housing collar. Housings for square trims feature a square housing collar that rotates up to 90 degrees for fixture alignment. Housing collars accommodate ceiling thicknesses between 0.50" and 2.125".



IC HOUSING MAX AMBIENT TEMPERATURE	
LUMEN PACKAGE	TEMPERATURE
06W / 11W STATIC WHITE	40°C (104°F)
10W WARM DIM	35°C (95°F)
15W STATIC WHITE	25°C (77°F)
15W WARM DIM	30°C (86°F)
17W TUNABLE WHITE	30°C (86°F)

TECHNICAL

CONSTRUCTION

Downlight: Painted finishes are granulated powder coat.
Housing: Aluminum and 22 Gauge galvanized steel. Die-cast aluminum heat-sink.
Remote Power Supply: 22 Gauge galvanized steel.
Appliqué: Zinc alloy.

STATIC WHITE LED

2-step MacAdam ellipse LED module available in 80+, 90+ and 97+ CRI configurations in color temperatures of 2700K, 3000K, 3500K and 4000K.
 3-step MacAdam ellipse LED module available in 90+ CRI configuration in color temperature of 2400K. Average rated lamp life of 50,000 hours.
 LED and driver assemblies are field-replaceable.

WARM DIM LED

3-step MacAdam ellipse warm dim LED module available in 90+ CRI configuration. 3000K or 2700K at full brightness, warming to 1800K at full dim. Average rated lamp life of 50,000 hours. LED and driver assemblies are field-replaceable.

TUNABLE WHITE LED

3-step MacAdam ellipse tunable white LED module available in 90+ CRI configuration. Features tuning ranges of 1800K to 4000K and 2700K to 5000K. Average rated lamp life of 50,000 hours. LED and driver assemblies are field-replaceable.

POWER SUPPLY PERFORMANCE AND DIMMING INFORMATION

Power Supply	PHASE		0-10V					ECO	DALI-2		ATHENA		CASAMBI	
	PH	SG	SN	EG	EN	DG	DN	LP	ED	DD	AS	AD	CS	CD
Minimum °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	0 °C	-20 °C	-20 °C	0 °C	0 °C	-20 °C	-20 °C
Maximum °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Dimming %	2.0%	1.0%	1.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%

Note: For LP, EG and EN drivers consult chart on page 9 to confirm appropriate dimming curve for compatibility with selected control.

MAXIMUM ALLOWABLE REMOTE DRIVER WIRING DISTANCES

DRIVER	WIRE AWG				
	12	14	16	18	20
PH	285'	180'	113'	71'	45'
LP	60'	40'	25'	15'	-
EG, EN, ED, DG, DN, DD, SG, SN, AS, CS, AD, CD	-	-	118'	72'	46'

LISTING

cTUVus listed to UL1598 standard for Dry / Damp and Wet locations. CCEA, Airtight, and Title 24 JA8-2022 Listed. NEMA 410 Compliant.

BUY AMERICAN ACT

All Fraxion3 Slim Adjustable configurations are Buy American Act compliant.

DECLARE

LBC Red List Approved.

WEIGHT

Fixture - 2.4 lbs
 Remote Driver - 1.4 lbs

LIMITED WARRANTY

Manufacturer's Limited Warranty guarantees product(s) listed to be free from defects in material and workmanship under normal use and service for 1-year. LED and power supplies are warranted to operate with 70% of original flux and remain within a range of 3 duv for a period of 5-years.

10-year Lutron Advantage limited warranty available on Lutron equipped systems. Warranty period begins from the date of shipment by Seller.

[Consult website for full warranty terms and conditions.](#)

CHANGE LOG

- 10/17/2022: REMOVED 90W13A 3200K-1800K WARM DIM AND ADDED 90W15AD 3000K-1800K WARM DIM.
- 10/17/2022: UPDATED MAX AMBIENT TEMPERATURE TABLE.
- 02/14/2023: ADDED EG, EN, AND ED DRIVER OFFERINGS.
- 04/26/2023: ADDED DECLARE LBC RED LIST APPROVED.
- 08/07/2023: ADDED NEW LED AND OPTIC OFFERINGS. REMOVED 2200K OFFERING.
- 02/01/2024: ADDED ATHENA AND CASAMBI CONTROL OFFERING, 2400K, AND WARM PROFILE TUNABLE WHITE.
- 07/15/2024: REMOVED L2 DRIVER OFFERING.



DIMMING COMPATIBILITY

LUTRON DRIVER COMPATIBILITY

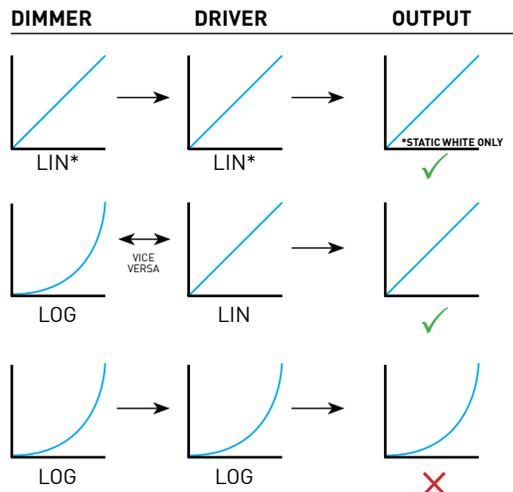
Power supply LP Lutron Product Family	Part No.
PowPak Dimming Modules	RMJ-EC032-DV-B
PowPak Dimming Modules	FCJ/FCJS-ECO
Energi Savr Nodes	QSN-1ECO-S
GRAFIK Eye QS control unit Homeworks QS control unit	QSN-2ECO-S
GRAFIK Eye QS control unit Homeworks QS control unit	QSGRJ- _E (wireless) QSGR- _E
Quantum Hub	QP2- _ _ 2C
Quantum Hub	QP2- _ _ 4C
Quantum Hub	QP2- _ _ 6C
Quantum Hub	QP2- _ _ 8C
Homeworks QS power module myRoom Plus power module	LQSE-2ECO-D



eldoLED DRIVER COMPATIBILITY

Power supply EG/SG Manufacturer	Family/Model #
Busch-Jaeger	2112U-101
Jung	240-10
Leviton Lighting Controls	IP710-DLX
Lightolier Controls	ZP600FAM120
Merten	5729
Pass & Seymour	CD4FB-W
The Watt Stopper	DCLV1
Synergy	ISD BC
Crestron®	GLX-DIMFLV8
Crestron®	GLXP-DIMFLV8
Crestron®	GLPAC-DIMFLV4-*
Crestron®	GLPAC-DIMFLV8-*
Crestron®	GLPP-DIMFLVEX-PM
Crestron®	GLPP-1DIMFLV2EX-PM
Crestron®	GLPP-1DIMFLV3EX-PM
Crestron®	DIN-A08
Crestron®	DIN-4DIMFLV4
Crestron®	CLS-EXP-DIMFLV
Crestron®	CLCI-1DIMFLV2EX
Power supply EN/SN Manufacturer	Family/Model #
Lutron Electronics	Nova T® - NTFTV
Lutron Electronics	Diva® - DDTV
Lutron Electronics	Nova® - NFTV
Lutron Electronics	GrafixEye® GRX-TVI w GRX3503
Lutron Electronics	Energy Savr Node™ - QSN-4T16-S
Lutron Electronics	TVM2 Module
Sensor Switch	nIO EZ
ABB	SD/S 2.16.1

ANALOG DRIVERS AND DIMMERS

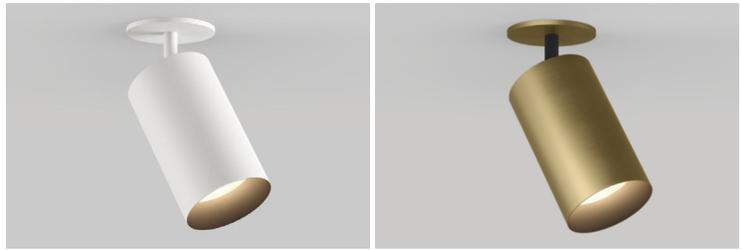


LIN = LINEAR
 LOG = LOGARITHMIC
 *LIN-TO-LIN NOT COMPATIBLE FOR WARM-DIM

MONOPOINT CM2 SURFACE MOUNT

Elegant design means this monopoint does more. An inventive elbow built into the fixture body that allows a full 90 degree tilt and drop lengths of up to 1' extend adjustability.

PROJECT NAME:	TYPE L20
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ORDERING INFORMATION - MONOPOINT



JA8-2022 COMPLIANCE INDICATED BY SHADING

CYLINDER	LENGTH	FIXTURE	BODY FINISH	BAFFLE FINISH	STEM FINISH	CRI/WATTAGE PACKAGE	CCT	OPTIC (UGR)	DRIVER	MEDIA	MOUNTING
CM2											
CM2 3.25"	LENGTHS SL 1.4" Standard 06 6" 12 12" CUSTOM LENGTHS XX Specify in 1" increments between 2"-11" (Ex. 4" = 04)* *(Increased lead time) STEMS ARE NOT FIELD CUTTABLE	ADJUSTABLE DRY / DAMP AD1 Adjustable 90° Tilt FIXED ANGLE WET (IP65) F02 Fixed 0° No Tilt* F12 Fixed 15° Tilt* F32 Fixed 30° Tilt* F42 Fixed 45° Tilt* *FIXED ANGLE TILT IS SET AS SPECIFIED, CANNOT BE CHANGED IN THE FIELD	POWDERCOAT WH White BK Black AB Architectural Bronze AG Satin Silver AU Cashmere Gold BB Burnt Bronze CF Custom Finish* ALUMINA INTERIOR APPLICATIONS ONLY 01 Brushed Obsidian 02 Matte Obsidian 03 Brushed Dark Patinated Bronze 04 Matte Dark Patinated Bronze 05 Brushed Aged Aluminum 06 Matte Aged Aluminum 07 Brushed Cast Brass 08 Matte Cast Brass 09 Brushed Light Patinated Bronze 10 Matte Light Patinated Bronze ALUMINA NOT RECOMMENDED FOR EXTERIOR APPLICATIONS, FINISHES ARE NOT UV RATED	POWDERCOAT WH White BK Black AB Architectural Bronze AG Satin Silver AU Cashmere Gold BB Burnt Bronze CF Custom Finish* ALUMINA CONSULT FACTORY FOR ALUMINA FINISHES	POWDERCOAT WH White BK Black AB Architectural Bronze AG Satin Silver AU Cashmere Gold BB Burnt Bronze CF Custom Finish* ALUMINA CONSULT FACTORY FOR ALUMINA FINISHES	<p>STATIC WHITE</p> <p>24 2400K* *(90+ CRI only) 27 2700K 30 3000K 35 3500K 40 4000K</p> <p>80S11A 80+ CRI, 11 Watts Im Delivered - 1216</p> <p>80S17A 80+ CRI, 17 Watts Im Delivered - 1843</p> <p>90S11A 90+ CRI, 11 Watts Im Delivered - 1045</p> <p>90S17A 90+ CRI, 17 Watts Im Delivered - 1583</p> <p>97S11A 97+ CRI, 11 Watts Im Delivered - 918</p> <p>97S17A 97+ CRI, 17 Watts Im Delivered - 1390</p> <p>REMOTE STATIC WHITE</p> <p>27 2700K 30 3000K 35 3500K* *(Not available for 97+ CRI) 40 4000K</p> <p>80S28B 80+ CRI, 28 Watts Im Delivered - 2756</p> <p>90S28B 90+ CRI, 28 Watts Im Delivered - 2368</p> <p>97S28B 97+ CRI, 28 Watts Im Delivered - 2079</p> <p>WARM DIM</p> <p>90W18A 90+ CRI, 18 Watts Incandescent Profile Im Delivered - 1140</p> <p>Halogen Profile Im Delivered - 1128</p> <p>SEE PAGE 3 FOR WARM DIM PROFILE COMPARISON.</p> <p>REMOTE TUNABLE WHITE</p> <p>90T28A 90+ CRI, 28W Cool Profile: 5000K - 2700K Im Delivered - 1977</p> <p>Warm Profile: 4000K - 1800K Im Delivered - 1995</p>	<p>24 2400K* *(90+ CRI only) 27 2700K 30 3000K 35 3500K 40 4000K</p> <p>WL 2700K - 1800K WD 3000K - 1800K</p> <p>TH 5000K - 2700K TR 4000K - 1800K</p>	<p>10 10° (>19) 15 15° (<13) 20 20° (<10) 25 25° (<10) 40 40° (<10) 60 60° (<16)</p> <p>15 15° (<13) 20 20° (<10) 25 25° (<10) 40 40° (<10) 60 60° (<13)</p> <p>15 15° (<13) 20 20° (<13) 25 25° (<13) 40 40° (<13) 60 60° (<16)</p>	<p>INTEGRAL CA 0-10V Analog 120-277V CE Electronic ELV / TRIAC 120V</p> <p>REMOTE (120V) RE Electronic ELV / TRIAC L2 Lutron, Hi-Lume 1% 2-wire</p> <p>REMOTE (120V-277V) RA 0-10V Analog LH Lutron, Hi-Lume Ecosystem 1% Fade to Black, LP Lutron, Hi-Lume Premier Ecosystem 0.1% Fade to Black EG eldoLED, SOLDrive 0.1% 0-10V, LOG EN eldoLED, SOLDrive 0.1% 0-10V, LIN ED eldoLED, SOLDrive 0.1% DALI-2, LOG AS1 / Athena Control ASR eldoLED, DUALdrive 0.1%* *(Includes Athena Node. Increased lead time, consult factory. ASR includes shunt.) CS1 / Casambi Control CSR eldoLED, DUALdrive 0.1%* *(Includes Athena Node. Increased lead time, consult factory. CSR includes shunt.)</p> <p>TUNABLE WHITE POWER SUPPLIES (120-277V) DD1 eldoLED, DUALdrive 0.1% DALI-2, LOG DG1 eldoLED, DUALdrive 0.1% 0-10V, LOG DL1 eldoLED, DUALdrive 0.1% 0-10V, LIN AD1 / Athena Control ADR eldoLED, DUALdrive 0.1%* *(Includes Athena Node. Increased lead time, consult factory. ADR includes shunt.) CD1 / Casambi Control CDR eldoLED, DUALdrive 0.1%* *(Includes Casambi Node. Extended lead time, consult factory. CDR includes shunt)</p>	<p>STANDARD MEDIA 4 Soft Focus Lens* *(Required for 10° optic)</p> <p>ALTERNATE MEDIA 2 Honeycomb Louver* *(Not available for Wet Location or Warm Dim) 3 Clear Glass Lens* *(Not available for Warm Dim) 5 Frosted Glass Lens 6 Frosted Soft Focus Lens 7 Frosted Linear Spread Lens S Soft Focus Lens w/ Honeycomb Louver F Frosted Glass Lens w/ Honeycomb Louver N No Lens* *(Not available for Wet Location or Warm Dim)</p>	<p>ROUGH-IN J JBMP 4" Sq. or 4/0 Junction Box Mounting Plate. Features 3.25" diameter canopy* *(Mounting plate must be installed on junction box prior to ceiling installation).</p> <p>FINISH OUT C CMJB 1/2" and 3/4" Conduit Ceiling Mount Junction Box. Features matching 3.25" canopy.* *(Not available for Wet Location. Only available in powdercoat finishes. Alumina finish fixtures ship with Black powdercoat CMJB) G Zero Sightline Gypsum (1/16" Applique) Features 2.6" diameter canopy* *(Mounts to 4/0 junction box) R Remodel 4.5" diameter Flange Overlay Canopy* *(Mounts to existing 4/0 junction box)</p>
			ALL LM DELIVERED AND T24 COMPLIANCE REFLECT 3000K PAIRED WITH 20° OPTIC AND SOFT FOCUS LENS						SEE PAGE 3 FOR UGR RATINGS		

PART NUMBER NOTES

- CM2 ships as e.g., CM202AD1WHBKWH90S11*3040CA*4
- Remote driver ships as e.g., PS-RMT-90S-28B-1L2*
- Mounting ships separate from fixture, part numbers listed on page 5.



FINISHES

POWDERCOAT FINISHES



ALUMINA FINISHES BY LUCIFER LIGHTING™



ACCESSORIES

REPLACEMENT MEDIA

HCL-CT2 Honeycomb Louver*
*(Not available for Warm Dim)

CGL-CT2 Clear Glass Lens*
*(Not available for Warm Dim)

SFL-CT2 Soft Focus Lens

FGL-CT2 Frosted Glass Lens

FSFL-CT2 Frosted Soft Focus Lens

FLSL-CT2 Frosted Linear Spread Lens

SECOND MEDIA GASKET

Replaces standard gasket when installing second media. Not required if two media are specified with fixture.

2EDG-CT2 Two Media Gasket

REPLACEMENT OPTICS

Interchangeable optics accessible by removing baffle.

Static White

- RO-70-15-S** 15° optic
- RO-70-20-S** 20° optic
- RO-70-25-S** 25° optic
- RO-70-40-S** 40° optic
- RO-70-60-S** 60° optic

Warm Dim

- RO-70-20-W** 20° optic
- RO-70-25-W** 25° optic
- RO-70-40-W** 40° optic
- RO-70-60-W** 60° optic

Tunable White

- RO-70-15-T** 15° optic
- RO-70-20-T** 20° optic
- RO-70-25-T** 25° optic
- RO-70-40-T** 40° optic
- RO-70-60-T** 60° optic

EMERGENCY LIGHTING - REMOTE MOUNT ONLY

During disruption of main power, emergency battery inverter provides temporary 120V or 277V to fixture.

- EMB-S-25-120/277-LEDX** 25 watt max capacity, 120 or 277 VAC 60Hz, Non-Dimmable
- EMB-S-100-120-LEDX** 100 watt max capacity, 120 VAC 60Hz, 0-10V Dimmable
- EMB-S-100-277-LEDX** 100 watt max capacity, 277 VAC 60Hz, 0-10V Dimmable
- EMB-S-250-120/277-LEDX** 250 watt max capacity, 120 or 277 VAC 60Hz, 0-10V Dimmable

***SHUNT REQUIRED FOR USE WITH ATHENA AND CASAMBI CONTROLS, CONSULT FACTORY FOR DETAILS.**

MONOPOINT CM2 SURFACE MOUNT

TYPE L20

PERFORMANCE - 3000K

LUMEN PACKAGE	WATTAGE	10° OPTIC SOFT FOCUS LENS		15° OPTIC SOFT FOCUS LENS		20° OPTIC SOFT FOCUS LENS		25° OPTIC SOFT FOCUS LENS		40° OPTIC SOFT FOCUS LENS		60° OPTIC SOFT FOCUS LENS	
		DELIVERED	LPW										
80S11A	11	613	55	1143	104	1216	111	1202	109	1124	102	949	86
80S17A	17	828	49	1750	103	1843	108	1823	107	1690	99	1440	85
80S28B	28	-	-	2571	92	2756	98	2694	96	2529	90	2072	74
90S11A	11	528	48	982	89	1045	95	1033	94	966	88	815	74
90S17A	17	714	42	1503	88	1583	91	1566	92	1452	85	1237	73
90S28B	28	-	-	2209	79	2368	85	2314	83	2193	78	1780	64
97S11A	11	456	41	862	78	918	83	907	82	848	77	716	65
97S17A	17	616	36	1320	78	1390	82	1375	81	1275	75	1086	64
97S28B	28	-	-	1939	69	2079	74	2032	73	1908	68	1563	56
90W18A (2700K-1800K)	18	-	-	-	-	1140	63	1128	63	1044	58	915	51
90W18A (3000K-1800K)	18	-	-	-	-	1128	63	1126	63	1063	59	926	51
90T28A (4000K-1800K)	28	-	-	1972	70	1995	71	1971	70	1837	66	1655	59
90T28A (5000K-2700K)	28	-	-	1954	70	1977	71	1953	70	1820	65	1640	59

MEDIA LIGHT LOSS MULTIPLIER

MEDIA	LIGHT LOSS FACTOR
No Lens	1.05
CGL	1.00
SFL	1.00
FGL	0.85
FSFL	0.82
FLSL	0.78
HCL	0.75
SFL W/ HCL	0.68
FGL W/ HCL	0.47

OUTPUT MULTIPLIER

CCT	CCT SCALE
2400K	0.85
2700K	0.97
3000K	1.000
3500K	1.03
4000K	1.08

TUNABLE WHITE MULTIPLIER

CCT	5000K-2700K	4000K-1800K
5000K	1.16	-
4000K	1.08	1.14
3500K	1.04	1.07
3000K	1.00	1.00
2700K	0.96	0.92
2400K	-	0.84
1800K	-	0.69



JA8-2022 INDICATED BY SHADING

UNIFIED GLARE RATING

10° OPTIC SOFT FOCUS LENS	15° OPTIC SOFT FOCUS LENS	20° OPTIC SOFT FOCUS LENS	25° OPTIC SOFT FOCUS LENS	40° OPTIC SOFT FOCUS LENS	60° OPTIC SOFT FOCUS LENS
>19	<13	<13	<13	<13	<16

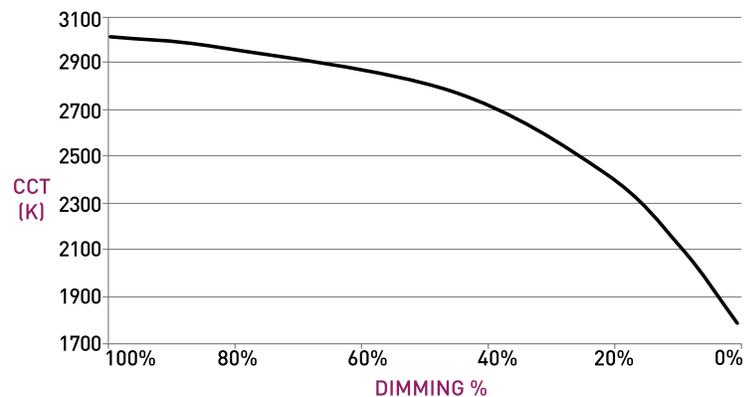
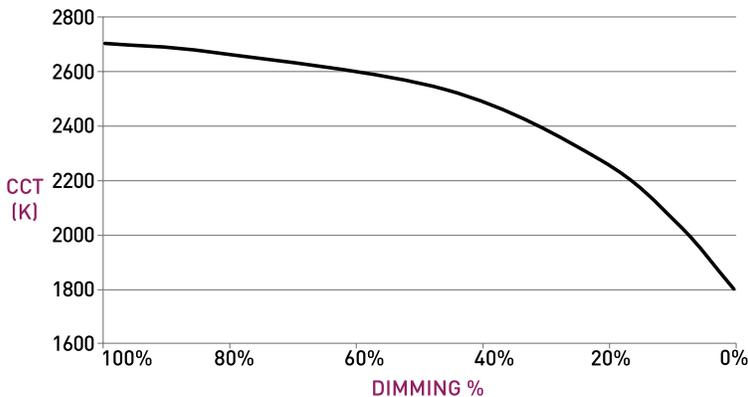
WARM DIM PERFORMANCE - SOFT FOCUS LENS - 20° OPTIC

INCANDESCENT DIMMING PROFILE

90W18AL 2700K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2700	2650	2620	2520	2180	1950	1800
Light Output (lm)	1128	902	790	564	226	113	23
Power (W)	18	14.4	12.6	9	3.6	1.8	0.36
Efficacy (LPW)	63	63	63	63	63	63	63

HALOGEN WARM DIM PROFILE

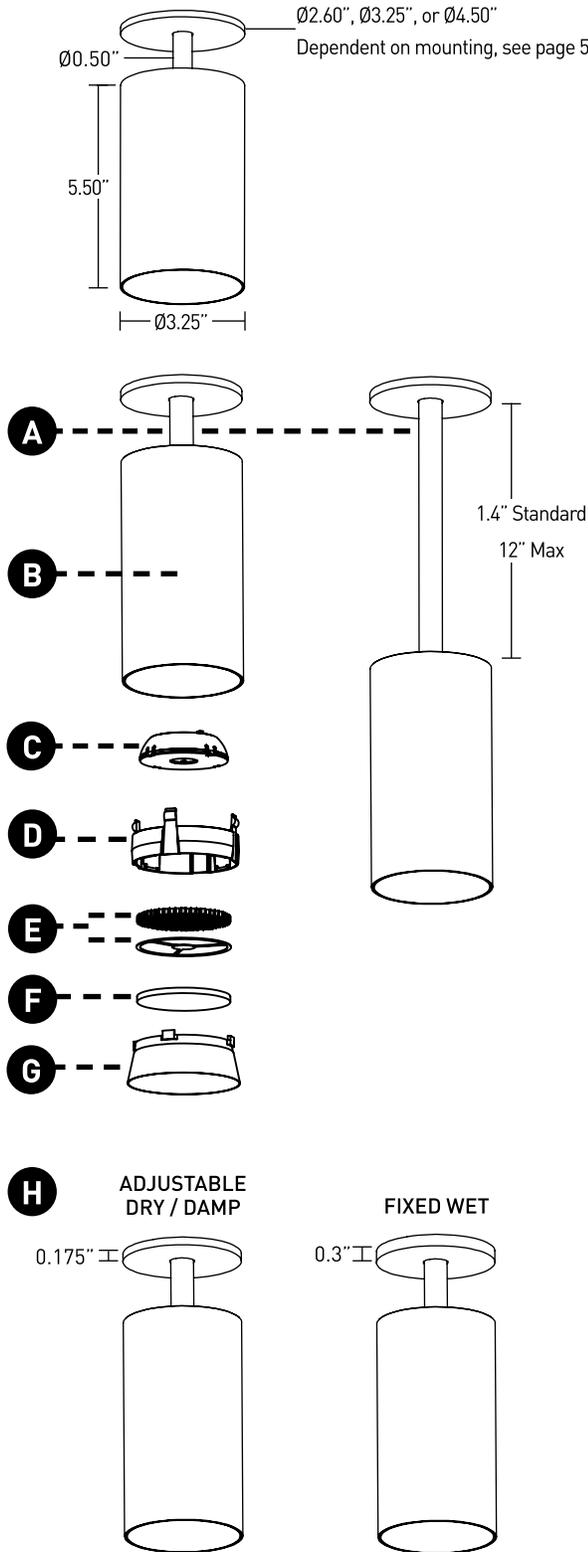
90W18AD 3000K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	3000	2950	2920	2775	2375	2000	1800
Light Output (lm)	1140	912	798	570	228	114	23
Power (W)	18	14.4	12.6	9	3.6	1.8	0.36
Efficacy (LPW)	62	62	62	62	62	62	62



MONOPOINT

- A STEM**
Standard length is 1.4", available in even-inch increments between 2"-12". Stem is not field cuttable. Powdercoat finishes standard, consult factory for Alumina finishes.
- B BODY**
Available in powdercoat finishes and Alumina finishes (interior applications only). Power supply integrated into fixture body.
- C OPTICS**
Robust light engine with optimized optic pairing integrates Reflection, Refraction, and TIR offering 10°, 15°, 20°, 25°, 40° & 60° beams.
- D LENS RETAINER**
Accepts 2 media devices.
- E 10° FIELD REDUCER**
Included with 10° optic. Reduces field angle by 30%.
- F MEDIA**
Soft Focus Lens standard. Wet location media sealed in place.
- G BAFFLE**
Baffle minimizes aperture glare and conceals view into fixture. Powdercoat finishes standard, consult factory for Alumina finishes.
- H CANOPY**
Adjustable Dry/Damp fixture features 0.175" and Fixed Wet fixture features 0.3" tall canopy.
- I ADJUSTABLE FIXTURE**
Features 90° tilt and 365° rotation. Only available for Dry / Damp locations.
- J FIXED FIXTURE**
Available with pre-set tilts of 0°, 15°, 30°, or 45°, and features 365° rotation. Wet rated, may be used in Dry / Damp locations.

DIMENSIONS / DRAWINGS



IMPORTANT: FIXED FIXTURE TILT CANNOT BE ADJUSTED OR CHANGED IN THE FIELD, FIXTURES MUST BE RETURNED TO FACTORY FOR TILT CHANGES AT ADDITIONAL COST.

MOUNTING

K JUNCTION BOX MOUNTING PLATE
Mounting plate (concealed) for standard 4" square or 4" 4/0 j-box. To be installed during rough-in prior to substrate. Features minimalist 3.25" diameter canopy.

Part Number - CM-JBMP.

L ZERO-SIGHTLINE
Provided with mud-in appliqué that mounts to standard 4" 4/0 junction box. Allows fixture canopy to be recessed into ceiling for a flush or zero-sightline aesthetic. Standard plaster stop thickness of 1/16". Not recommended for stucco applications.

Dry / Damp Part Number - DLA-APP-CM

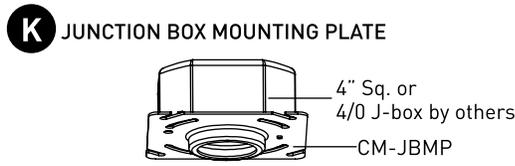
Wet Part Number - DLA-APP-CM-2

M CEILING MOUNT JUNCTION BOX
Ceiling mount junction box perfectly matches canopy profile for a continuous, integrated look where exposed ceiling mount junction box and conduit applications apply. For use with 1/2" and 3/4" EMT conduit only. Features two conduit entrances on either side and one conduit knockout on top of j-box. J-box is IP10 rated (Dry / Damp); powdercoat finishes only. Blank off plugs included.

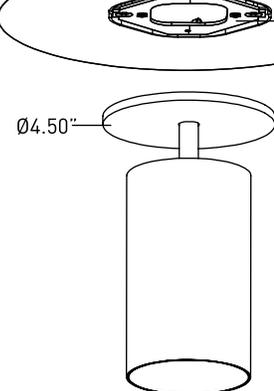
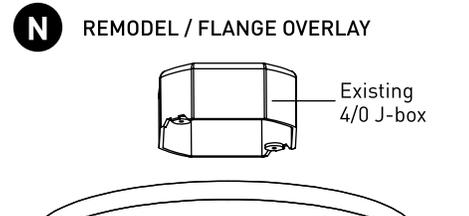
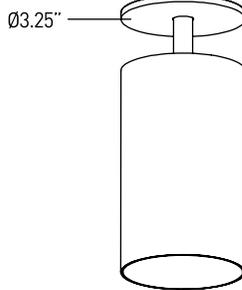
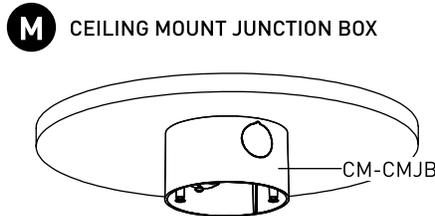
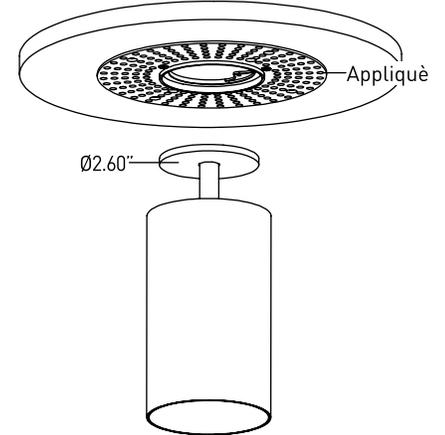
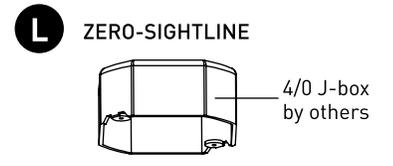
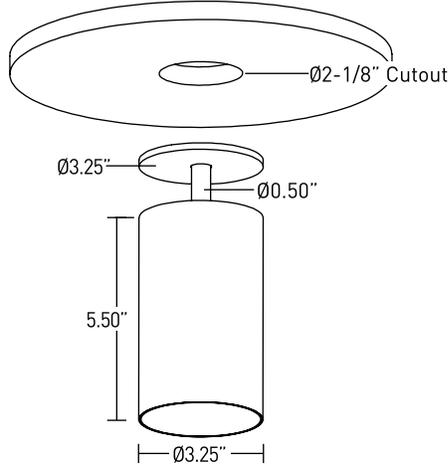
Part number - CM-CMJB-(Finish).

N REMODEL / FLANGE OVERLAY
Provided with oversized canopy and mounting plate for standard 4" 4/0 junction boxes. Ideal for existing applications and features oversized 4.5" canopy to cover standard 4" octagon box cutout.

DIMENSIONS / DRAWINGS



INSTALL JBMP BEFORE CEILING



REMOTE POWER SUPPLY

Q Remote power supply provides additional driver options. See page 7 for maximum allowable wiring distance. Must be installed in an accessible location.

P **ATHENA / CASAMBI CONTROL**
Controls integrated into remote driver assembly. All equipment is serviceable.

Athena Model Numbers: A-WN-D01-RF-BL & DFC-OEM-DBI

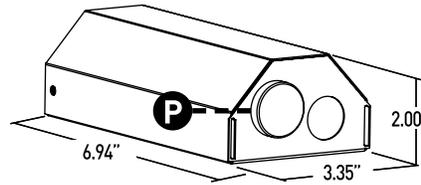
Casambi Model Number: BT-S1E1-5400

Q **ATHENA / CASAMBI EM SHUNT**
Included with drivers specified as ASR, ATR, CSR, or CTR. One required for each wireless EM fixture, requires class 2 control wiring between fixture and shunt. Features integrated test switch.

Model Number: PS-RMT-SHUNT

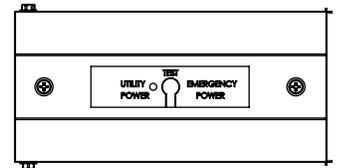
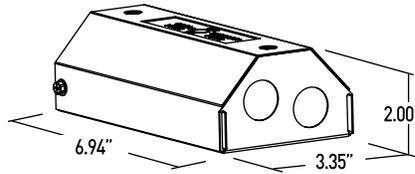
DIMENSIONS / DRAWINGS

Q



Q

ATHENA / CASAMBI EM SHUNT



TECHNICAL

CONSTRUCTION

Monopoint: Machined aluminum body; painted finishes are granulated powder coat; Alumina finishes are anodized aluminum.

Remote Power Supply: 22 Gauge galvanized steel.

Appliqué: Machined Aluminum

STATIC WHITE LED

2-step MacAdam ellipse LED module available in 80+, 90+ and 97+ CRI configurations in color temperatures of 2700K, 3000K, 3500K and 4000K.

3-step MacAdam ellipse LED module available in 90+ CRI configurations in color temperature of 2400K. Average rated lamp life of 50,000 hours.

WARM DIM LED

3-step MacAdam ellipse warm dim LED module available in 90+ CRI configuration. 3000K or 2700K at full brightness, warming to 1800K at full dim. Average rated lamp life of 50,000 hours.

TUNABLE WHITE LED

3-step MacAdam ellipse tunable white LED module available in 90+ CRI configuration. Features tuning ranges of 1800K to 4000K and 2700K to 5000K. Average rated lamp life of 50,000 hours.

POWER SUPPLY PERFORMANCE AND DIMMING INFORMATION

Power Supply	PHASE		ECO		0-10V					DALI-2	ATHENA		CASAMBI	
	CE/RE	L2	LH	LP	CA/RA	SG	SN	EG	EN	ED	AS	AT	CS	CT
Minimum °C	-20 °C	0 °C	0 °C	0 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C
Maximum °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Dimming %	2.0%	1.0%	1.0%	0.1%	2.0%	1.0%	1.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%

Note: For L2, LH, LP, SG, SN, EG and EN drivers consult chart on page 8 to confirm appropriate dimming curve for compatibility with selected control.

MAXIMUM ALLOWABLE REMOTE DRIVER WIRING DISTANCES

DRIVER	WIRE AWG				
	12	14	16	18	20
RA, RE	-	164'	105'	66'	40'
SG, SN	285'	180'	113'	71'	45'
L2, LH, LP	60'	40'	25'	15'	-
EG, EN, ED, AS, AT, CS, CT	-	-	118'	72'	46'

LISTING

cTUVus listed to UL1598 standard for Dry / Damp and IP65 Wet locations. Title 24 JA8-2022 Listed. NEMA 410 Compliant.

DECLARE

LBC Red List Approved.

BUY AMERICA ACT

All CM2 Adjustable and Fixed fixtures are BAA compliant.

LIMITED WARRANTY

Manufacturer's Limited Warranty guarantees product(s) listed to be free from defects in material and workmanship under normal use and service for 1-year. LED and power supplies are warranted to operate with 70% of original flux and remain within a range of 3 duv for a period of 5-years. 10-year Lutron Advantage limited warranty available on Lutron equipped systems. Warranty period begins from the date of shipment by Seller.

[Consult website for full warranty terms and conditions.](#)

CHANGE LOG

- 04/27/2023: ADDED AU AND BB FINISHES OPTIONS FOR BODY AND STEM.
- 04/27/2023: ADDED DECLARE LBC RED LIST APPROVED.
- 08/07/2023: ADDED NEW LED AND OPTIC OFFERINGS. REMOVED 2400K OFFERING.
- 01/17/2024: ADDED WET RATED FIXED FIXTURE, ATHENA AND CASAMBI CONTROL, AND INTEGRAL WARM DIM OFFERINGS.
- 02/13/2024: ADDED TUNABLE WHITE OFFERING.
- 03/18/2024: UPDATED 10 DEGREE NARROW BEAM TO UTILIZE FILED REDUCER.



DIMMING COMPATABILITY

PHILIPS DRIVER COMPATIBILITY

Power supply SG Manufacturer	Family/Model #
Lutron Electronics	DVTV plus PP-DV
Lutron Electronics	DVSCTV plus PP-DV
Lutron Electronics	DVSTV
Lutron Electronics	DVSCSTV
Lutron Electronics	QSGRJ-XP plus GRX-TVI
Lutron Electronics	QSGRJ-XE plus GRX-TVI
Lutron Electronics	QSGR-XE plus GRX-TVI
Lutron Electronics	NFTV plus PP-DV
Lutron Electronics	NTSTV
Lutron Electronics	RMJ-5T
Lutron Electronics	RMJS-8T
Lutron Electronics	FCJS-010
Leviton	IllumaTch IP7 series
Philips	Sunrise - SR1200ZTUNV

LUTRON DRIVER COMPATIBILITY

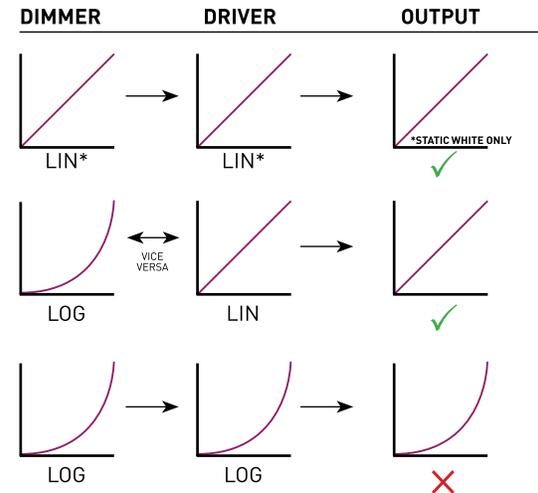
Power supply L2 Lutron Product Family	Part No.
Maestro WirelessR 600 W dimmer	MRF2-6ND-120-
Maestro WirelessR 1000 W dimmer	MRF2-10ND-120-
Caséta® Wireless Pro 1000 W dimmer	PD-10NXD-
GRAFIK T™ CL® dimmer	GT-250M-GTJ-250M-
HomeWorks® QS adaptive dimmer	HQRD-6NA-
HomeWorks® QS 600 W dimmer	HQRD-6ND-
HomeWorks® QS 1000 W dimmer	HQRD-10ND-
RadioRA® 2 adaptive dimmer	RRD-6NA-
RadioRA® 2 1000 W dimmer	RRD-10ND
myRoom™ DIN power module	MQSE-4A1-D
HomeWorks® QS DIN power module	LQSE-4A1-D
HomeWorks® QS wallbox power module	HQRJ-WPM-6D-120
HomeWorks® wallbox power module	HWI-WPM-6D-120
GRAFIK Eye® QS control unit	QSGR-, QSGRJ-
GRAFIK Eye® 3000 control unit	GRX-3100-GRX-3500-
RPM-4U module (LCP, HomeWorks® QS, GRAFIK Systems™, Quantum®)	HW-RPM-4U-120 LP-RPM-4U-120
RPM-4A module (LCP, HomeWorks® QS, GRAFIK Systems™, Quantum®)	HW-RPM-4A-120 LP-RPM-4A-120
GP dimming panels	Various
Ariadni CL 250W dimmer	AYCL-253P-
Diva CL 250W dimmer	DVCL-253P-DCSCCL-253P-
Nova T CL 250W dimmer	NTCL-250-
Power supply LH / LP Lutron Product Family	Part No.
PowPak Dimming Modules	RMJ-ECO32-DV-B
PowPak Dimming Modules	FCJ/FCJS-ECO
Energi Savr Nodes	QSN-1ECO-S
GRAFIK Eye QS control unit	QSN-2ECO-S
Homeworks QS control unit	QSGRJ- _E (wireless) QSGR- _E
Quantum Hub	QP2- _ _ 2C
Quantum Hub	QP2- _ _ 4C
Quantum Hub	QP2- _ _ 6C
Quantum Hub	QP2- _ _ 8C
Homeworks QS power module	LQSE-2ECO-D
myRoom Plus power module	



eldoLED DRIVER COMPATIBILITY

Power supply EG Manufacturer	Family/Model #
Busch-Jaeger	2112U-101
Jung	240-10
Leviton Lighting Controls	IP710-DLX
Lightolier Controls	ZP600FAM120
Merten	5729
Pass & Seymour	CD4FB-W
The Watt Stopper	DCLV1
Synergy	ISD BC
Crestron®	GLX-DIMFLV8
Crestron®	GLXP-DIMFLV8
Crestron®	GLPAC-DIMFLV4-*
Crestron®	GLPAC-DIMFLV8-*
Crestron®	GLPP-DIMFLVEX-PM
Crestron®	GLPP-1DIMFLV2EX-PM
Crestron®	GLPP-1DIMFLV3EX-PM
Crestron®	DIN-A08
Crestron®	DIN-4DIMFLV4
Crestron®	CLS-EXP-DIMFLV
Crestron®	CLCI-1DIMFLV2EX
Power supply EN Manufacturer	Family/Model #
Lutron Electronics	Nova T® - NTFTV
Lutron Electronics	Diva® - DVTV
Lutron Electronics	Nova® - NFTV
Lutron Electronics	GrafixEye® GRX-TVI w GRX3503
Lutron Electronics	Energy Savr Node™ - QSN-4T16-S
Lutron Electronics	TVM2 Module
Sensor Switch	nI0 EZ
ABB	SD/S 2.16.1

ANALOG DRIVERS AND DIMMERS



LIN = LINEAR
 LOG = LOGARITHMIC
 *LIN-TO-LIN NOT COMPATIBLE FOR WARM-DIM

Echo Blade Micro Max

EIW12399 9.13 in

TYPE L21 SERIES

SPI LIGHTING

PROJECT DETAILS

JOB NAME:

TYPE:

NOTES:

DESCRIPTION

Our Smallest, most powerful, and most versatile asymmetric lighting tool. Designed to be a discreet powerhouse, this fixture delivers up to 5,000 lumens, has 6 optical distributions, and can be utilized in both indirect and direct applications.

FEATURES & BENEFITS

- 4" x 9" x 1.5"
- ADA compliant
- Up to 5,000 delivered lumens
- 6 optical distributions
- Indirect and direct applications
- A true asymmetric with high-efficiency optics
- Efficacy up to 112 lm/W
- Optional backlight shield available
- Full horizontal cutoff
- Top lens removes striations and corrects for color-over-angle
- Handcrafted in USA

SPECIFICATIONS

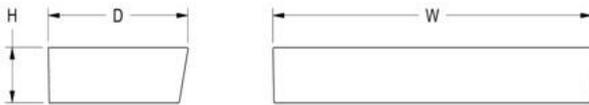
- **LIGHT SOURCE:** White LED light engine
- **CRI:** 80+ or 90+
- **ORIENTATION:** Indirect or direct
- **LUMEN MAINTENANCE:** L85 = >72,000 Hrs at 36°C ambient temperature
- **EFFICACY:** Up to 112 lm/W delivered
- **CCT:** 2700K, 3000K, 3500K, 4000K, 5000K
- **VOLTAGE:** 120-277V standard
- **DRIVER:** Includes remote Class 2 power supply and enclosure.
Max distance to the driver is: #18 AWG = 50', #16 AWG = 75', #14 AWG = 100'. For extended distances, contact factory.
- **MAX AMBIENT OPERATING TEMP:** 36°C (97°F)
- **DIMMING:** 1% minimum dim level standard
- **CONTROLS:** 0-10V standard. Lutron Athena, Current NX, and nLight AIR optional. Contact factory for other controls (e.g.,



Enlighted, Encelium, Wattstopper, WaveLinX, or Casambi)

- **EMERGENCY:** Remote battery option is provided with 10W Constant Power Battery Back-up, providing 90 minutes of emergency operation. Contact factory for other emergency options.
- **CONSTRUCTION:** Aluminum construction; precision injection molded optics
- **FINISH:** Choose from 26 standard thermoset polyester powder coat paint colors or various metal finishes. RAL®, Pantone®, or custom finishes available upon request.
- **MODIFICATIONS:** Consult factory for all modification requests
- **APPROVALS:** ETL listed to UL standards (US & Canada) for use in damp locations; not recommended for exterior applications

DIMENSIONS



W	H	D
9.1 in	1.5 in	4 in
23.2 cm	3.8 cm	10.2 cm

Mounting Weight
Approximate: 5 lb (3 kg)

CONFIGURATOR

To configure your spec sheet online, go to www.spilighting.com/EIW12399. Not all options are available in all configurations; consult factory for details.

Required Field *

Catalog	Light Source*	Primary Finish*	Voltage*	Lamp Options*	CRI*	Controls*	Mounting*	Emergency	Optical Distribution
EIW12399									
	A		B	C	D	E	F	G	H

A - LIGHT SOURCE *

To ensure color consistency, SPI uses precise bin selection and strict quality processes to maintain a 3-step (MacAdam) SDCM on all white LED lampings. Published LED luminaire wattages are calculated using a typical power supply efficiency of 88%; exact wattages may vary based on application. Delivered lumens shown are with the Deep Asymmetric (DA) optical package; apply multiplier for alternate distributions.

- L12W** | White 12W LED Light Engine | Delivered Lumens: 1,345
- L22W** | White 22W LED Light Engine | Delivered Lumens: 2,466
- L44W** | White 44W LED Light Engine | Delivered Lumens: 4,932

See last page for finish options

B - VOLTAGE *

120-277V | Universal Voltage

C - LAMP OPTIONS *

Apply multiplier from chart for delivered lumens at other CCT's and CRI's.

- 2700K** | 2700K CCT
- 3000K** | 3000K CCT
- 3500K** | 3500K CCT
- 4000K** | 4000K CCT
- 5000K** | 5000K CCT

	80 CRI	90 CRI
2700K	n/a	0.67
3000K	0.93	0.74
3500K	0.93	0.74
4000K	1.00	0.74
5000K	1.00	n/a

D - CRI *

- DF_80**¹ | (default)
- 90**²

¹ Not Available in 2700K

² Not Available in 5000K

E - CONTROLS *

Extended lead times may apply for controls other than 0-10V. Contact factory for additional control options such as Enlighted, Encelium, Wattstopper, WaveLinx, Casambi, or others.

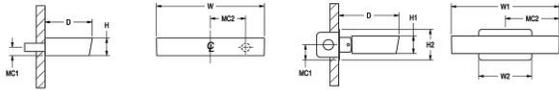
- DF_DIM1** | 0-10V Control, 1% Dimming (default)
- AWNR** | Lutron Athena Wireless Node, 1% Dimming
- NX** | Current NX Wireless, 1% Dimming
- NLTA** | Acuity nLight Air, 1% Dimming

F - MOUNTING *

Yoke Mount features $\pm 10^\circ$ of adjustable tilt.

- SCN** | Surface Mount over 1/2" EMT Conduit (default)
- YOK** ³ | Yoke Mount with Standard Switch Box Cover

³ Not ADA compliant with yok mount



D	H	MC1	MC2	D	H1	H2	MC1
4.0 in 10.2 cm	1.5 in 3.8 cm	0.7 in 1.8 cm	3.0 in 3.8 cm	5.1 in 12.9 cm	1.5 in 3.8 cm	2.6 in 6.6 cm	1.3 in 3.3 cm
W				MC2	W1	W2	
9.1 in 23.2 cm				4.6 in 11.7 cm	9.1 in 23.2 cm	4.5 11.4 cm	

SCN

YOK

G - EMERGENCY

10W, Constant Power Battery Back-up, with 90 minutes of emergency operation. EMR includes damp location enclosure for battery back-up.

- EMR** | Emergency Battery Remote

H - OPTICAL DISTRIBUTION

Deep Asymmetric: Larger spaces, gets more light to center of room.

Wide Asymmetric: Ceiling uniformity, wall wash, closer to ceiling applications.

Ultra-Wide Asymmetric: Narrow spaces, maximize fixture spacing.

- DA** | Deep Asymmetric
- DAB** ⁴ | Deep Asymmetric with Backlight Shield
- WA** ⁵ | Wide Asymmetric
- WAB** ⁶ | Wide Asymmetric with Backlight Shield
- UWA** ⁷ | Ultra Wide Asymmetric
- UWAB** ⁸ | Ultra Wide Asymmetric With Backlight Shield

⁴ Delivered lumens are 76% of the output shown under Light Source; see IES file

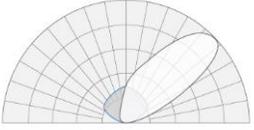
⁵ Delivered lumens are 91% of the output shown under Light Source; see IES file

⁶ Delivered lumens are 65% of the output shown under Light Source; see IES file

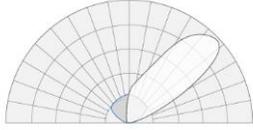
⁷ Delivered lumens are 95% of the output shown under Light Source; see IES file

⁸ Delivered lumens are 73% of the output shown under Light Source; see IES file

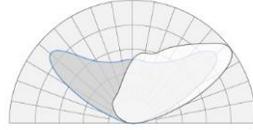
TYPE L21 SERIES



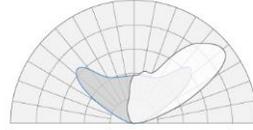
DA



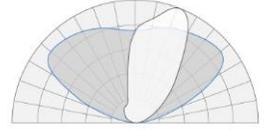
DAB



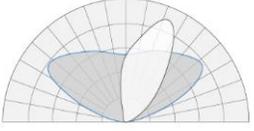
WA



WAB



UWA



UWAB

The colors shown are representative. Their actual appearance may vary due to differences in display settings. You can request color chips by emailing contact@spilighting.com. Please note, finishes may not be available in all configurations.

Paint Colors

PT01 RAL9003 Signal White (Gloss)	PT51 Matte White (Textured)	PT02 White (Textured)	PT04 RAL9001 Cream (Textured)	PT67 RAL7044 Silk Grey (Textured)
PT53 RAL7035 Light Grey (Textured)	PT54 RAL7037 Dusty Grey (Textured)	PT55 RAL7012 Basalt Grey (Textured)	PT56 RAL7016 Anthracite Grey (Textured)	PT11 Black (Textured)
PT57 RAL1015 Light Ivory (Textured)	PT58 RAL8004 Copper Brown (Textured)	PT59 RAL6021 Pale Green (Textured)	PT60 RAL1019 Grey Beige (Textured)	PT61 RAL7006 Beige Grey (Textured)
PT62 RAL1003 Signal Yellow (Textured)	PT63 RAL3001 Signal Red (Textured)	PT64 RAL6001 Emerald Green (Textured)	PT65 RAL5005 Signal Blue (Textured)	PT66 RAL5003 Sapphire Blue (Textured)

Metallic Paint Colors

PT22 Platinum (Metallic Gloss)	PT48 Brass (Metallic Textured)	PT28 Dark Stainless (Metallic Gloss)	PT49 Bronze (Metallic Textured)	PT32 Dark Bronze (Metallic Gloss)
PT46 Aluminum (Metallic Textured)				

Brushed Aluminum

BAL Brushed Aluminum	MAL Microbrushed Aluminum
--------------------------------	-------------------------------------

Specialty Finishes



More RAL®, Pantone®, and custom finishes are available upon request. Setup fee and additional lead time applies. Call factory for details.

SIMPLESEAL™

CSEDO SERIES – LED – OVERLAPPING DOOR

PRODUCT FEATURES:

- » High-output, high-CRI LED lamp sources for accurate color rendition and lighting performance
- » Diffused high-efficiency lens for reduced glare
- » Recessed ceiling mount; grid or flange - 1'x4', 2'x2', 2'x4'
- » Suitable for universal installation into 1.0" and 1.5" grid or flange (drywall) ceilings
- » One piece overlapping door provides air-tight integrity of luminaire
- » Optional Food Zone/Non-Contact listing, ideal for food processing applications
- » Optional NSF P442 Protocol assures a sealed cleanroom environment

SPECIFICATIONS

HOUSING: Standard 24-gauge (optional 20-gauge) cold rolled steel, hole-free, one-piece, seam-welded construction. 18-gauge housing flange with mitered and welded corners. White TGIC polyester powder coat finish with 5-step pre-treatment. Salt spray test: 1,000 hours; Reflectance: 92%.

DOORFRAME: 20-gauge type 304 stainless steel (#4 finish-post fabrication). One-piece 60° beveled perimeter construction. Continuous angle lens retention system. Mechanical guide for doorframe fastener alignment. Doorframe secured to housing with stainless steel aircraft cables and captive flush mounted Phillips head stainless steel fasteners (8) for 2x2, (12) for 2x4; thumb screws optional.

OPTICS: Symmetric optic includes diffused, impact-resistant acrylic lens. FN option includes FDA approved Food Zone clear polycarbonate lens outer lens; diffused acrylic inner lens.

DOORFRAME GASKET: One-piece closed cell extruded Nitrile gasket seals Doorframe to housing and ceiling structure.

ELECTRICAL: Available 3000K, 3500K, 4000K and 5000K color temperatures with maximum 3-step MacAdam variation allowance. 120-277VAC, 50/60Hz electrical input with serviceable high power factor electronic, constant-current driver (<20% THD, >0.95 PF). Standard 0-10V dimming with 1-100% range and dim-to-dark capabilities (non dim-to-dark with 347V; 660µA maximum source current per circuit). Optional 0-10V dimming with 0.1-100% range and dim-to-dark capabilities via eLoLED SOLdrive series driver (n/a 347V input; ≤0.5V required from dimming control for dim-to-dark operation; 800µA max. source current).

SENSOR & CONTROLS: Optional sensor available with compatible third party controls. To see the full list of compatible controls, [click here](#).

INSTALLATION: Non-IC recessed ceiling mounting into grid and flange application types. Flange installation utilizes included adjustable swing-out mounting brackets. Grid installation suitable for 1" and 1.5" T-bar ceilings. Housing is field-convertible between grid and flange-style mounting types. See Options for continuous row mounting and install frames.

PHOTOMETRICS: Photometry tested to the IESNA LM-79-08 standard. For additional photometric data, please go to [www.kenall.com](#).

WARRANTY: Limited five (5) year LED warranty.

LISTINGS: Luminaire is certified to UL standards by Intertek Testing Laboratories for Wet Location. Certified IP66 per IEC 60598. NSF2 Splash/Non-Food Zone. CCEA Approved. Suitable for biosafety labs rated BSL 3 and 4. Optional NSF Protocol P442 certified. FED-STD-209E/Class 1 (ISO 3) Cleanrooms. Optional NSF2 Food Zone/Non-Contact. Suitable for EU GMP Grade A cleanrooms. Suitable for installation into -30°C to 40°C ambient environments, unless otherwise noted.



TYPE L22

Job Name _____

Fixture Type _____

Catalog Number _____

Approved by _____



ORDERING INFORMATION (Ex: CSEDO-24-67L-40K8-DIM1-DV-2F-4H-SYM)

Model	Size	Lamp Power	Lamp Color	Driver	Voltage	Doorframe	Housing	Optics	Options	Accessories	
CSEDO								SYM			
Size		Lamp Power		Driver Type				Options			
14	1'x4'	1'x4'		DIM1	0-10V Dimming to 1%			LEL†	10W Emergency Battery Pack		
22	2'x2'	45L	45 Watt LED	DIM01	0-10V Dimming to 0.1% (n/a with 347 Voltage)			20KV	20KV/KA Surge Protection per IEEE/ANSI C62.41.2 Cat. A		
24	2'x4'	67L	67 Watt LED					AMF*	Antimicrobial Finish		
		90L	90 Watt LED					FN**	Food Zone/Non-Contact		
		2'x2'		Voltage				TS	Stainless Steel Doorframe Thumb Screws		
		45LD	45 Watt Dual-Row LED	DV	120-277VAC, 50/60Hz			FS	Fuse & Holder		
		67L	67 Watt LED	120	120VAC			HJ	Sealed Wireway		
		90L	90 Watt LED	277	277VAC			MS	Motion Sensor (n/a with 347 Voltage Option)		
		2'x4'		347	347VAC			RF•	Radio Frequency Filter		
		45LD	45 Watt Dual-Row LED	Doorframe Options				RM♦	Continuous Row Mounting		
		67L	67 Watt LED	5F	20-Ga Type 304 SS (STD)			2C	Two Circuit Wiring (1'x4'-45L single circuit operation will yield uneven lens luminance)		
		90L	90 Watt LED	2F	20-Ga CRS			P442‡	Optional NSF Protocol P442 Certified		
		135L	135 Watt LED	XF	20-Ga Type 316 SS			Accessories			
		180L	180 Watt LED	PAF	.063" Painted Fabricated Aluminum			IF**	Install Frame		
		Lamp Color		Housing Options							
		30K8	3000K / 82 CRI min.	4H	24-Ga CRS (STD)					* Add .375" to ceiling cut out dimensions	
		35K8	3500K / 82 CRI min.	2H	20-Ga CRS					• Voltage specific selection required	
		40K8	4000K / 82 CRI min.	5H	20-Ga Type 304 SS					** Lensing consists of FDA approved Food Zone clear polycarbonate outer lens and diffused acrylic inner lens	
		50K8	5000K / 82 CRI min.	XH	20-Ga Type 316 SS					† n/a with 180L lamp option or 347V input; voltage-specific selection required and height of fixture is 5.875" when specified with 135L lamp option; 0°C/32°F min. operating environment.	
				PAH	.050" Painted Aluminum					▲ Applied only to exposed painted surfaces of luminaire (not available on stainless steel doorframes)	
				Optics						‡ P442 only available on CSEDO24	
				SYM	Symmetric, Diffused DR Acrylic					♦ Only available when installed in drywall ceilings (flange mount)	

Mod to CRI 90

[Click HERE for CSEDO 'Fast Track' Ordering Options](#)
 Ships in 5 days



www.kenall.com | P: 800-4-Kenall | F: 262-891-9701 | 10200 55th Street Kenosha, Wisconsin 53144, USA

A brand of **Legrand**

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SIMPLESEAL™

CSEDO SERIES – LED – OVERLAPPING DOOR

PERFORMANCE		Initial Delivered Lumens		Input Power (W)	Drive Current (mA)	Estd. L70 LED Life (Hrs)
Model	Lamp Type	@ 25°C	Efficacy (lm/W)			
CSEDO14	45L-30K8	4,906	100	49	100	80,000
	45L-35K8	5,057	103			
	45L-40K8	5,230	107			
	45L-50K8	5,439	111			
	67L-30K8	7,514	104	72	75	80,000
	67L-35K8	7,747	108			
	67L-40K8	8,011	111			
	67L-50K8	8,332	116			
	90L-30K8	9,587	99	97	100	60,000
	90L-35K8	9,884	102			
	90L-40K8	10,221	105			
	90L-50K8	10,630	110			
CSEDO22	45LD-30K8	5,212	106	49	100	80,000
	45LD-35K8	5,373	110			
	45LD-40K8	5,556	113			
	45LD-50K8	5,779	118			
	67L-30K8	7,984	111	72	75	80,000
	67L-35K8	8,231	114			
	67L-40K8	8,511	118			
	67L-50K8	8,852	123			
	90L-30K8	10,259	106	97	100	60,000
	90L-35K8	10,576	109			
	90L-40K8	10,937	113			
	90L-50K8	11,374	117			
CSEDO24	45LD-30K8	6,293	137	46	50	100,000
	45LD-35K8	6,593	143			
	45LD-40K8	6,709	146			
	45LD-50K8	6,977	152			
	67L-30K8	8,753	122	72	75	80,000
	67L-35K8	9,171	127			
	67L-40K8	9,331	130			
	67L-50K8	9,704	135			
	90L-30K8	11,247	116	97	100	60,000
	90L-35K8	11,594	120			
	90L-40K8	11,990	124			
	90L-50K8	12,470	129			
	135L-30K8	15,943	108	147	100	60,000
	135L-35K8	16,436	112			
	135L-40K8	16,997	116			
	135L-50K8	17,677	120			
	180L-30K8	21,739	111	196	100	60,000
	180L-35K8	22,411	114			
180L-40K8	23,176	118				
180L-50K8	24,103	123				

Displayed information is for described luminaires only. Subject to change without notice. Visit www.kenall.com for IES files additional information.



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A brand of **Legrand**

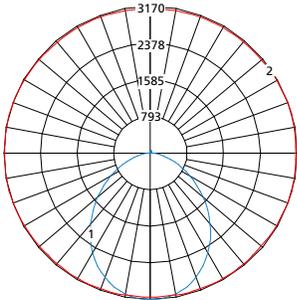
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SIMPLESEAL™

CSEDO SERIES – TECHNICAL DATA

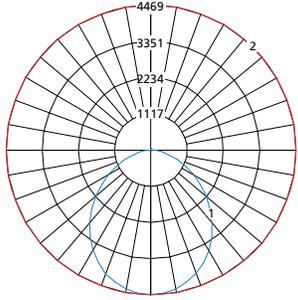
PERFORMANCE

Model: CSEDO14-67L-40K8-DIM1-1-DV-5F-2H-SYM



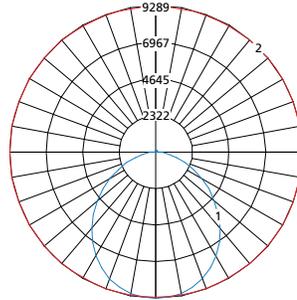
Maximum Candela = 3170 Located At Horizontal Angle = 15, Vertical Angle = 2.5
 1 - Vertical Plane Through Horizontal Angles (15-195) (Through Max. Cd.)
 2 - Horizontal Cone Through Vertical Angle (2.5) (Through Max. Cd.)

Model: CSEDO22-90L-40K8-DIM1-1-DV-5F-2H-SYM



Max Candela = 4469 Located At Horizontal Angle = 0, Vertical Angle = 0
 1 - Vertical Plane Through Horizontal Angles (0 - 180) (Through Max. Cd.)
 2 - Horizontal Cone Through Vertical Angle (0) (Through Max. Cd.)

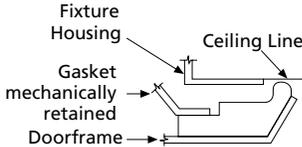
Model: CSEDO24-180L-40K8-DIM1-1-DV-5F-2H-SYM



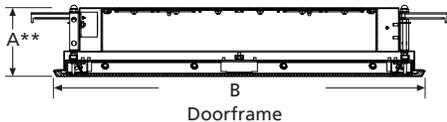
Max Candela = 9289 Located At Horizontal Angle = 0, Vertical Angle = 5
 1 - Vertical Plane Through Horizontal Angles (0 - 180) (Through Max. Cd.)
 2 - Horizontal Cone Through Vertical Angle (5) (Through Max. Cd.)

DIMENSIONAL DATA

GASKET PROFILE



CROSS SECTION



CEILING CUTOUT

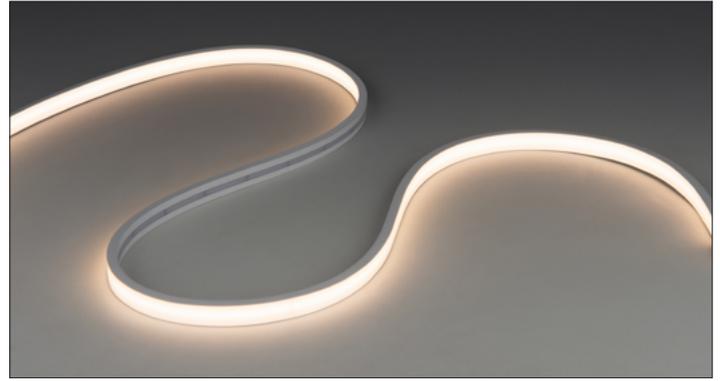
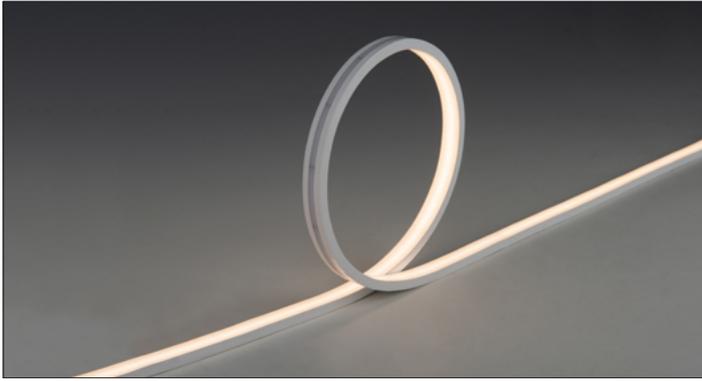


DIMENSIONAL DATA (IN INCHES)				
	A	B	C	D
1x4	4.43	11.94 x 47.94	10.85	46.85
2x2	4.43	23.94 x 23.94	22.85	22.85
2x4	4.43	23.94 x 47.94	22.85	46.85

* Add .375" to ceiling cut out dimensions when IF Option is specified
 ** Height is 5.875" with 135L lamp option when ordered in conjunction with LEL option.



DATE PROJECT LOCATION TYPE



PRODUCT FEATURES

- Seamless Diode Free Illumination
- Ultra Slim
- High Efficiency / High Output (110lm/W)
- High CRI (CRI 90)
- Bend Direction Vertically
- Interior/Exterior Applications
- Field Cuttable (33.3mm/1.31")
- Available in Standard Lengths of 1,2,3,4,5M
- Dim - multiple protocols
- 4.4W/ft
- Straight Feed Only

PRODUCT SPECIFICATIONS

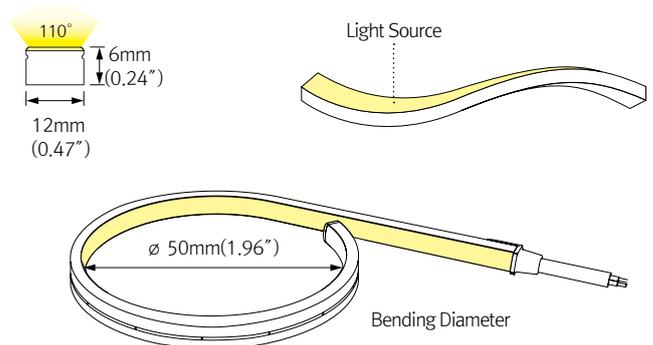
IP Rate	IP65 with Factory Termination
Lamp Power	4.4W/ft
Power Input	24V DC
Color Rendering	Ra>90
Operating Temperature Ranges	0-45°C
Beam Angle	110°
Material	Silicon
Available Color	2700K, 3000K, 3500K, 4000K
Maximum Length	5,000mm(16.5')
Minimum Length-Cut Point	33mm(1.31")
Bend Diameter	50mm(1.96")

SPECIFICATIONS TABLE



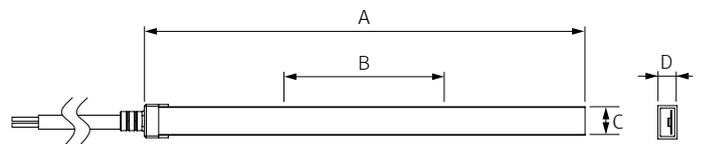
Model Number	Color	Lamp Power	Luminous Flux (lm/ft)	Lumen/W
FTP15 27K-24V-C90	2700K	4.2W/ft	415lm	98.24/W
FTP15 30K-24V-C90	3000K	4.3W/ft	440lm	103.02/W
FTP15 35K-24V-C90	3500K	4.3W/ft	465lm	109.44/W
FTP15 40K-24V-C90	4000K	4.4W/ft	476lm	108.7/W

PHYSICAL SPECIFICATIONS



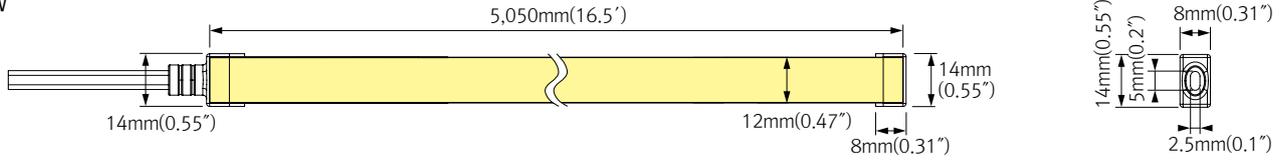
PHYSICAL SPECIFICATIONS

Model Number	A Length	B Cutting Unit	C Width	D Thickness
FTP15 (color)-24V-C90	1,012mm (39.84")	33.3mm (1.31")	12mm (0.47")	6mm (0.24")



DIMENSIONS

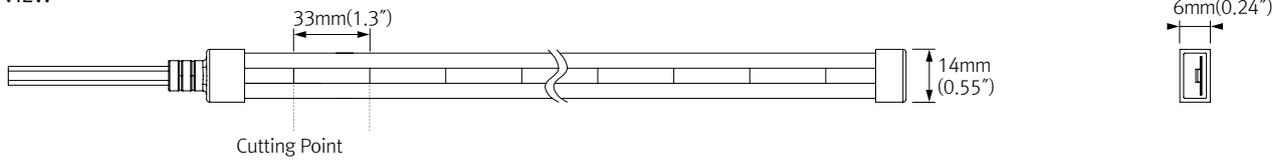
TOP VIEW



SIDE VIEW

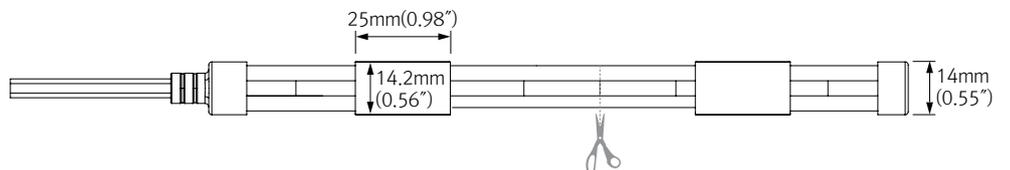
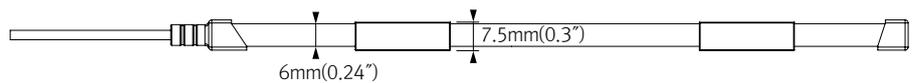
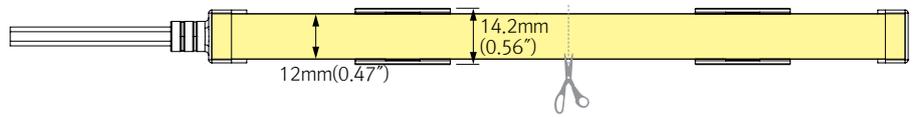
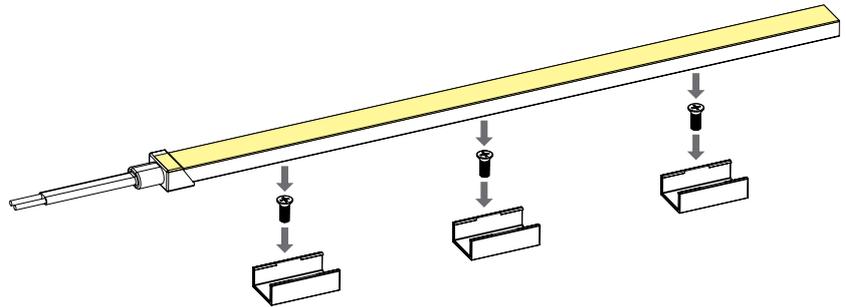
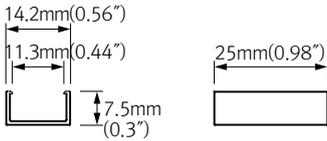
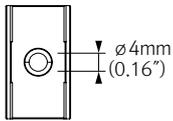


BOTTOM VIEW



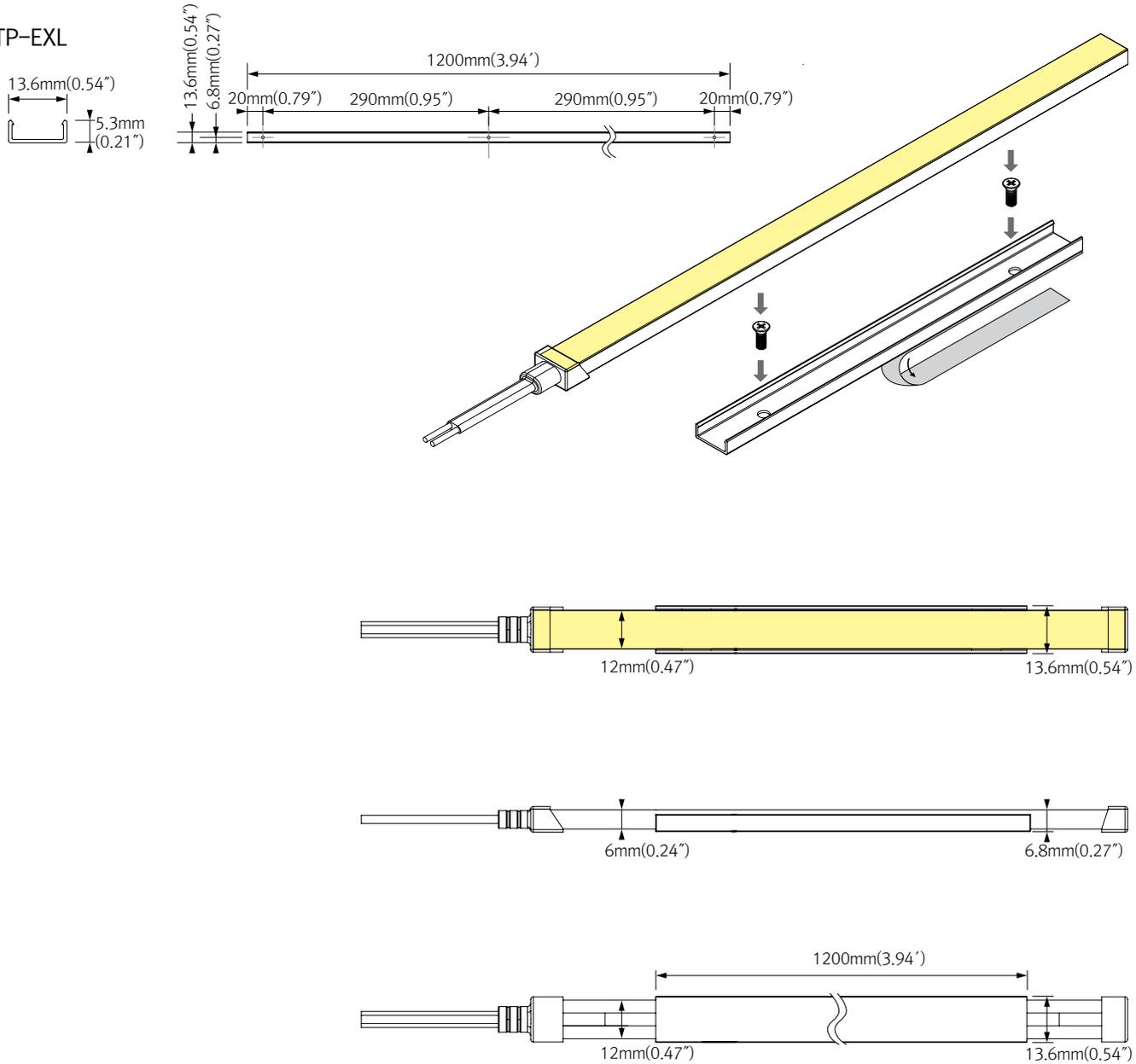
INSTALLATION - Bracket

FTP-BRACKET1



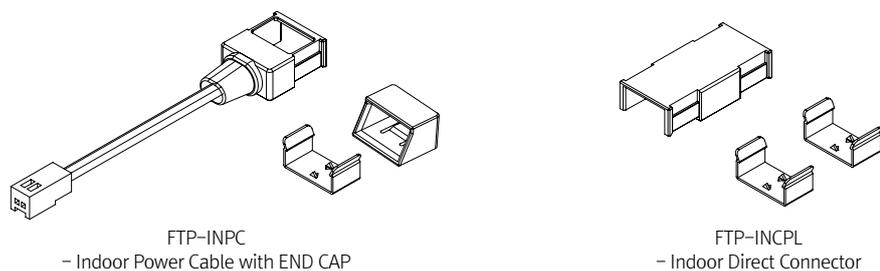
INSTALLATION – Extrusion

FTP-EXL

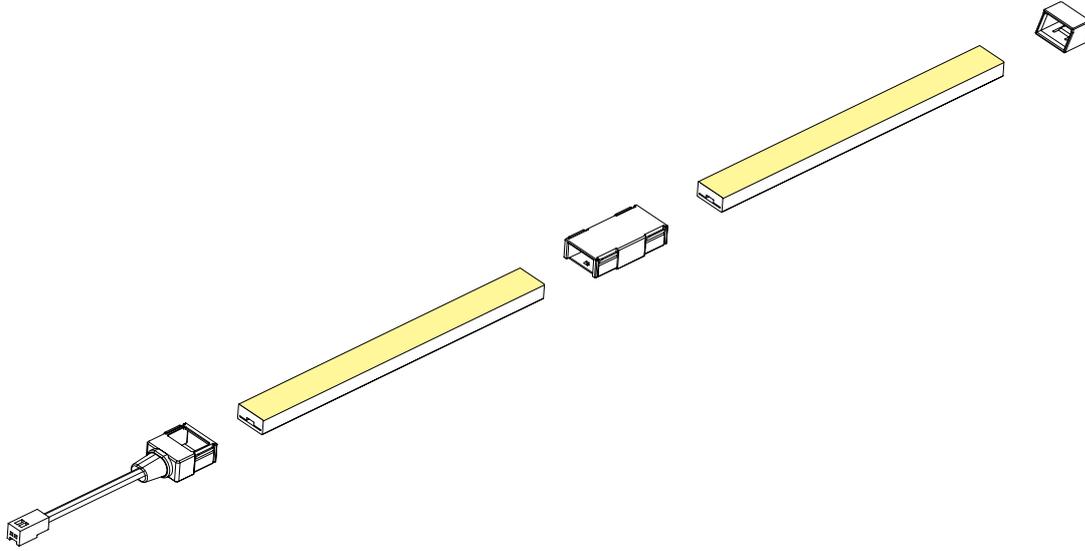


INSTALLATION – Indoor Termination (IP20)

* Components

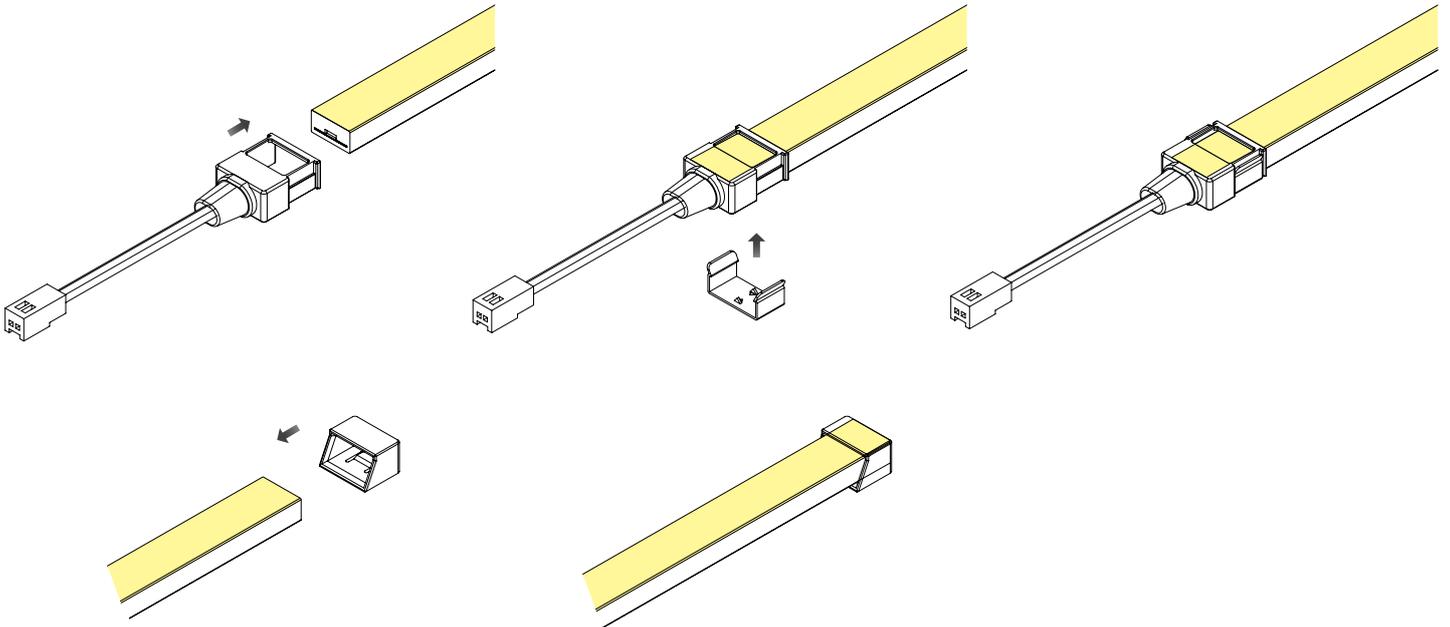


* Expanded View

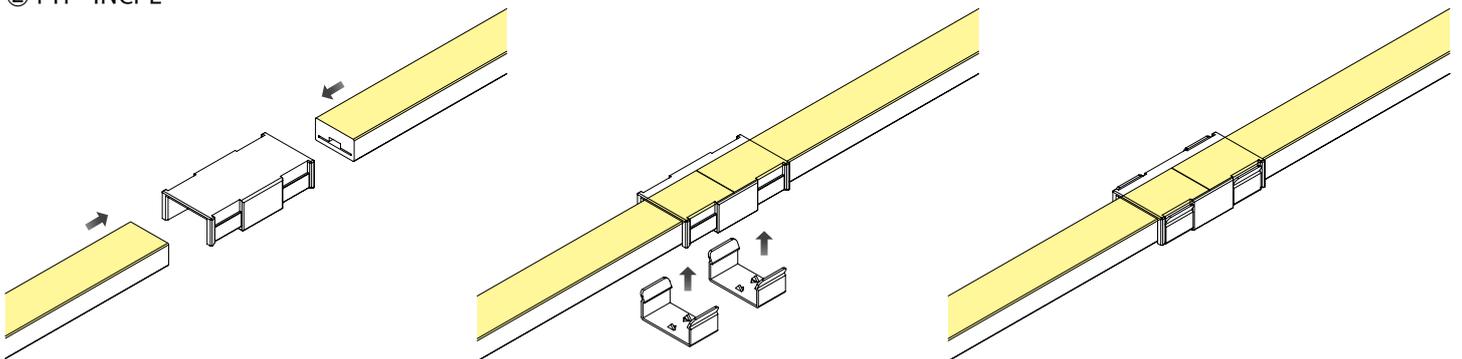


* Installation Method

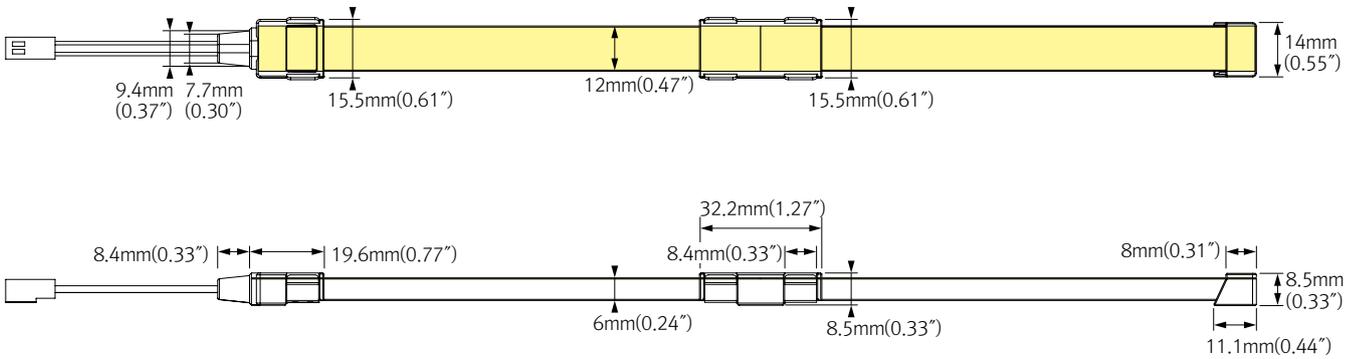
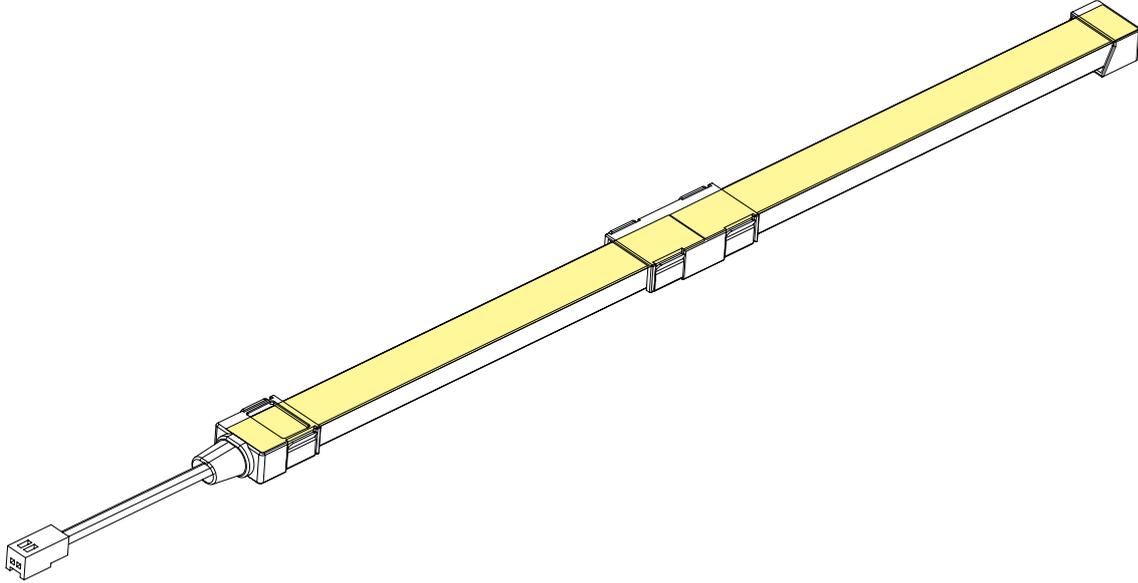
① FTP-INPC



② FTP-INCL



* Finished view



COMPONENTS



Mounting Brackets
_FTP-BRACKET1



FTP Extrusion Line
_FTP-EXL (1200mm)



Indoor Power Cable
_FTP-INPC (2,500mm)
with END CAP



Indoor Direct Connector
_FTP-INCP1



LED Drivers
_ FLC30-24V/XL (30W) *
_ FLC75-24V/XL (75W) *
With distributor and power cord
1800mm (6')



Driver Junction Box
_ MHWB-FLE



Hard Wire Driver
_XLD200-224V-FCL-DIM
_XLD75-124V-FC (90V to 300V) *



Hard Wire Driver
_FLE90-24V-L10-DIM
_FLE60-24V-L10-DIM

Additional Power Supply/ Driver Options Available.
Please consult Factory.

* FDC-L10 module required for dimming 0-10V

A larger selection of drivers are available including remote and hard wire drivers. Please consult factory.

PRODUCT FEATURES



- Class 2 power supply
- UL Class P
- Ripple $\leq 5\%$ @ 20% & 100% load
- Constant voltage mode with over-current protection
- IP20-rated case with silicone-based potting
- Max. case temperature (Tc) 90°C
- Lifetime: 5 years min at 85°C case temperature
- EMI : Compliant with FCC CFR Title 47 Part 15 Class B at 120 Vac & Class A at 277 Vac
- Surge protection
 - IEC61000-4-5 : 2 kV line to line/2 kV line to earth
 - 2.5 kV ring wave: ANSI/IEEE c62.41.1-2002 & c62.41.2-2002 category A
- Complies with ENERGY STAR®, DLC (DesignLight Consortium®) and CA Title 24 technical requirements

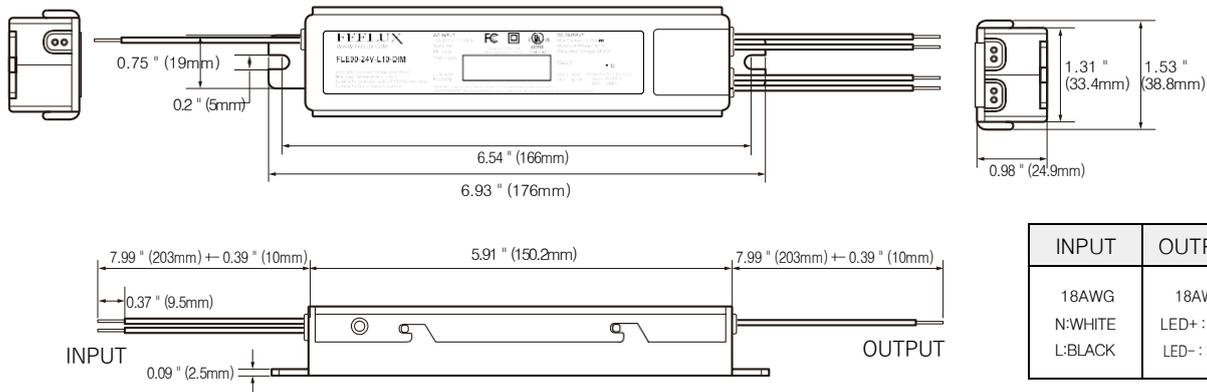


SPECIFICATION

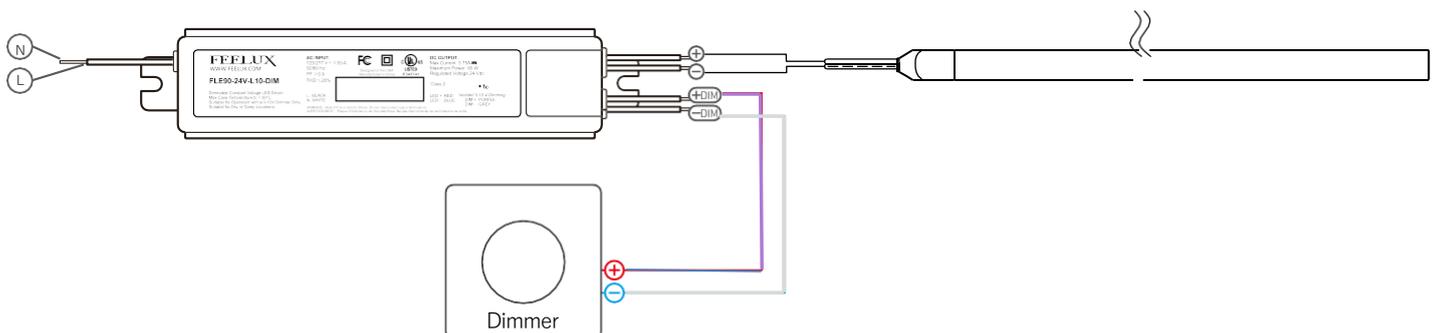
Model Name	Nominal Input Voltage	Wattage	Nominal Output Voltage	Max. Output Current	Efficiency	Max. Case Temperature	THD	Power Factor	Dimming Method	Dimming Range	Startup Time
FLE90-24V-L10-DIM	120 & 277 Vac	90 W	24 Vdc	3.75, 1.9 A	up to 90% typical	90°C (measured at the hot spot)	< 20%	> 0.9	0 - 10 V	1 - 100%	300 ms typical

OUTLINE DRAWINGS

Model Name	Wattage (W)	Lenght (L)	Width (W)	Height (H)	Volume
FLE90-24V-L10-DIM	90 W	5.91 " (150.2mm)	1.53 " (38.8mm)	0.98" (24.9mm)	8.86 in3 (145.1cm ³)



WIRING DIAGRAM



SPECIFICATION

1. INPUT SPECIFICATION (@25°C ambient temperature)

	Units	Minimum	Typical	Maximum	Notes
Input Voltage Range (Vin)	Vac	90	120, 277	305	· At maximum load, as specified in section 1
Input Frequency Range	Hz	47	60	63	
Input Current (Iin)	A			1.05 A @ 120 Vac 0.48 A @ 277 Vac	
Power Factor (PF)		0.9	> 0.9		· At nominal input voltage · From 100% to 60% of maximum rated power
Inrush Current	A	Meets NEMA-410 requirements			· At any point on the sine wave and 25°C
Leakage Current	µA			400 µA @ 120 Vac 920 µA @ 277 Vac	· Measured per IEC60950-1
Input Harmonics	Complies with IEC61000-3-2 for Class C equipment				
Total Harmonics Distortion (THD)				20%	· At nominal input voltage · From 100% to 60% of maximum rated power · Complies with DLC (Design Light Consortium) technical requirements
Efficiency	%	-	up to 90%	-	
Isolation	The AC input to the main DC output is isolated and meets Class II reinforced/double insulation power supply				

2. OUTPUT SPECIFICATION (@25°C ambient temperature)

	Units	Minimum	Typical	Maximum	Notes
Output Voltage (Vout)	Vdc	16.4 32.0	24 48		· See ordering information for details
Output Current (Iout)	A			24 Vdc: 3.75 A 48 Vdc: 1.9 A	
Output Voltage Regulation	%	-5		5	· At nominal AC line voltage · Includes load and voltage set point variations.
Output Voltage Overshoot	%	-	-	10	· The driver does not operate outside of the regulation requirements for more than 500 ms during power on with maximum load.
Ripple Voltage	≤ 5% of rated output voltage for each model				· Measured at maximum load and nominal input voltage. · At 20% & 100% load
Dimming Range (% of Iout)	%	1		100	· Dimming is a function of the output voltage and is achieved through decreasing Vout. · The dimming range is dependent on each specific dimmer and LED load. It may not be able to achieve 1% dimming with some dimmers or LED loads. · Refer to section 6 for additional information regarding the 0-10V dimming characteristics of the FLE90 series.
Start-up Time	ms		300	500	· Measured from application of AC line voltage to 100% light output · Complies with ENERGY STAR® luminaire specification and CA Title 24
Isolation	The main DC output is certified and tested per UL8750 Class 2 or LED Class 2				

3. ENVIRONMENTAL CONDITIONS

	Units	Minimum	Typical	Maximum	Notes
Operating Ambient Temperature (Ta)	°C	-10		40	· When mounted to insulating material such as wood or drywall with junction box such that at Ta ≤ 40°C Tc does not exceed 85°C
Maximum Case Temperature (Tc)	°C			+90	· Case temperature measured at the hot spot · tc
Storage Temperature	°C	-40		+85	
Humidity	%	5	-	95	· Non-condensing
Cooling	Convection cooled				
Acoustic Noise	dBA			22	· Measured at a distance of 1 foot (30 cm)
Mechanical Shock Protection	per EN60068-2-27				
Vibration Protection	per EN60068-2-6 & EN60068-2-64				
MTBF	> 200,000 hours when operated at nominal input and output conditions, and at Tc ≤ 85°C				
Lifetime	5 years at Ta ≤ 40°C. Tc ≤ 85°C maximum case hot spot temperature				

4. EMC COMPLIANCE AND SAFETY APPROVALS

EMC Compliance				
Conducted and Radiated EMI	Compliant with FCC CFR Title 47 Part 15 Class B at 120 Vac & Class A at 277 Vac			
Harmonic Current Emissions	IEC61000-3-2	For Class C equipment		
Voltage Fluctuations & Flicker	IEC61000-3-3			
Immunity Compliance	ESD (Electrostatic Discharge)	IEC61000-4-2	6 kV contact discharge, 8 kV air discharge, level 3	
	RF Electromagnetic Field Susceptibility	IEC61000-4-3	3 V/m, 80 – 1000 MHz, 80% modulated at a distance of 3 meters	
	Electrical Fast Transient	IEC61000-4-4	± 2 kV on AC power port for 1 minute, ± 1 kV on signal/control lines	
	Surge	IEC61000-4-5	± 2 kV line to line (differential mode) / ± 2 kV line to common mode ground (tested to secondary ground) on AC power port, ± 0.5 kV for outdoor cables	
			ANSI/IEEE c62.41.1-2002 & c62.41.2-2002 category A, 2.5 kV ring wave	
	Conducted RF Disturbances	IEC61000-4-5	3V, 0.15-80 MHz, 80% modulated	
Voltage Dips	IEC61000-4-11	>95% dip, 0.5 period; 30% dip, 25 periods; 95% reduction, 250 periods		

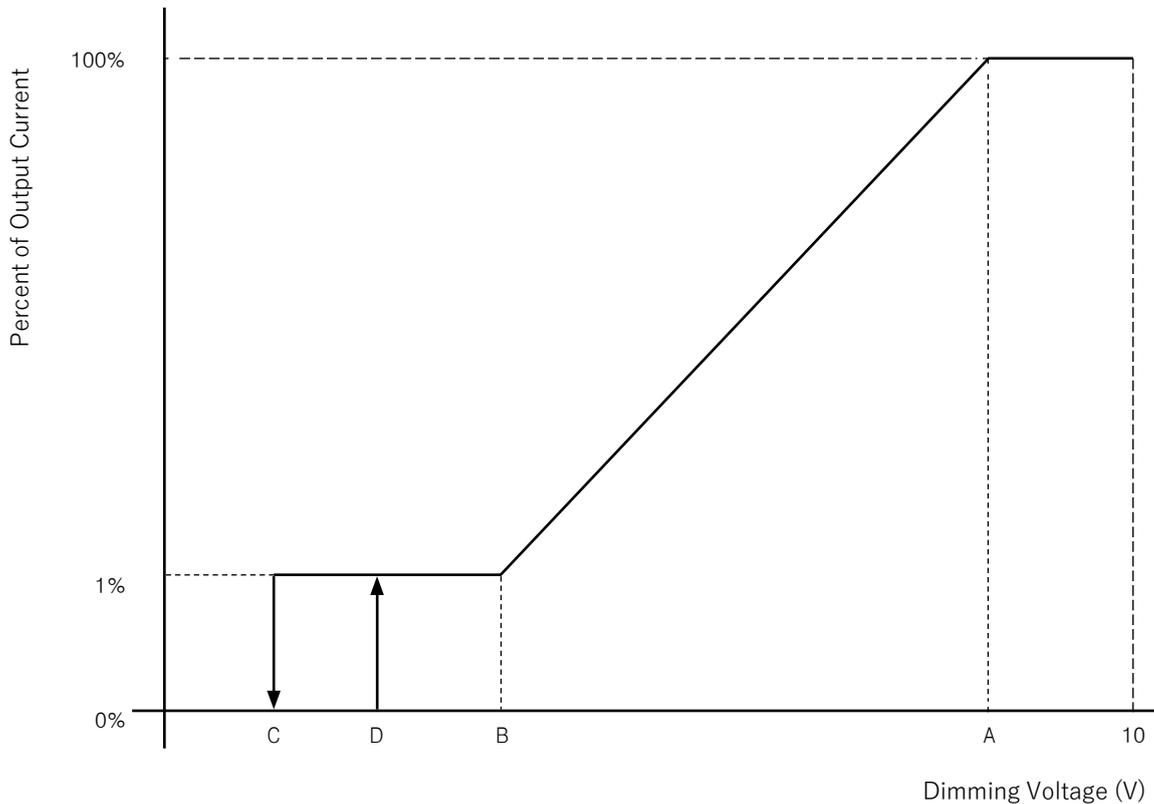
Safety Agency Approvals	
UL	UL8750 listed, Class 2, Class P
cUL	CAN/CSA C22.2 No. 250.13-14 LED equipment for lighting applications

Safety					
	Units	Minimum	Typical	Maximum	Notes
Hi Pot (High Potential) or Dielectric voltage-withstand	Vdc	4400			· Insulation between the input (AC line and Neutral) and the output · Tested at the RMS voltage equivalent of 3110 Vac

5. 0-10 V DIMMING CONTROL (@25°C ambient temperature)

The FLE series exhibits a non-linear dimming profile with 1% minimum dimming and dim-to-off. Dimming is achieved by decreasing the output voltage of the driver. In the default non-linear 0-10 V dimming profile, 10 V to 8.2 V=100% of Vmax, 1.5 V to 0.7 V=65% of Vmax, and <0.7 V=dim-to-off. Each point in the non-linear dimming profile (points A-D in figure 1) can be programmed using the programming software.

	Units	Minimum	Typical	Maximum	Notes
+Dim Signal, -Dim Signal	The FLE series operate only with 0-10V dimmers that sink current. The method to dim the output current of the driver is done via the +Dim/-Dim Signal pins. The +Dim/-Dim signal pins can be used to adjust the output setting via a standard commercial wall dimmer, an external control voltage source (0 to 10 Vdc), or a variable resistor when using the recommended number of LEDs. The dimming input permits 1% to 100% dimming with dim-to-off.				
Dimming Profile (see figure 1)	Programmed upper output voltage limit between 10 V and 8.2 V, Linear between 8.2 V and 1.5 V, Programmed lower output voltage limit between 1.5 V and 0.7 V, Output voltage off below 0.7 V.				
Dimming Range	%	1		100	
High Level Voltage - A	V	8.1	8.2	8.3	
Low Level Voltage - B	V		1.5		
Dim to Off - C	V	0.6	0.7	0.8	
Dim to Off Hysteresis - D	V			+0.2	
Current Supplied by the +Dim Signal Pin	mA			1	
Output Voltage Tolerance While Being Dimmed	%			± 8	The tolerance of the output voltage while being dimmed is ≤ +/-8% until down to 1.5 V.
Isolation	The 0-10 V circuit is isolated from both the AC input and the main DC output. UL8750 Supplement SF compliant.				



6. COMPATIBLE 0-10 V DIMMERS

Mfg.	Model	Mfg.	Model	Mfg.	Model
Lutron	NFTV	Lutron	DVTV	Lutron	DVSTV
Lutron	RMJS-8T	Lightoller	SR1200ZTUNV	Cooper	SF10P-W
Leviton	IP710-LFZ	Leviton	IP710-DL		

7. PROTECTION FEATURES

Input Over Current Protection

The FLE series incorporates a primary AC line fuse for input over current protection to prevent damage to the LED driver and meet product safety requirements as outlined in Section 6.

Short Circuit and Over Current Protection

The FLE series is protected against short-circuit such that a short from any output to return shall not result in a fire hazard or shock hazard. The driver shall hiccup as a result of a short circuit or over current fault. Removal of the fault will return the driver to within normal operation. The driver shall recover, with no damage, from a short across the output for an indefinite period of time.

Internal Over temperature Protection

The FLE series is equipped with internal temperature sensor on the primary power train. Failure to stay within the convection power rating will result in the power supply reducing the available current (fold back) below the programmed amount. The main output current will be restored to the programmed value when the temperature of the built-in temperature sensor cools adequately.

Output Open Load Protection

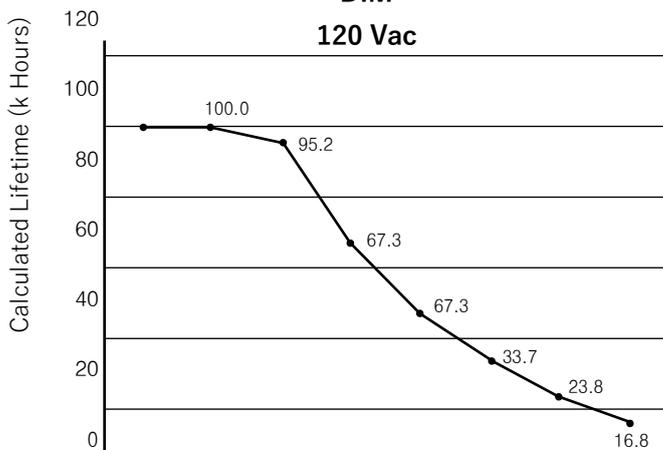
When the LED load is removed, the output voltage of the FLE series is typically limited to 1.3 times the maximum output voltage of each model.

8. PREDICTED LIFETIME VERSUS CASE AND AMBIENT TEMPERATURE

Lifetime is defined by the measurement of the temperatures of all the electrolytic capacitors whose failure would affect light output under the nominal LED load and worst case AC line voltage. The graphs in figures 2 and 3 are determined by the electrolytic capacitor with the shortest lifetime, among all electrolytic capacitors. It represents a worst case scenario in which the LED driver is powered 24 hours/day, 7 days/week. The lifetime of an electrolytic capacitor is measured when any of the following changes in performance are observed:

- 1) Capacitance changes more than 20% of initial value
- 2) Dissipation Factor (tan δ): 150% or less of initial specified value
- 3) Equivalent Series Resistance (ESR): 150% or less of initial specified value
- 4) Leakage current: less of initial specified value

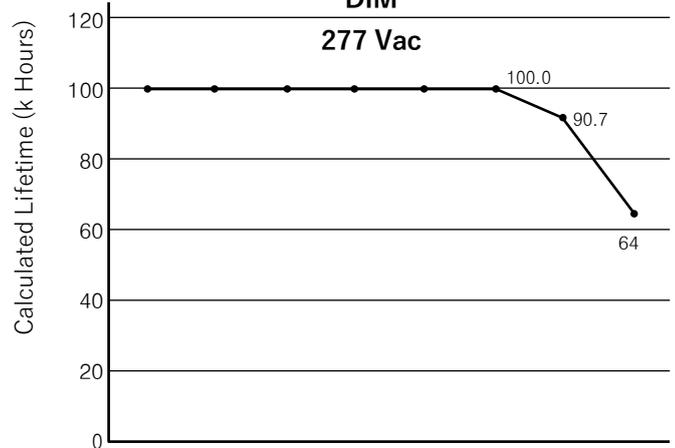
**FLE90-24V-L10-DIM
120 Vac**



Tamb(°C)	25	30	35	40	45	50	55	60
Tcase(°C)	68	73	78	83	88	93	98	103

Note : With Baseplate dimension of 195mm x 60mm x 3mm

**FLE90-24V-L10-DIM
277 Vac**



Tamb(°C)	25	30	35	40	45	50	55	60
Tcase(°C)	55	60	65	70	75	80	85	90

Note : With Baseplate dimension of 195mm x 30mm x 5mm

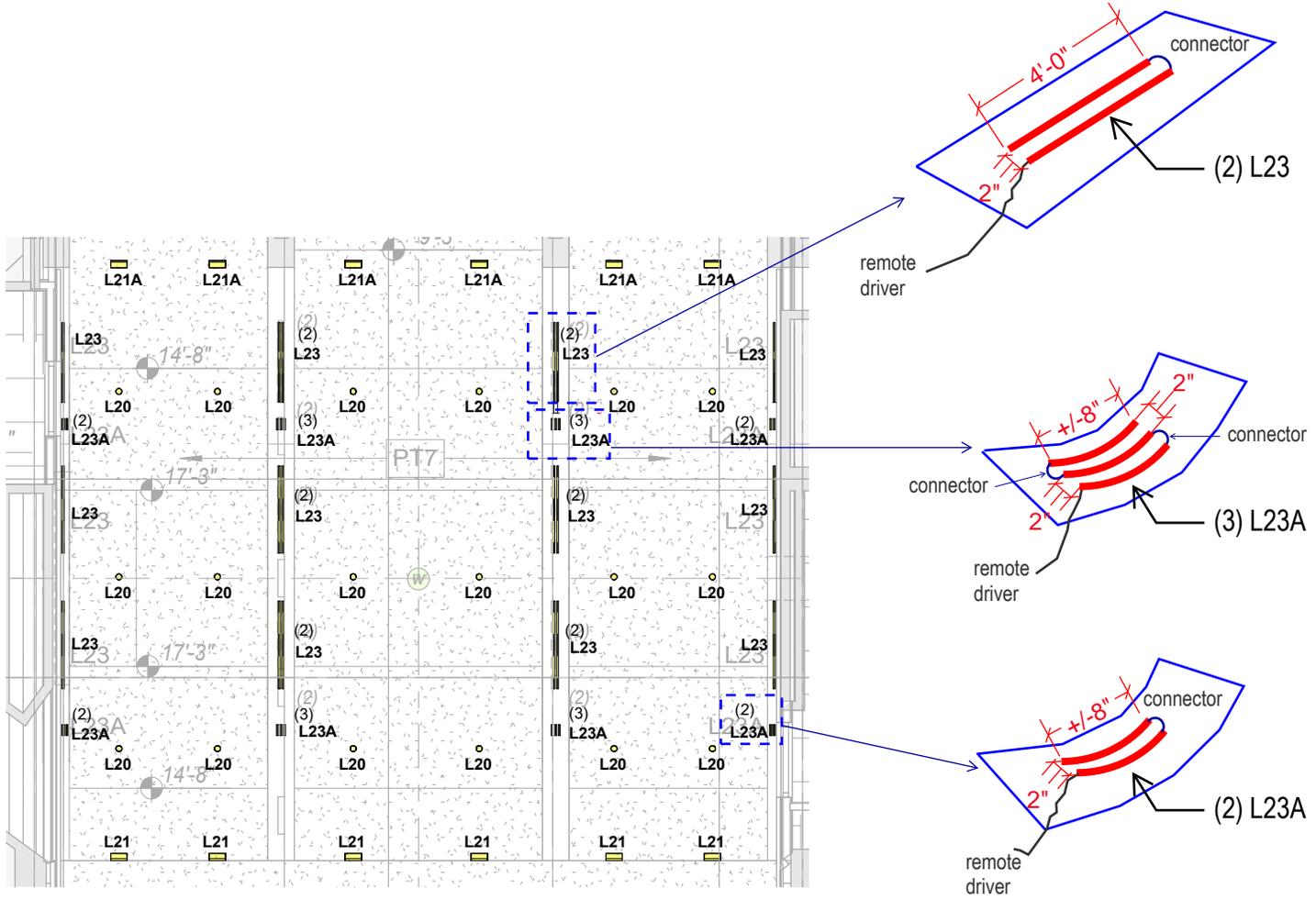
Notes:

- The ambient temperature T_{ambient} and the differential between T_{ambient} and T_{case} mentioned in the above graphs are relevant only as long as both the driver and the light fixture are exposed to the same ambient room temperature. If the LED driver is housed in an enclosure or covered by insulation material, then the ambient room temperature is no longer valid. In this situation, please refer only to the case temperature T_{case} .
- It should be noted the graph “Lifetime vs. Ambient Temperature” may have an error induced in the final application if the mounting has restricted convection flow around the case. For applications where this is evident, the actual case temperature measured at the T_c point in the application should be used for reliability calculations.

MECHANICAL DETAILS

- Packaging : Aluminum case
- I/O Connections :
- Models with flying leads : 18 AWG on all leads, 22 AWG on 0–10V dimming wires, 203mm (8 in) long, 105°C rated, stranded, stripped by approximately 9.5 mm, and tinned. All the wires, on both input and output, have a 300 V insulation rating.
- Ingress Protection : IP20 rated
- Mounting Instructions : The FLE driver case must be secured on a flat surface through the two mounting tabs, shown here below in the case outline drawings.

TYPE L23, L23A SKETCH FOR CONNECTING FIXTURE RUNS





MICRO RING II sets a new performance benchmark in decorative rings, boasting a best-in-class lumen efficacy of 105 LPW. This performance is not just about brightness but about the quality of light. Its high-efficiency, flexible diffuser snugly fits the frame, eliminating any light leakage while ensuring a uniform and seamless diffusion of light. The slim design of **MICRO RING II**, available in 8 diameters ranging from 2 feet to 12 feet, makes it ideal for crafting grand, multi-tiered circular installations. This versatile ring offers both direct and indirect lighting and is part of the larger MICRO RING family, which includes five additional light emission options for layered lighting effects. Moreover, each ring can be equipped with an acoustic panel of up to eight feet.

Expanding your options to better meet a wide range of design requirements, we now offer a lower output **MICRO RING II**. This new addition is designed to serve your decorative needs where subtler, more atmospheric lighting is desired without compromising on the quality and uniformity of light diffusion that the **MICRO RING II** is celebrated for. Ideal for creating ambient moods in intimate settings or when a less pronounced lighting effect is required, this lower output option expands the versatility of the MICRO RING collection, ensuring that there is a ring solution for every design challenge.

GENERAL SPECIFICATION

Body

Aluminum.

Power cable

Silver braided.

Remote Emergency

Emergency option provides a 1.5 hour (3 hours for EU) emergency lighting facility. The remote system includes the inverter module, NiCad batteries and a remote wall/ceiling LED charge indicator and test switch (NA only) Maximum distance between wall/ceiling plate and luminaire is 15' (4.5m). Test switch fits a single gang box (not supplied).

Suspension

Steel cables. Power over aircraft cable option (S6) available on direct versions only up to 2134mm/7ft diameter (North America only).

Acoustic Panels NRC Rating

0.80

Acoustic Panels Material

100% recycled polyester fiber (PET).

Mechanical

Luminaires mount directly over J box (by others - North America only).

Delivered Lumens

Delivered lumens & LPW based on 4000K (min 80 CRI).

Sensors

Consult factory regarding sensor compatibility.

Finish

Powder coated

Diffuser

Protruding Lens 0.08" (2.1mm)

Drivers

Remote, HPF electronic drivers for 120-277V, 347V (EU-240V) dimming. Wire size 18 AWG - max distance (from fixture to drivers) 40' (12.2m), wire size 16 AWG - max distance 60' (18.3m), wire size 14 AWG - max distance 90' (27.4m). Drivers must be accessible after installation. Drivers are either remote mounted or integral to the canopy depending on the size of the fixture.

PoE

Micro Ring II can integrate into your data network via Power over Ethernet (PoE) connectivity.

Acoustic Panels Class A Fire Rating

ASTM E-84 material.

Acoustic Panels Thickness

12mm (0.5").

L70 @25°C

> 60,000 hrs.

Approvals

Damp Rated.

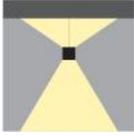
MICRO RING II™ - SUSPENDED

TYPE L24 SERIES

MOUNTING & OPTICS



Suspended Direct



Suspended Direct/Indirect



Declare



PoE

MICRO RING II™ - SUSPENDED

TYPE L24 SERIES

HOW TO ORDER

A. LUMINAIRE

MRTP1P02 2ft, Direct, 5000 lms

MRTP1P03 3ft, Direct, 7400 lms

MRTP1P04 4ft, Direct, 9500 lms

MRTP1P05 5ft, Direct, 12900 lms

MRTP1P06 6ft, Direct, 15200 lms

MRTP1P07 7ft, Direct, 18100 lms

MRTP1P08 8ft, Direct, 17500 lms

MRTP1P12 12ft Direct, 27700 lms

MRTP2P02 2ft, Direct/Indirect, 6800 lms

MRTP2P03 3ft, Direct/Indirect, 10200 lms

MRTP2P04 4ft, Direct/Indirect, 13800 lms

MRTP2P05 5ft, Direct/Indirect, 17300 lms

MRTP2P06 6ft, Direct/Indirect, 20400 lms

MRTP2P07 7ft, Direct/Indirect, 24200 lms

MRTP2P08 8ft, Direct/Indirect, 23900 lms

MRTP2P12 12ft, Direct/Indirect, 37700 lms

B. EFFICIENCY

EFF1 Standard efficiency ¹

EFF2 High efficiency ²

¹ Standard efficiency refers to Standard efficacy.

² High efficiency refers to High efficacy. This option is 52% more efficient than Standard efficiency.

C. LUMENS/FT DIRECT

LPF017 175 lm/ft ^{1 2}

LPF026 260 lm/ft ^{1 2}

LPF035 350 lm/ft ^{1 2}

LPF052 525 lm/ft ^{1 2}

LPF080 800 lm/ft ²

¹ Standard efficiency is available from 175 lm/ft to 525 lm/ft.

² High efficiency is available from 175 lm/ft to 800 lm/ft for direct only and up to 525 lm/ft for direct/indirect.

D. LUMENS/FT INDIRECT

LPG000 Not required

LPG017 175 lm/ft ^{1 2}

LPG026 260 lm/ft ^{1 2}

LPG035 350 lm/ft ^{1 2}

LPG052 525 lm/ft ²

¹ Standard efficiency is available from 175 lm/ft to 350 lm/ft.

² High efficiency is available from 175 lm/ft to 525 lm/ft.

E. CRI

CR80 CRI 80+

CR90 CRI 90+

F. CCT (DIRECT)

CTA27 2700K ¹

CTA30 3000K

CTA35 3500K

CTA40 4000K

¹ Longer than normal lead times may apply, consult factory for details.

G. CCT (INDIRECT)

CTB00 Not required

CTB27 2700K ¹

CTB30 3000K

CTB35 3500K

CTB40 4000K

¹ Longer than normal lead times may apply, consult factory.

H. VOLTAGE

V1 120/277V

V2 240V ¹

V3 347V ²

V4 Low Voltage ³

¹ Not available in North America.

² Available with DA01 dimming only.

³ V4 available with DA45 dimming only.



I. DIMMING

DA01 0-10V Dimming 1.0%	DA20 DALI Dimming 0.1% ¹	DA21 DALI Dimming 1.0% ¹	DA45 PoE ²
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¹ Not available with MRTP2P05, MRTP2P06 or MRTP2P07.

² Available with V4 only.

J. SUSPENSION

SS1 Vertical, Remote driver	SS2 Hub, Remote driver ¹	SS3 Vertical, Integral driver ²	SS4 Hub, Integral driver ²
SS6 Power Over Suspension Cable, Vertical Remote driver ¹	SS7 Power over Suspension, Hub, Remote driver ^{1 4}	SS9 Power over Suspension, Hub, Integral driver ^{1 3 4}	

¹ Available up to 7ft for Direct and Direct/Indirect for DA01. Available up to 7ft for Direct only and available up to 6ft only for Direct/Indirect for DA20 & DA21. Available for all sizes for DA45.

² Available for all sizes for DA01. Available for up to 5ft Direct and up to 4ft DirectIndirect for DA20 & DA21. Available for all sizes for DA45.

³ Available with V1 voltage only.

⁴ The minimum suspension height relative to diameter is as follows: 2ft = 18", 3ft = 18", 4ft = 24", 5ft = 30", 6ft = 36", 7ft = 42".

K. FIXTURE FINISH

FA01 White	FA02 Black Metallic - Textured	FA20 Silver Metallic - Textured	FA25 Gold Metallic - Textured
FA27 Wood grain - Light Cherry ¹	FA28 Wood grain - Dark Walnut ¹	FA44 Midnight Blue Metallic - Textured	FA45 Copper Metallic
FA46 Charcoal Metallic - Textured	FA47 Bronze Metallic - Textured	FA52 Champagne Metallic	FA53 Red Metallic - Textured

¹ Wood grain finishes are not available for 2ft diameter or above 6ft diameter. Longer than normal lead times may apply, consult factory.

L. CANOPY FINISH

CF01 White	CF02 Black Metallic - Textured	CF20 Silver Metallic - Textured	CF25 Gold Metallic - Textured
CF44 Midnight Blue Metallic - Textured	CF45 Copper Metallic	CF46 Charcoal Metallic - Textured	CF47 Bronze Metallic - Textured
CF52 Champagne Metallic	CF53 Red Metallic - Textured		

M. ACOUSTIC PANEL COLOR

AP00 Not required	AP04 White	AP13 Apple Green	AP22 Blue
AP11 Light Gray	AP26 Sesame Gray	AP27 Black	

Available up to 4ft diameter. Larger sizes (5ft to 7ft) available with visible seams, consult factory. For accompanying non-illuminating acoustic panels see our Acoustic Circles, Quads, Triangles and Ellipse spec pages. Other finishes available. Consult factory.

N. EMERGENCY

E0 Not required	E2 Emergency system - Remote
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O. CIRCUITS

CS1 Single circuit	CS2 Dual circuit
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TECHNICAL DATA

LUMINAIRE

Code	M RTP1P02	M RTP1P03	M RTP1P04	M RTP1P05	M RTP1P06	M RTP1P07
Diameter (A)	2ft	3ft	4ft	5ft	6ft	7ft
Light Direction	Direct	Direct	Direct	Direct	Direct	Direct
Stan. Eff. Watts Max	52	77	100	135	160	190
Stan. Eff. Del. Lms Max	3300	4900	6300	8500	10000	11900
Stan. Eff. LPW Max	69	69	69	69	69	69
High Eff. Watts Max	52	77	100	135	160	190
High Eff. Del. Lms Max	5000	7400	9500	12900	15200	18100
High Eff. LPW Max	104	104	104	104	104	104
Suspension Points	3	3	3	3	4	4
# of Sections &	1	1	1	1	1	1

Canopies

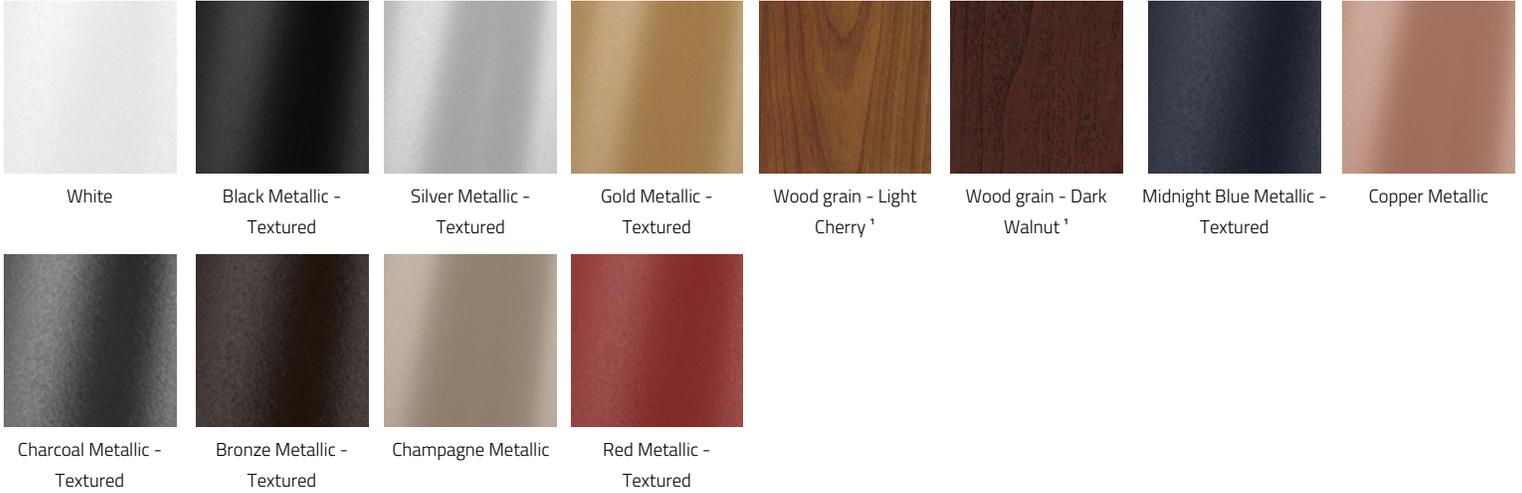
Code	M RTP1P08	M RTP1P12	M RTP2P02	M RTP2P03	M RTP2P04	M RTP2P05
Diameter (A)	8ft	12ft	2ft	3ft	4ft	5ft
Light Direction	Direct	Direct	Direct/Indirect	Direct/Indirect	Direct/Indirect	Direct/Indirect
Stan. Eff. Watts Max	240	380	69	103	138	168
Stan. Eff. Del. Lms Max	15600	24600	4500	6600	9100	11300
Stan. Eff. LPW Max	69	69	69	69	69	69
High Eff. Watts Max	240	380	68	102	136	171
High Eff. Del. Lms Max	17500	27700	6800	10200	13800	17300
High Eff. LPW Max	80	80	105	105	105	105
Suspension Points	6	8	3	3	3	3
# of Sections &	2	2	1	1	1	1

Canopies

Code	M RTP2P06	M RTP2P07	M RTP2P08	M RTP2P12
Diameter (A)	6ft	7ft	8ft	12ft
Light Direction	Direct/Indirect	Direct/Indirect	Direct/Indirect	Direct/Indirect
Stan. Eff. Watts Max	205	242	310	490
Stan. Eff. Del. Lms Max	13300	15900	20000	31700
Stan. Eff. LPW Max	69	69	69	69
High Eff. Watts Max	202	239	310	490
High Eff. Del. Lms Max	20400	24200	23900	37700
High Eff. LPW Max	105	105	80	80
Suspension Points	4	4	6	8
# of Sections &	1	1	2	2

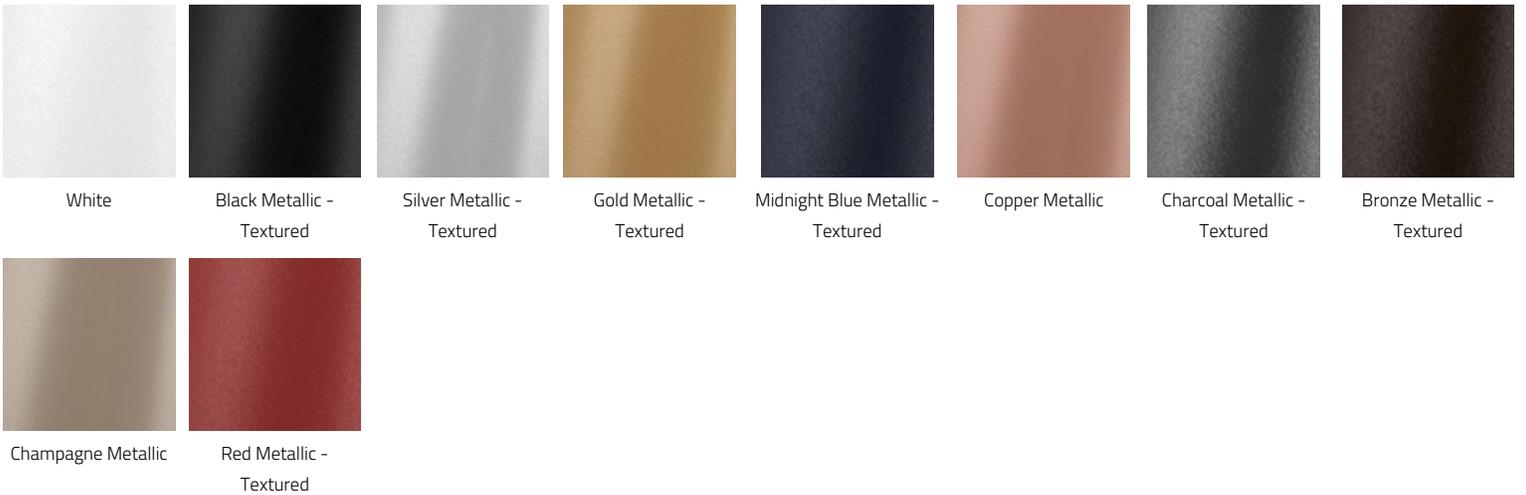
Canopies

FIXTURE FINISH

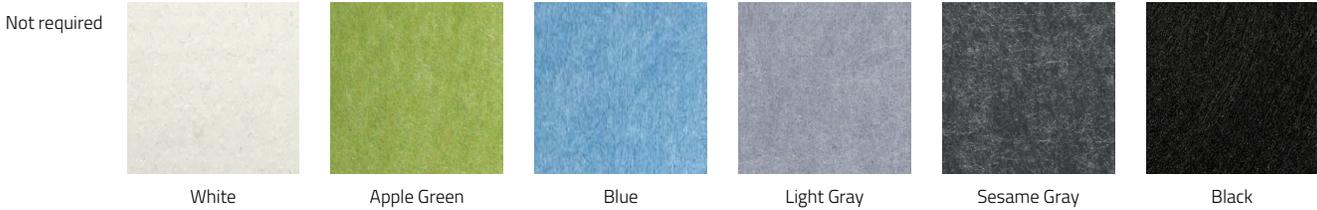


¹ Wood grain finishes are not available for 2ft diameter or above 6ft diameter.
Longer than normal lead times may apply, consult factory.

CANOPY FINISH



ACOUSTIC PANEL FINISH



Available up to 4ft diameter. Larger sizes (5ft to 7ft) available with visible seams, consult factory.
For accompanying non-illuminating acoustic panels see our Acoustic Circles, Quads, Triangles and Ellipse spec pages.
Other finishes available. Consult factory.

MICRO RING II™ - SUSPENDED

TYPE L24 SERIES

APPROVALS



DAMP
LOCATION



IP20

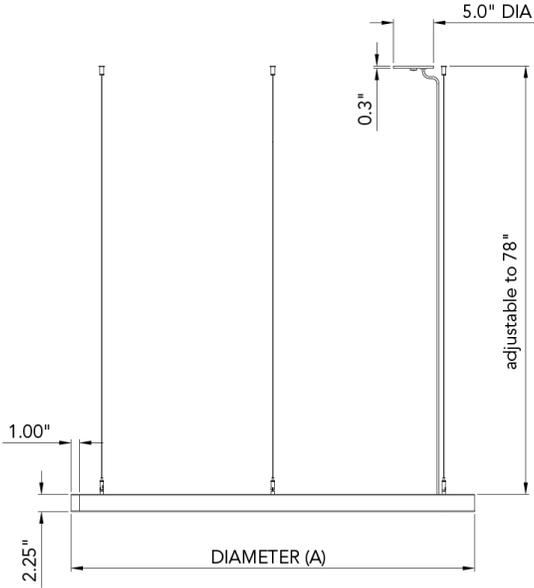


DIMENSIONAL DIAGRAMS

Power Cable Suspension

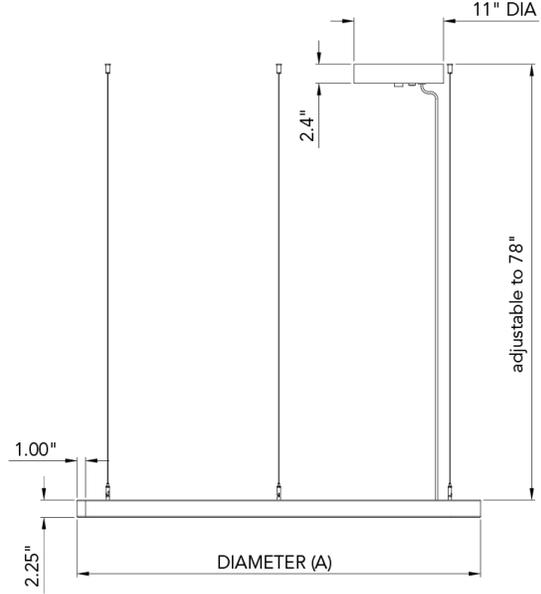
SS1

Vertical - Remote Driver



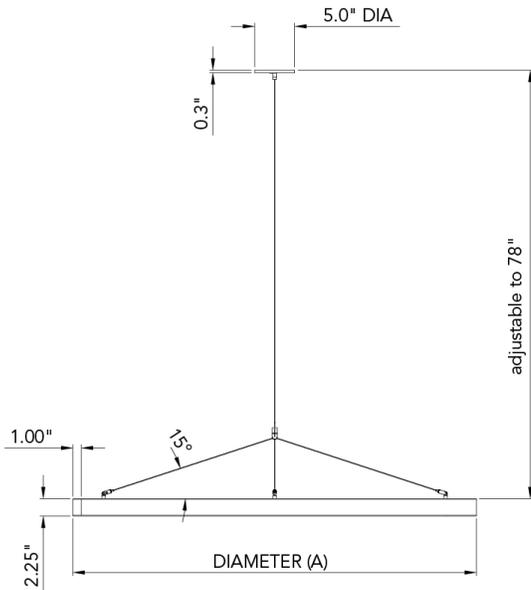
SS3

Vertical - Integral Driver



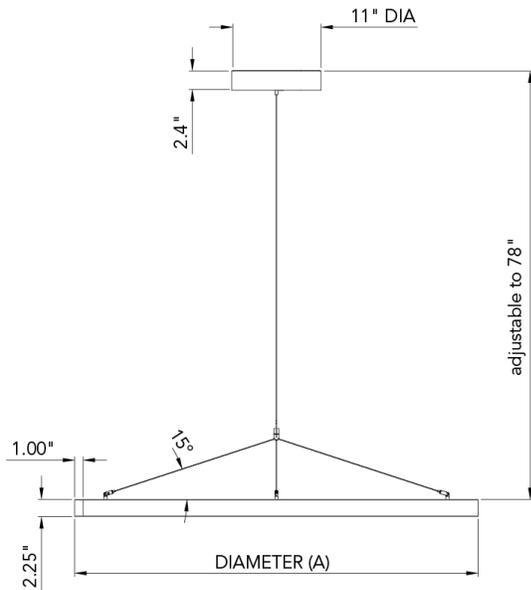
SS2

Hub - Remote Driver



SS4

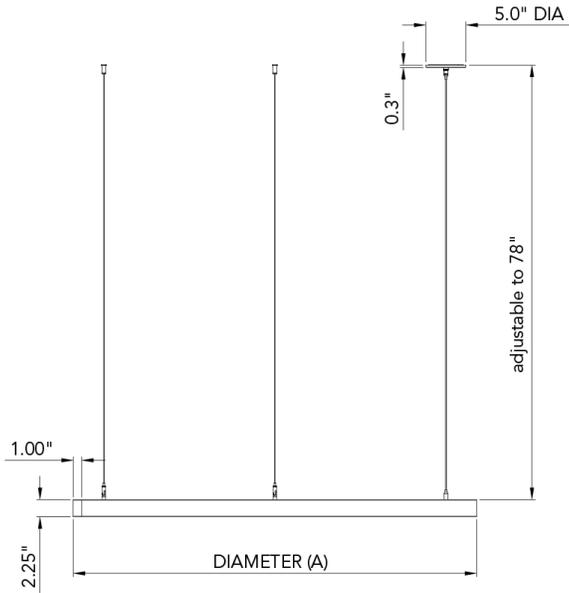
Vertical - Integral Driver



Power Over Suspension

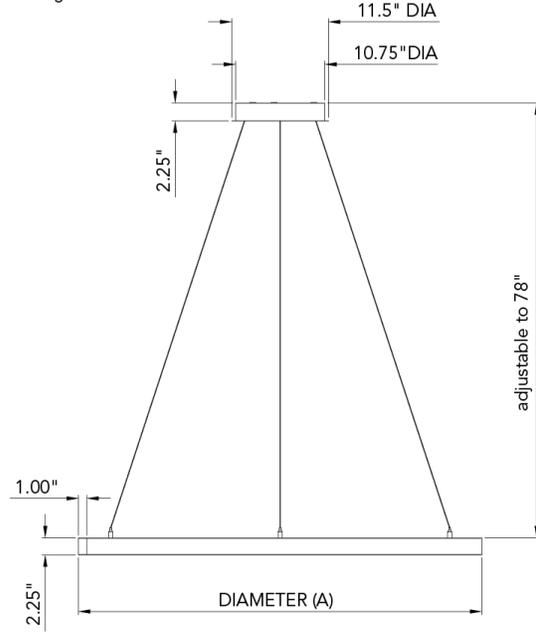
SS6

Vertical - Remote Driver



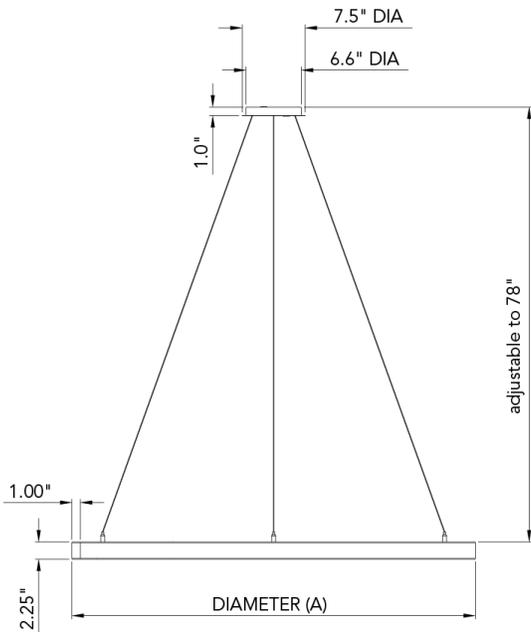
SS9

Hub - Integral Driver

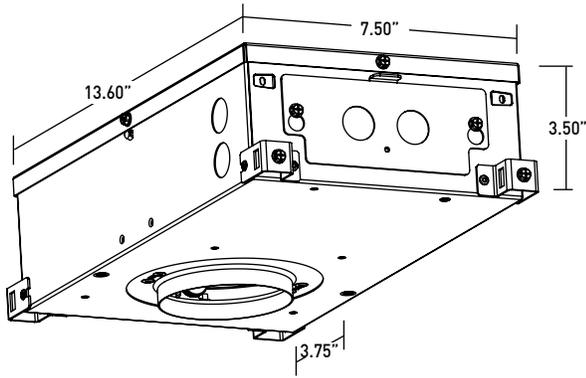


SS7

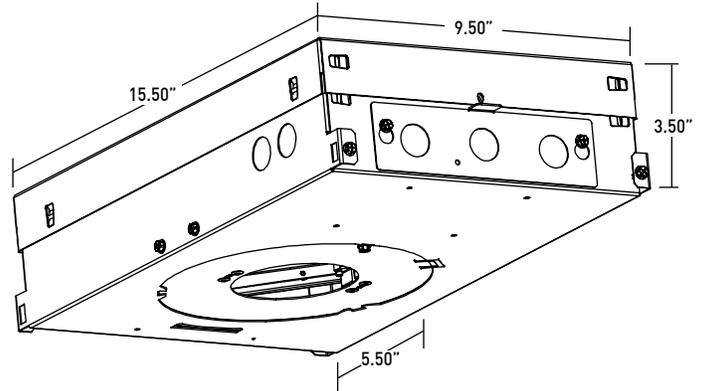
Hub - Remote Driver



CURRENT FRAXION3



NEW FRAXION3



FIXTURE COMPARISON	CURRENT	NEW
MAX DELIVERED LUMENS	2304	2750
STANDARD TILT	40° MAX	40° MAX FEATURING TILT GUIDE & JACK SCREW
ROTATION	365°	365° FEATURING SNAP LOCK
REMODEL	NO	YES
CONCRETE SOLUTION	NO	YES
INTERNATIONAL	NO	YES
DEEP REGRESS	NO	YES
SQUARE TO SQUARE BAFFLE	NO	YES

ACCESSORIES

ROUND SECONDARY MEDIA

Dry/Damp location only.
Wet location requires alternate baffle.

- HCL-F3R** Clear Glass Lens*
- CGL-F3R** Clear Glass Lens*
*(Not available for Warm Dim)
- FGL-F3R** Frosted Glass Lens
- SFL-F3R** Soft Focus Lens
- FSFL-F3R** Frosted Soft Focus Lens
- WDL-F3R** Wide Distribution Lens*
*(Required and only available for 85° beam spread)
- FLSL-F3R** Frosted Linear Spread Lens

SQUARE SECONDARY MEDIA

Dry / Damp location only.
Wet location requires alternate baffle.

- CGL-F3S** Clear Glass Lens*
*(Not available for Warm Dim)
- FGL-F3S** Frosted Glass Lens
- SFL-F3S** Soft Focus Lens
- FSFL-F3S** Frosted Soft Focus Lens
- WDL-F3S** Wide Distribution Lens*
*(Required and only available for 85° beam spread)
- FLSL-F3S** Frosted Linear Spread Lens

ADJUSTABLE HCL ASSEMBLY

Dry / Damp location only.

- OLR-F3RS1-SFL-HCL** Adjustable Honeycomb Louver and Soft Focus Lens*
*(Not available for 60° optic, 21W, or Airtight Housings. 5/8" ceiling depth minimum required.)

REPLACEMENT OPTICS

Interchangeable optics accessible through fixture aperture.

- | Static White | | Warm Dim | | Tunable White | |
|--|-----------|--|-----------|--|-----------|
| <input type="checkbox"/> RO-50-15-S | 15° optic | <input type="checkbox"/> RO-50-20-W | 20° optic | <input type="checkbox"/> RO-50-15-T | 15° optic |
| <input type="checkbox"/> RO-50-20-S | 20° optic | <input type="checkbox"/> RO-50-25-W | 25° optic | <input type="checkbox"/> RO-50-20-T | 20° optic |
| <input type="checkbox"/> RO-50-25-S | 25° optic | <input type="checkbox"/> RO-50-40-W | 40° optic | <input type="checkbox"/> RO-50-25-T | 25° optic |
| <input type="checkbox"/> RO-50-40-S | 40° optic | <input type="checkbox"/> RO-50-60-W | 60° optic | <input type="checkbox"/> RO-50-40-T | 40° optic |
| <input type="checkbox"/> RO-50-60-S | 60° optic | | | <input type="checkbox"/> RO-50-60-T | 60° optic |

ALTERNATE BAFFLE ASSEMBLY (INCLUDES EFFECTS DEVICE)

ASSEMBLY	SHAPE	RATING	TYPE	BAFFLE FINISH	EFFECTS DEVICE
RBA			A		
REPLACEMENT BAFFLE ASSEMBLY	F3R Round F3S Square	1 Dry / Damp 2 Wet* <small>*(Requires suction cup to service or aim & focus)</small>	A Adjustable	WH White BK Black PR Primer AU Cashmere Gold AG Satin Silver BB Burnt Bronze CF Custom Finish * <small>*(Consult Factory)</small>	Leave blank for standard Soft Focus Lens CGL Clear Glass Lens * <small>*(Not available for Warm Dim)</small> FGL Frosted Glass Lens FSFL Frosted Soft Focus Lens WDL Wide Distribution Lens * <small>*(For use with 60° optic only)</small> FLSL Frosted Linear Spread Lens

REPLACEMENT SUCTION TOOL

One included with every six fixtures designated Wet location.

- F4-TOOL-SUCTION** Allows for removal of Wet Location baffles

T-GRID ACCESSORY KIT

Supplied with ceiling thickness "T" and recommended for installations in T-Grid up to 1.5" tall. Available for ceiling thicknesses from 0.50" - 2.125".

- TG-FX3-KIT**

FURRING CHANNEL ACCESSORY KIT

Recommended for installations in furring channel. Available for ceiling thicknesses from 0.50" - 2.125".

- DHA-FC-KIT**

HANGER BAR EXTENDER KIT

Extends hanger bars from 24.0" to 46.0" maximum.

- FRX-HBE-46** Extender, Hanger Bar

REPLACEMENT APPLIQUÉ

- DLA-APP-F3RT** Round
- DLA-APP-F3ST** Square

EMERGENCY LIGHTING - REMOTE MOUNT ONLY

During disruption of main power, emergency battery inverter provides temporary 120V or 277V to fixture.

- EMB-S-25-120/277-LEDX** 25 watt max capacity, 120 or 277 VAC 60Hz, Non-Dimmable
- EMB-S-100-120-LEDX** 100 watt max capacity, 120 VAC 60Hz, 0-10V Dimmable
- EMB-S-100-277-LEDX** 100 watt max capacity, 277 VAC 60Hz, 0-10V Dimmable
- EMB-S-250-120/277-LEDX** 250 watt max capacity, 120 or 277 VAC 60Hz, 0-10V Dimmable

***SHUNT REQUIRED FOR USE WITH ATHENA AND CASAMBI CONTROLS, CONSULT FACTORY FOR DETAILS.**



LUMEN PACKAGE	WATT-AGE	10° OPTIC NO SOFT FOCUS LENS		15° OPTIC SOFT FOCUS LENS		20° OPTIC SOFT FOCUS LENS		25° OPTIC SOFT FOCUS LENS		40° OPTIC SOFT FOCUS LENS		60° OPTIC SOFT FOCUS LENS		85° OPTIC WIDE DISTRIBUTION	
		DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW
80S06A	06	-	-	727	121	774	129	745	124	673	112	722	120	585	98
80S11A	11	-	-	1179	107	1259	114	1211	110	1098	100	1172	107	949	86
80S15A	15	1022	93	1594	106	1696	113	1634	109	1476	98	1583	106	1283	86
80S21A	21	-	-	2158	103	2304	110	2216	106	2006	96	2153	103	1731	82
90S06A	06	-	-	624	104	665	111	640	107	578	96	620	103	503	84
90S11A	11	-	-	1013	92	1082	98	1040	95	943	86	1007	92	815	74
90S15A	15	881	80	1369	91	1457	97	1404	94	1268	85	1360	91	1102	73
90S21A	21	-	-	1854	88	1979	94	1904	91	1723	82	1850	88	1487	71
97S06A	06	-	-	548	91	583	97	562	94	508	85	545	91	441	74
97S11A	11	-	-	889	81	950	86	913	83	828	75	884	80	716	65
97S15A	15	760	69	1202	80	1279	85	1233	82	1113	74	1194	80	968	65
97S21A	21	-	-	1628	78	1738	83	1672	80	1513	72	1624	77	1306	62
90W10A (27K-18K)	10	-	-	-	-	737	73	726	72	664	66	709	70	582	58
90W10A (30K-18K)	10	-	-	-	-	736	73	720	72	667	66	714	71	588	58
90W15A (27K-18K)	15	-	-	-	-	1031	69	1001	67	928	62	992	66	814	54
90W15A (30K-18K)	15	-	-	-	-	1031	69	1009	67	934	62	1000	67	823	55
90T17A (50K-27K)	17	-	-	1065	63	1213	71	1204	71	1219	72	1226	72	997	59
90T17A (40K-18K)	17	-	-	1070	63	1219	71	1218	71	1118	65	1231	72	992	59

CCT	CCT SCALE
2400K	0.85
2700K	0.97
3000K	1.00
3500K	1.03
4000K	1.08

MEDIA	LIGHT LOSS FACTOR
NO LENS	1.08
CGL	1.00
SFL	1.00
FGL	0.86
FSFL	0.80
FLSL	0.77
WDL	0.81
HCL	0.68

CCT	5000K-2700K	4000K-1800K
5000K	1.16	-
4000K	1.08	1.14
3500K	1.04	1.07
3000K	1.00	1.00
2700K	0.96	0.92
2400K	-	0.84
1800K	-	0.69

JA8-2022 INDICATED BY SHADING

UNIFIED GLARE RATING

10° OPTIC NO LENS	15° OPTIC SOFT FOCUS LENS	20° OPTIC SOFT FOCUS LENS	25° OPTIC SOFT FOCUS LENS	40° OPTIC SOFT FOCUS LENS	60° OPTIC SOFT FOCUS LENS	85° OPTIC WIDE DISTRIBUTION LENS
>19	>19	<16	<16	<19	>19	>19

WARM DIM PERFORMANCE - SOFT FOCUS LENS - 20° OPTIC

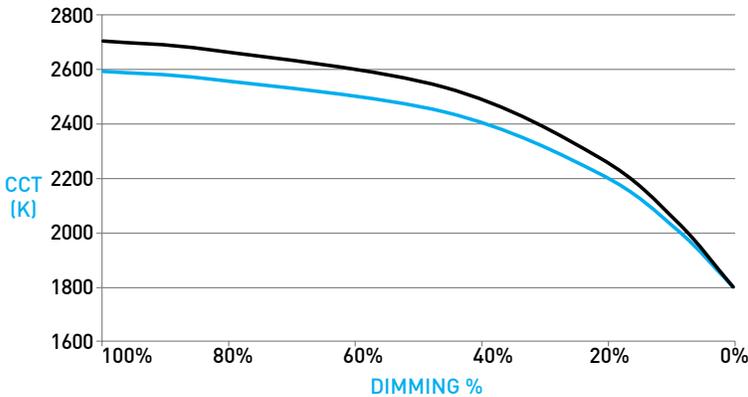
INCANDESCENT PROFILE

90W10AL 2700K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2600	2550	2520	2450	2200	1925	1800
Light Output (Lm)	737	589	515	368	147	73	14
Power (W)	10	8	7	5	2	1	.2
Efficacy (LPW)	73	73	73	73	73	73	73
90W15AL 2700K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2700	2650	2620	2520	2180	1950	1800
Light Output (Lm)	1031	824	721	515	206	103	20
Power (W)	15	12	10.5	7.5	3	1.5	0.3
Efficacy (LPW)	69	69	69	69	69	69	69

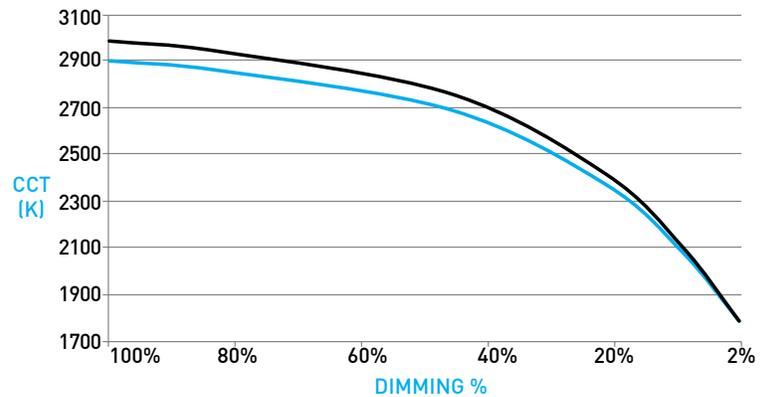
HALOGEN PROFILE

90W10AD 3000K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2900	2850	2800	2720	2350	1975	1800
Light Output (Lm)	736	589	515	368	147	73	14
Power (W)	10	8	7	5	2	1	.2
Efficacy (LPW)	73	73	73	73	73	73	73
90W15AD 3000K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	3000	2950	2920	2775	2375	2000	1800
Light Output (Lm)	1031	824	721	515	206	103	20
Power (W)	15	12	10.5	7.5	3	1.5	0.3
Efficacy (LPW)	69	69	69	69	69	69	69

10W / 15W



10W / 15W



DOWNLIGHT / HOUSING

A ADJUSTABILITY

Aiming mechanism is integral to the housing, providing lockable hot-aim tilt up to 40° and 365° rotation. Sliding pivot point optimizes center beam, ensuring unclipped beam of 15° at 40° tilt and 25° at 30° tilt. 1° tilt increments with 5° indicators, tilt guide included (see **A1** section view).

B LED

Integral LED module design enables field service / replacement through housing aperture.

C OPTIC

Robust light engine with optimized optic pairing integrates Reflection, Refraction, and TIR offering 10°, 15°, 20°, 25°, 40° & 60° beams.

D TRIMLESS MILLWORK SPACERS

Provided for Trimless Millwork installations; includes (1) 1/16" spacer and (5) 1/8" spacers.

E TRIM EXTENSION

Provided for -2 ceiling thickness; accommodates 2.125" max ceiling thickness.

F MICROFLANGE PROFILE

Features 0.30" flange. Thickness measures 0.06". Installed after ceiling is complete. Requires 3.375" diameter cutout. Wet location features integral silicone gasket.

G TRIMLESS DRYWALL PROFILE

Installs totally flush with the ceiling with no visible trim. Appliqué includes screws for mounting and has 0.06" plaster stop. Not recommended for stucco applications.

H1 MEDIA / LENS RETAINER

Fixture is limited to 1 effects device. Wet location effects device is sealed in place. Suction tool provided for removal of baffle with wet location. Lens retainer allows effects devices to be changed in Dry /Damp locations.

H2 ADJUSTABLE HCL ASSEMBLY

Honeycomb Louver and Soft Focus Lens attach directly to optic with clip-on lens retainer and adjusts with fixture. Only compatible with no lens baffle. Dry/Damp locations only. Specified as -28 Effects Device

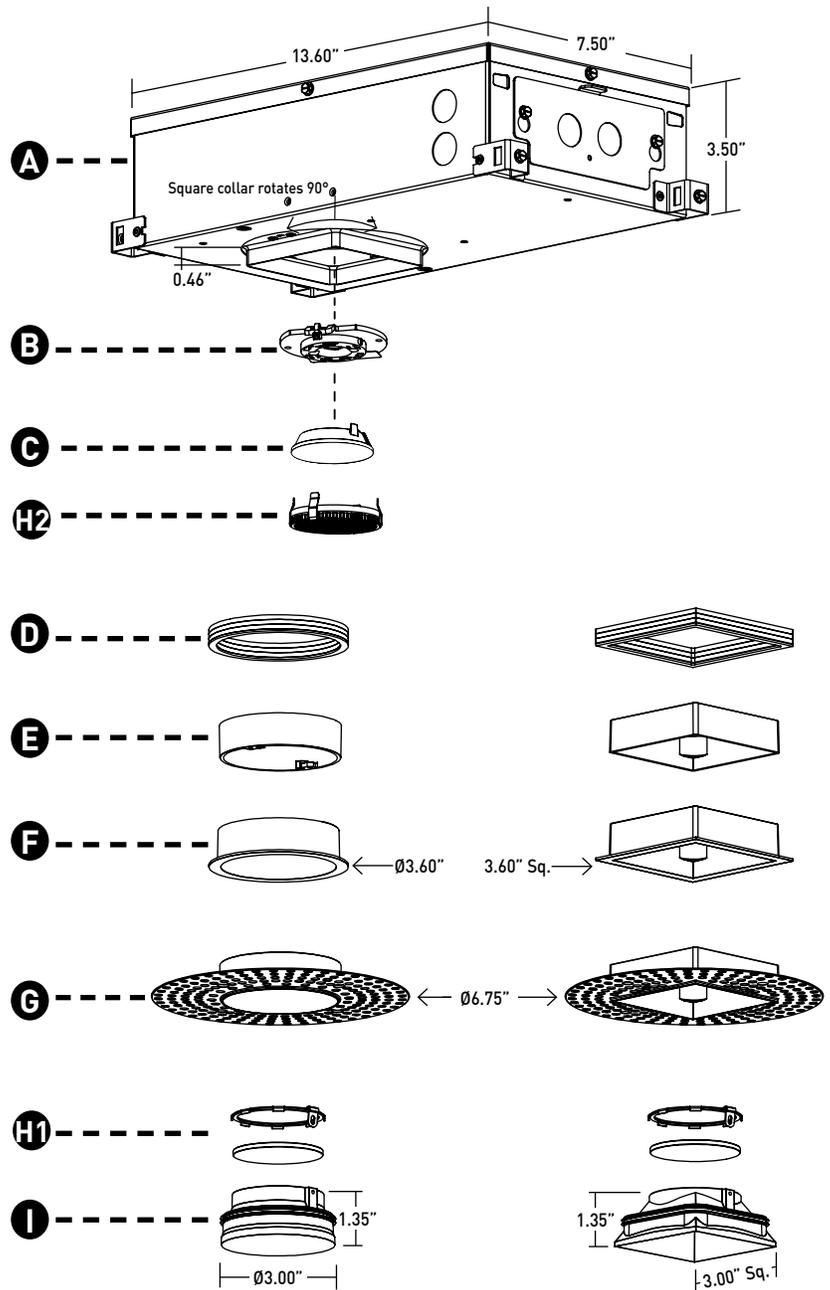
I ROUND BAFFLE

Die-cast removable baffle provides easy access to tilting mechanism and features 62° glare cutoff. Minimizes aperture glare and conceals view into housing; includes gasket.

SQUARE TRANSITIONAL BAFFLE

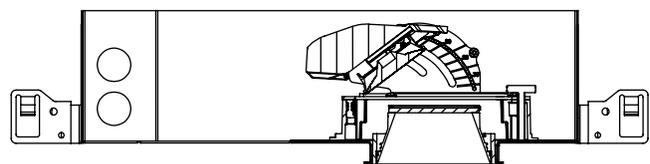
Die-cast removable baffle provides easy access to tilting mechanism and features 62° glare cutoff. Transitions from square aperture at ceiling plane to round aperture at light source. Minimizes aperture glare and conceals view into housing; includes gasket.

DIMENSIONS / DRAWINGS



A1

SECTION VIEW



DOWNLIGHT / HOUSING

- J** **IC HOUSING**
 - For IC ceilings.
 - No setback from polycell spray foam insulation having max R-Value of 60 on all sides and top of housing.
- K** **NIC HOUSING**
 - Minimum 0.50" setback from combustible and non-combustible materials on all sides and top of housing.
 - Minimum 3.00" setback from insulation material having max R-Value 30 on all sides and top of housing.
 - Minimum 6.00" setback from polycell spray foam insulation having max R-Value 60.
- L** **ADJUSTABLE HANGER BAR HEIGHT ACCESSORY**

Provided with ceiling thickness "T" and recommended for installations in T-Grid up to 1.5" tall. Hanger bars are installed to adjustable bracket. Allows housing to be raised and lowered; ceiling thickness remains 0.5" to 1.375" max.
- M** **APPLIQUÉ DETAIL**

Appliqué for plaster floating directly to baffle.
- N** **REMOTE POWER SUPPLY**

Provided with install Types "V", "W" and "D". Remote power supply provides additional driver options. See page 8 for maximum allowable secondary run lengths between PSF3-RMT and fixture. Must be installed in an accessible location.
- O** **ATHENA / CASAMBI CONTROL**

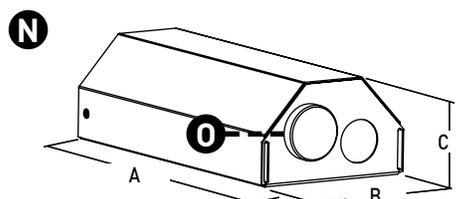
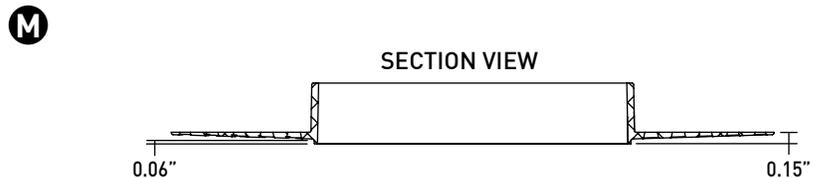
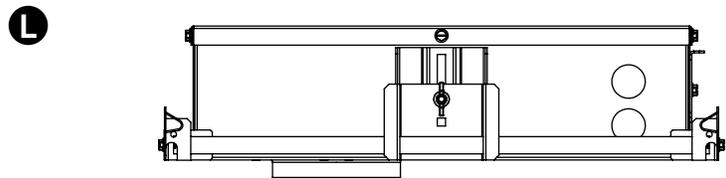
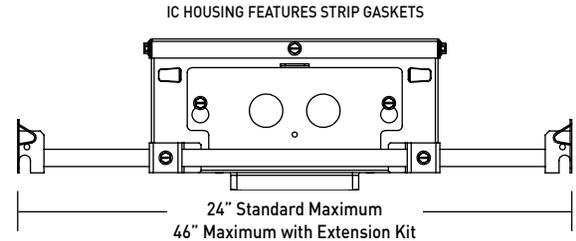
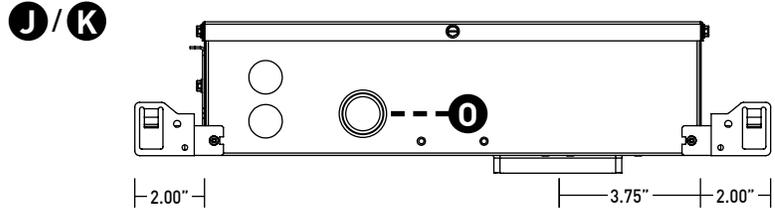
Controls integrated into housing or remote driver assembly. All equipment is serviceable.

Athena Model Numbers: A-WN-D01-RF-BL & DFC-OEM-DBI

Casambi Model Number: BT-S1E1-5400
- P** **ATHENA / CASAMBI EM SHUNT**

Included with drivers specified as ASR, ADR, CSR, or CDR. One required for each wireless EM fixture, requires class 2 control wiring between fixture and shunt. Features integrated test switch.

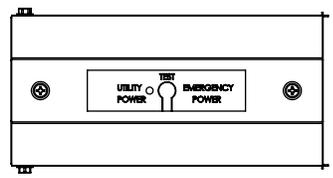
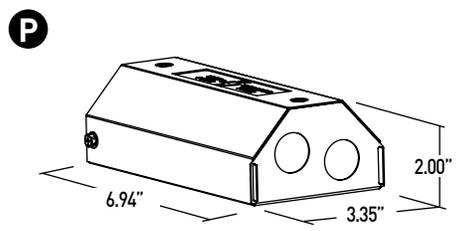
Model Number: PS-RMT-SHUNT



	A	B	C
STATIC WHITE / WARM DIM	6.94"	3.35"	2.00"
TUNABLE WHITE	8.10"	5.00"	2.00"
ATHENA / CASAMBI CONTROLLED	8.10"	5.00"	2.00"

HOUSING NOTES

- Do not install NON-IC housings in environments where ambient temperatures exceed 40°C (104°F). See table below for IC housings.
- Power supply compartment and all splice connections may be serviced from room side.
- Consult factory for spacing requirements for any installations exceeding R-Value 60.
- Hanger bars fitted to short side of housing or long side when TG accessory is specified; extend from 14.0" to 24.0", but may be field cut to accommodate narrow stud spacing. Can be extended up to 46" maximum with FRX-HBE-46 kit.
- Hanger bars and brackets add 4.00" max to the overall dimension, but are exclusive of the setback requirements.
- Housings for round trims feature a round aperture housing collar. Housings for square trims feature a square housing collar that rotates up to 90 degrees for fixture alignment. Housing collars accommodate ceiling thicknesses between 0.50" and 2.125".



IC HOUSING MAX AMBIENT TEMPERATURE	
LUMEN PACKAGE	TEMPERATURE
06W / 11W STATIC WHITE	40°C (104°F)
10W WARM DIM	35°C (95°F)
15W STATIC WHITE	25°C (77°F)
15W WARM DIM	30°C (86°F)
17W TUNABLE WHITE	30°C (86°F)

TECHNICAL

CONSTRUCTION

Downlight: Painted finishes are granulated powder coat.
Housing: Aluminum and 22 Gauge galvanized steel. Die-cast aluminum heat-sink.
Remote Power Supply: 22 Gauge galvanized steel.
Appliqué: Zinc alloy.

STATIC WHITE LED

2-step MacAdam ellipse LED module available in 80+, 90+ and 97+ CRI configurations in color temperatures of 2700K, 3000K, 3500K and 4000K.
 3-step MacAdam ellipse LED module available in 90+ CRI configuration in color temperature of 2400K. Average rated lamp life of 50,000 hours. LED and driver assemblies are field-replaceable.

WARM DIM LED

3-step MacAdam ellipse warm dim LED module available in 90+ CRI configuration. 3000K or 2700K at full brightness, warming to 1800K at full dim. Average rated lamp life of 50,000 hours. LED and driver assemblies are field-replaceable.

TUNABLE WHITE LED

3-step MacAdam ellipse tunable white LED module available in 90+ CRI configuration. Features tuning ranges of 1800K to 4000K and 2700K to 5000K. Average rated lamp life of 50,000 hours. LED and driver assemblies are field-replaceable.

POWER SUPPLY PERFORMANCE AND DIMMING INFORMATION

	PHASE		0-10V					ECO	DALI-2		ATHENA		CASAMBI	
Power Supply	PH	SG	SN	EG	EN	DG	DN	LP	ED	DD	AS	AD	CS	CD
Minimum °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	0 °C	-20 °C	-20 °C	0 °C	0 °C	-20 °C	-20 °C
Maximum °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Dimming %	2.0%	1.0%	1.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%

Note: For LP, EG and EN drivers consult chart on page 9 to confirm appropriate dimming curve for compatibility with selected control.

MAXIMUM ALLOWABLE REMOTE DRIVER WIRING DISTANCES

DRIVER	WIRE AWG				
	12	14	16	18	20
PH	285'	180'	113'	71'	45'
LP	60'	40'	25'	15'	-
EG, EN, ED, DG, DN, DD, SG, SN, AS, CS, AD, CD	-	-	118'	72'	46'

LISTING

cTUVus listed to UL1598 standard for Dry / Damp and Wet locations. CCEA, Airtight, and Title 24 JA8-2022 Listed. NEMA 410 Compliant.

BUY AMERICAN ACT

All Fraxion3 Slim Adjustable configurations are Buy American Act compliant.

DECLARE

LBC Red List Approved.

WEIGHT

Fixture - 6.5 lbs max
 Remote Driver - 1.75 lbs max

LIMITED WARRANTY

Manufacturer's Limited Warranty guarantees product(s) listed to be free from defects in material and workmanship under normal use and service for 1-year. LED and power supplies are warranted to operate with 70% of original flux and remain within a range of 3 duv for a period of 5-years. 10-year Lutron Advantage limited warranty available on Lutron equipped systems. Warranty period begins from the date of shipment by Seller. Consult website for full warranty terms and conditions.

CHANGE LOG

- 10/17/2022: REMOVED 90W13A 3200K-1800K WARM DIM AND ADDED 90W15AD 3000K-1800K WARM DIM.
- 10/17/2022: UPDATED MAX AMBIENT TEMPERATURE TABLE.
- 02/14/2023: ADDED EG, EN, AND ED DRIVER OFFERINGS.
- 04/26/2023: ADDED DECLARE LBC RED LIST APPROVED.
- 08/07/2023: ADDED NEW LED AND OPTIC OFFERINGS. REMOVED 2200K OFFERING.
- 02/01/2024: ADDED ATHENA AND CASAMBI CONTROL OFFERING, 2400K, AND WARM PROFILE TUNABLE WHITE.
- 07/15/2024: REMOVED L2 DRIVER OFFERING.



DIMMING COMPATIBILITY

LUTRON DRIVER COMPATIBILITY

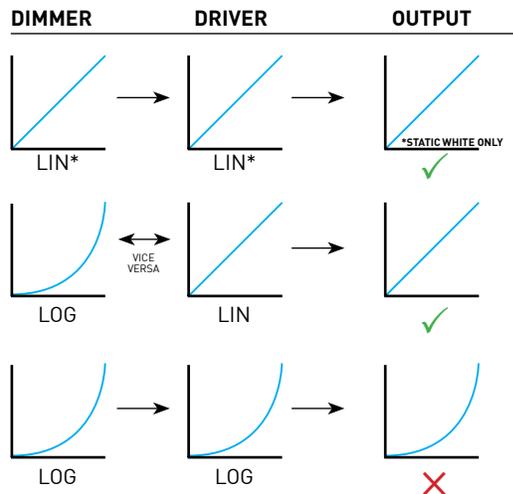
Power supply LP Lutron Product Family	Part No.
PowPak Dimming Modules	RMJ-EC032-DV-B
PowPak Dimming Modules	FCJ/FCJS-ECO
Energi Savr Nodes	QSN-1ECO-S
GRAFIK Eye QS control unit Homeworks QS control unit	QSN-2ECO-S
GRAFIK Eye QS control unit Homeworks QS control unit	QSGRJ- _E (wireless) QSGR- _E
Quantum Hub	QP2- _ _ 2C
Quantum Hub	QP2- _ _ 4C
Quantum Hub	QP2- _ _ 6C
Quantum Hub	QP2- _ _ 8C
Homeworks QS power module myRoom Plus power module	LQSE-2ECO-D



eldoLED DRIVER COMPATIBILITY

Power supply EG/SG Manufacturer	Family/Model #
Busch-Jaeger	2112U-101
Jung	240-10
Leviton Lighting Controls	IP710-DLX
Lightolier Controls	ZP600FAM120
Merten	5729
Pass & Seymour	CD4FB-W
The Watt Stopper	DCLV1
Synergy	ISD BC
Crestron®	GLX-DIMFLV8
Crestron®	GLXP-DIMFLV8
Crestron®	GLPAC-DIMFLV4-*
Crestron®	GLPAC-DIMFLV8-*
Crestron®	GLPP-DIMFLVEX-PM
Crestron®	GLPP-1DIMFLV2EX-PM
Crestron®	GLPP-1DIMFLV3EX-PM
Crestron®	DIN-A08
Crestron®	DIN-4DIMFLV4
Crestron®	CLS-EXP-DIMFLV
Crestron®	CLCI-1DIMFLV2EX
Power supply EN/SN Manufacturer	Family/Model #
Lutron Electronics	Nova T® - NTFTV
Lutron Electronics	Diva® - DDTV
Lutron Electronics	Nova® - NFTV
Lutron Electronics	GrafixEye® GRX-TVI w GRX3503
Lutron Electronics	Energy Savr Node™ - QSN-4T16-S
Lutron Electronics	TVM2 Module
Sensor Switch	nIO EZ
ABB	SD/S 2.16.1

ANALOG DRIVERS AND DIMMERS



LIN = LINEAR
 LOG = LOGARITHMIC
 *LIN-TO-LIN NOT COMPATIBLE FOR WARM-DIM



Huntington 1 Series

HTG-1W

WALL

Brilliant by Design™, minimalistic aesthetic combined with our innovative Microstructure EdgeTech Optics (MEO)™ will bring your vision to light. The innovative MEO™ design utilizes high efficiency Microstructure Lenses and Light Guide Plates for high optical extraction and precise light management.



WALL

FEATURES

- Innovative Microstructure EdgeTech Optics™ delivers unparalleled optic control and exceptional performance with seamless illumination and uniformity. Specify Batwing, Glare Control, Diffused (Lambertian), Room Fill or Ceiling Wash Optics.
- MEO™ allows for minimalistic 1.5" Aperture fixtures with extremely low profiles.
- Individual fixture lengths and seamless continuous rows with no lens breaks up to 300 feet.
- Surface Wall Mount
- Innovative Toolless "Push to Eject" System allows for easy installation and serviceability.
- No visible fasteners.
- Specified Lumen Outputs (SLO) available.
- Proudly crafted in Huntington Beach, CA - USA.

Performance Overview

4' Huntington 1 Direct - 3500K 90CRI				
Lumen Output	LL (Low)	ML (Medium)	HL (High)	SLO* (Specified)
Delivered Lumens	772	1908	3760	772-5920
Consumed Wattage	7	18	38	7.3 - 65.6
Efficacy (lm/W)	105	105	99	90-105
SDCM	3	3	3	3

*Specified Lumen Output (SLO) available in customizable lumen configurations (896 lm - 6852 lm). See SLO Configurator [HERE](#)



ORDERING INFORMATION

PROJECT _____ TYPE _____
 PRODUCT _____ QTY _____

Product Family	Driver Location	Mounting Direction	Length
HTG-1W Huntington Series 1.5" Aperture (Wall Mount)	<input type="checkbox"/> TD Intergral Driver <input type="checkbox"/> RD Remote Driver	<input type="checkbox"/> DT Direct <input type="checkbox"/> UT Indirect	<input type="checkbox"/> _____* Specify length in 1 foot increments <input type="checkbox"/> L_X_ L Pattern <input type="checkbox"/> CP Custom Pattern *Minimum Integral Driver length is 2'. Minimum Remote or In Canopy Driver can be shorter, consult factory. *Custom length fixtures can be ordered in 3" increments. *Any length over 8' requires multiple fixture segments.

Lumen Output	Optics	Color Temp	Voltage
<input type="checkbox"/> DLL Low (193 l/ft @ 1.84 W)* <input type="checkbox"/> DML Medium (477 l/ft @ 4.55 W)* <input type="checkbox"/> DHL High (940 l/ft @ 9.46 W)* <input type="checkbox"/> SLO-XX **Specified Lumen Output available. *Delivered lumen output & consumed wattage based on "MEODF 35" (90 CRI - 3500K). See SLO Configurator for alternate outputs.	MEO <input type="checkbox"/> MEODF Diffusing <input type="checkbox"/> MEOBW Batwing <input type="checkbox"/> MEOGC Glare Control <input type="checkbox"/> MEORF Room Fill <input type="checkbox"/> MEOCW** Ceiling Wash PRO* <input type="checkbox"/> PROAY Asymmetric <input type="checkbox"/> PROWD Wide <input type="checkbox"/> PRONR Narrow *PRO Optics are only available for indirect orientation and 90+ CRI. PRO Optics are not a diffused light source. LED pixelation will be seen with this optic choice. **Indirect Only	90+ CRI <input type="checkbox"/> 27 2700K <input type="checkbox"/> 30 3000K <input type="checkbox"/> 35 3500K <input type="checkbox"/> 40 4000K <input type="checkbox"/> 50 5000K <input type="checkbox"/> XX Optional Color Temp & CRI Available	<input type="checkbox"/> VU 120V-277V <input type="checkbox"/> V3 347V

Driver	Finish
<input type="checkbox"/> D* 1% 0-10V <input type="checkbox"/> DN NON DIM <input type="checkbox"/> DL1 Lutron Hi-Lume 1% EcoSystem <input type="checkbox"/> DE* .1% 0-10V <input type="checkbox"/> DD1 1% DALI <input type="checkbox"/> DDE .1% DALI <input type="checkbox"/> DMX .1% DMX/RDM <input type="checkbox"/> DELV 1% Electronic Low Voltage Dimming (Reverse Phase) <input type="checkbox"/> DTRIAC 1% Electronic Low Voltage Dimming (Forward Phase) <input type="checkbox"/> XX Other (Please Specify) *Dim to Off available. Please Specify "-OFF" next to driver option if required.	<input type="checkbox"/> SA* Silver Anodized <input type="checkbox"/> WP* Matte White <input type="checkbox"/> BP* Matte Black <input type="checkbox"/> CC* Custom *When above finish selected, the housing finish and end cap finish will match <input type="checkbox"/> SAMF SA Housing/Machine Finish End Caps <input type="checkbox"/> WPMF WP Housing/Machine Finish End Caps <input type="checkbox"/> BPMF BP Housing/Machine Finish End Caps <input type="checkbox"/> CCMF CC Housing/Machine Finish End Caps

Options	Mounting
<input type="checkbox"/> EMB_*_ Emergency Battery Pack(s) <input type="checkbox"/> EMC_*_ Emergency Circuit(s) <input type="checkbox"/> SOC * Occupancy Sensor <input type="checkbox"/> SDL* Daylight Sensor <input type="checkbox"/> BCS* Brilliant Communications Solutions (wired/wireless) <input type="checkbox"/> JA8 JA8 Approved BCS: includes wired and wireless integration from our partners at nLight™, Enlighted, Legrand, Crestron, Osram, Lutron and many more. Contact Extant for details. EMB: Specify quantity of battery packs. Minimum 4' unit. EMC: Specify quantity of emergency circuits. SOC & SDL: Specify spacing/location of sensors(s).	<input type="checkbox"/> SW Surface Wall



Specifications

CONSTRUCTION One-piece heavy gauge 6063 extruded aluminum housing. Precision-machined aluminum end caps.

OPTICS Microstructure EdgeTech Optics (MEO)™ utilizes high efficiency Microstructure Lenses and Light Guide Plates for high optical extraction and precise light management. Specify Batwing, Glare Control, Diffused (Lambertian), Room Fill or Ceiling Wash Optics.

LIGHT OUTPUT (3) Standard lumen packages are available: Low (DLL), Medium (DML) and High (DHL). Specified Lumen Output (SLO) packages available. Please see the (SLO) configurator at ExtantLighting.com.

LEDS Latest generation of premium Nichia 3-step MacAdam Ellipse LED's available in (90+ CRI) 2700K, 3000K, 3500K, 4000K. LED modules are easily accessible and replaceable.

VOLTAGE Universal 120/277V (VU) and 347V (V3) available. Consult factory for driver options when 347V is specified.

EMERGENCY BATTERY Factory provided low profile 10W emergency battery for UL924 required 90-minute run time (optional).

FINISH Standard finishes include silver anodized, powder coated white or powder coated black. Custom anodized and powder coated finishes available (RAL number matched).

CONTINUOUS ROWS Innovative Toolless Latch System ensures simple installation. Seamless continuous rows with no lens breaks, pixelation or hotspots up to 300 feet (MEODF, MEOGC, MEORF, MEOCW) or 250 feet (MEOBW).

PATTERNS Standard L Pattern (L) available. Custom patterns available.

MOUNTING Surface Wall Mount.

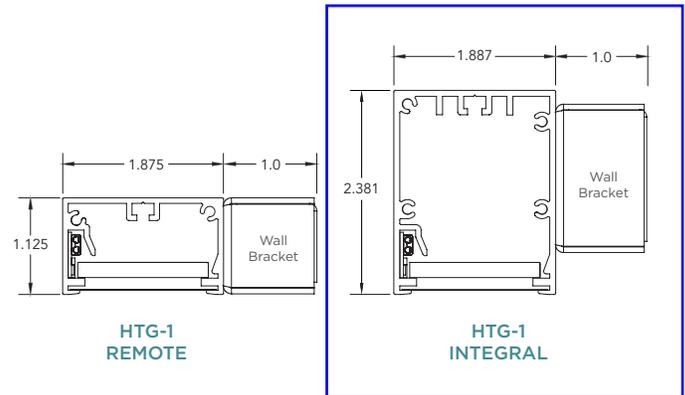
APPROVALS UL and cUL Listed. Approved for Dry/Damp locations. Made in the USA. JA8 Approved.

LUMEN MAINTENANCE (L70) 70% of initial light output = Reported > 60,000 hours | Calculated > 200,000 hours (L90) 90% of initial light output = Reported > 60,000 hours | Calculated > 200,000 hours.

WARRANTY HTG 1 offered with a 5-year limited warranty. 5-year limited warranty covers LED, Driver and fixture. For further details, refer to General Warranty and Obligations at ExtantLighting.com.

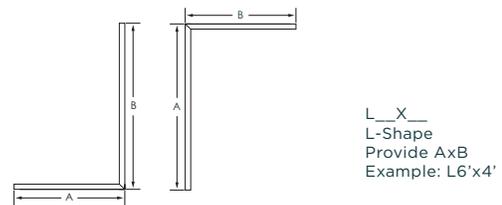
PATENTS Extant Lighting's intellectual property is protected under Patent No. US 11,378,262 B2 by the U.S. Patent Office.

Dimensions



Patterns

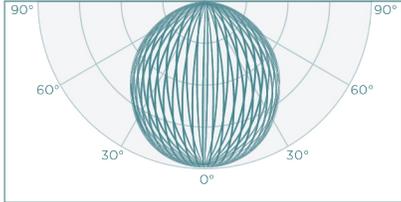
Note: Patterns shown and ordered in Plan View.



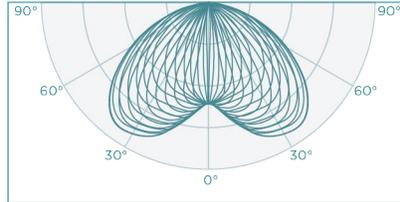
Microstructure EdgeTech Optics (MEO)™

MEO™ Optics can be specified in direct and indirect orientation. Our innovative MEO™ design utilizes high efficiency Microstructure Lenses and Light Guide Plates for high optical extraction and precise light management. MEO™ delivers exceptional light quality with seamless illumination and uniformity with no pixelation, hot spots or lens breaks up to 300° (MEODF, MEOGC, MEORF, MEOCW) or 250° (MEOBW).

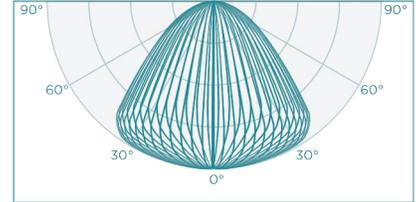
DIRECT



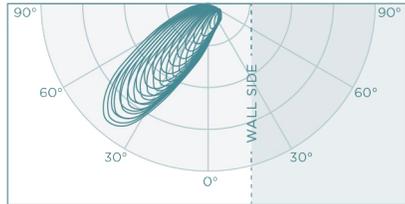
MEODF
LAMBERTIAN



MEOBW
BATWING

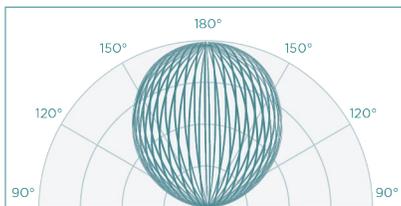


MEOGC
GLARE CONTROL

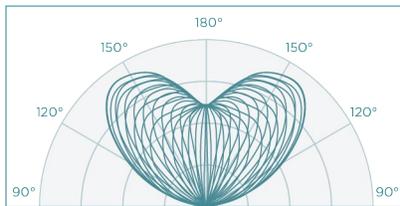


MEORF
ROOM FILL

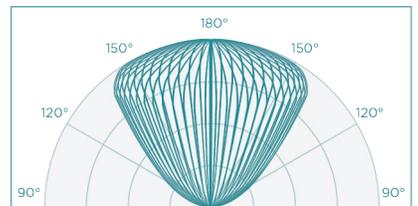
INDIRECT



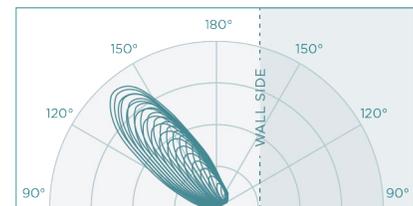
MEODF
LAMBERTIAN



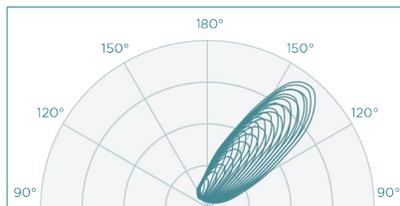
MEOBW
BATWING



MEOGC
GLARE CONTROL



MEOCW
CEILING WASH



MEORF
ROOM FILL

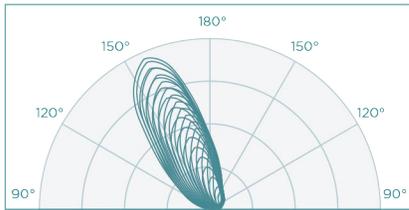


Precision Refractive Optics (PRO)

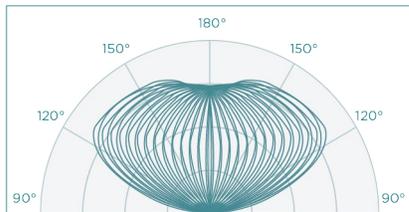
Precision Refractive Optics (PRO) are designed to produce precise optic control for diverse design applications. PRO Optics are only available in indirect orientation. PRO utilizes the latest in extruded lens technology that mount directly to the LED board channel to give optimum control.

Please Note: The PRO optics are not a diffused light source. LED pixelation will be seen with this optic choice. If you want a completely diffused light source with no pixelation or hot spots, see our Microstructure EdgeTech Optics (MEO)™ options.

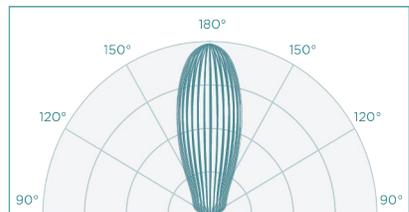
INDIRECT



PROAY
ASYMMETRIC



PROWD
WIDE



PRONR
NARROW

Continuous Row Detail

NOTE: Detail below is specific to the Surface Wall only. For additional Continuous Row Detail, please visit ExtantLighting.com

Nominal Row Length (ft)	Segment Lengths (ft)	Overall Row Length
9	5 + 4	9' 1/2"
10	6 + 4	10' 1/2"
11	7 + 4	11' 1/2"
12	8 + 4	12' 1/2"
13	8 + 5	13' 1/2"
14	8 + 6	14' 1/2"
15	8 + 7	15' 1/2"
16	8 + 8	16' 1/2"
17	8 + 5 + 4	17' 1/2"
18	8 + 6 + 4	18' 1/2"
19	8 + 7 + 4	19' 1/2"
20	8 + 8 + 4	20' 1/2"
21	8 + 8 + 5	21' 1/2"
22	8 + 8 + 6	22' 1/2"
23	8 + 8 + 7	23' 1/2"
24	8 + 8 + 8	24' 1/2"
25	8 + 8 + 5 + 4	25' 1/2"
26	8 + 8 + 6 + 4	26' 1/2"
27	8 + 8 + 7 + 4	27' 1/2"
28	8 + 8 + 8 + 4	28' 1/2"
29	8 + 8 + 8 + 5	29' 1/2"
30	8 + 8 + 8 + 6	30' 1/2"
31	8 + 8 + 8 + 7	31' 1/2"
32	8 + 8 + 8 + 8	32' 1/2"
33	8 + 8 + 8 + 5 + 4	33' 1/2"
34	8 + 8 + 8 + 6 + 4	34' 1/2"
35	8 + 8 + 8 + 7 + 4	35' 1/2"
36	8 + 8 + 8 + 8 + 4	36' 1/2"
37	8 + 8 + 8 + 8 + 5	37' 1/2"
38	8 + 8 + 8 + 8 + 6	38' 1/2"
39	8 + 8 + 8 + 8 + 7	39' 1/2"
40	8 + 8 + 8 + 8 + 8	40' 1/2"
41	8 + 8 + 8 + 8 + 5 + 4	41' 1/2"
42	8 + 8 + 8 + 8 + 6 + 4	42' 1/2"
43	8 + 8 + 8 + 8 + 7 + 4	43' 1/2"
44	8 + 8 + 8 + 8 + 8 + 4	44' 1/2"
45	8 + 8 + 8 + 8 + 8 + 5	45' 1/2"
46	8 + 8 + 8 + 8 + 8 + 6	46' 1/2"
47	8 + 8 + 8 + 8 + 8 + 7	47' 1/2"
48	8 + 8 + 8 + 8 + 8 + 8	48' 1/2"

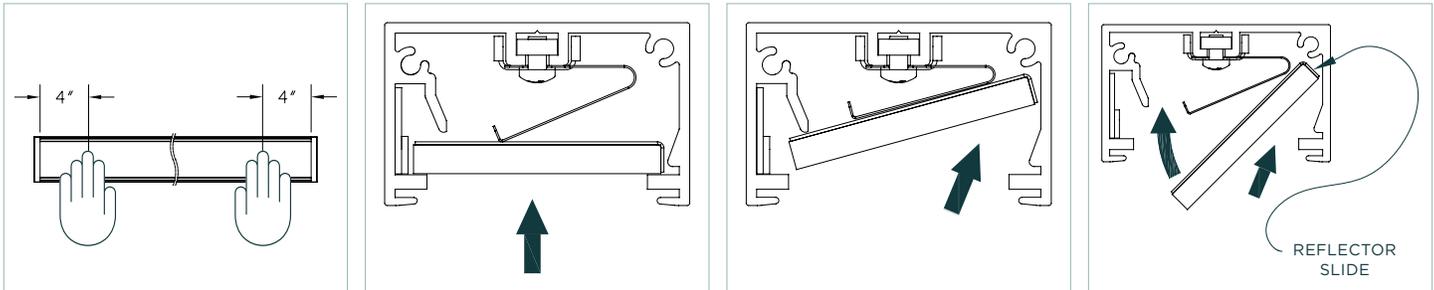


Installation

Thoughtful engineering is at the core of all of our fixture designs. All of our products are thoughtfully engineered and include innovative features that create a sophisticated fixture that is also contractor friendly and easy to install and service.

PUSH TO EJECT SYSTEM

Innovative “Push to Eject” System allows for toolless removal and installation of the Light Guide Plate. This thoughtful engineering creates easy access into the housing for simple installation and serviceability.

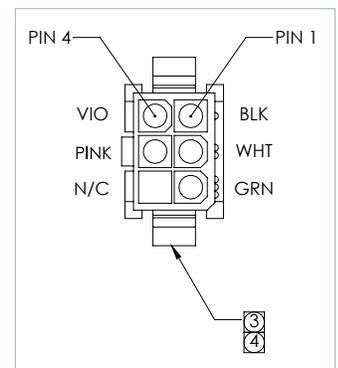
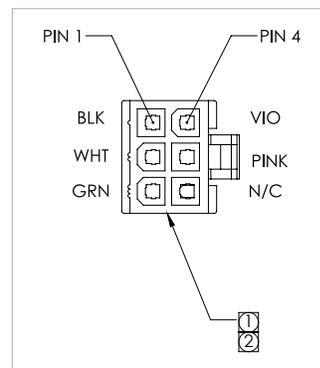
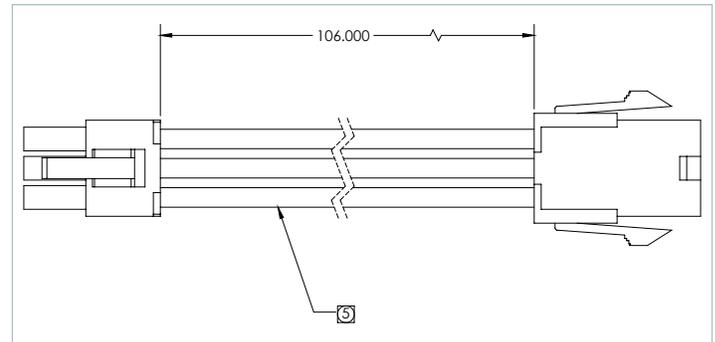
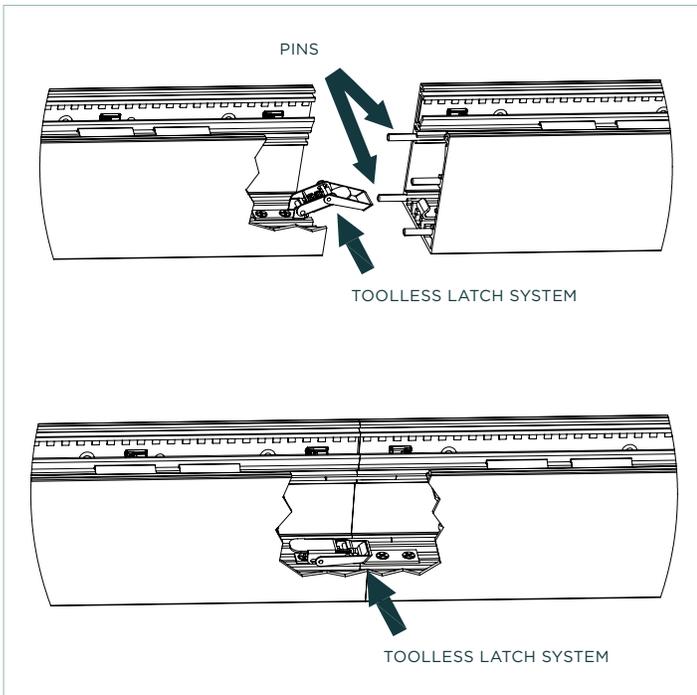


TOOLLESS LATCH SYSTEM

Our Toolless Latch System is designed to securely connect the extrusions of the continuous runs without the use of any tools, screws or external parts. Our innovative design allows the contractor to perfectly align the extrusion with the built-in alignment pins and cinch up the extrusion with the Toolless Latch System for a tight fit. The Toolless Latch System eliminates gaps and ensures perfect alignment.

QUICK-CLICK 5-WIRE SYSTEM

Our Quick-Click 5-Wire System connects the continuous run through wiring with a simple push and click connection. The Quick-Click System is contractor friendly and decreases installation time and cost and ensures proper wiring.

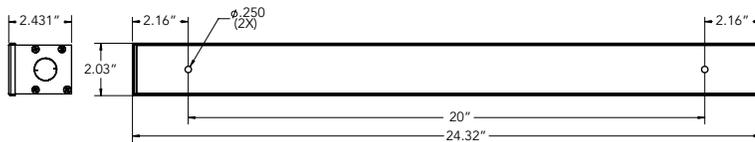


Decorative Driver

SINGLE DRIVER BOX

For driver input watts see SLO Configurator of Specified Fixture for input (aka “consumed”) wattage

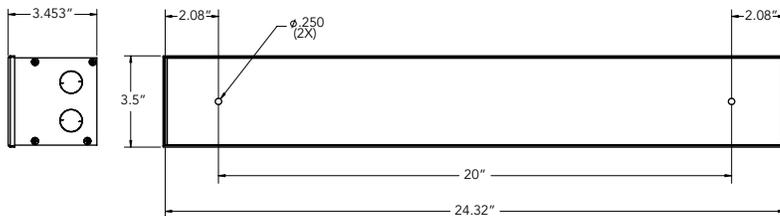
- Houses 1 remote LED Driver
- DL2 driver option up to 45 input watts
- D, DN, DD1 driver options up to 90 input watts
- DL5, DL1, DE and DDE driver options up to 80 input watts
- Available in SA Silver Anodized, WP Matte White, BP Matte Black and CC Custom Color finishes.
- Remote Driver distance cannot exceed 32’ for D, DN, and DD1 driver options, 10’ for DL5, DL1 and DL2 driver options and 46’ for DE and DDE driver options.
- Compatible for single circuit Direct/Indirect fixture only if Uplight and Downlight Outputs specifications are identical and total luminaire wattage does not exceed values above.
- Suspended fixtures have AWM feeds factory prewired, 6” longer than aircraft cable specification and remote driver Surface Mount fixtures have 10’ AWM leads out of fixture.



DUAL DRIVER BOX

For driver input watts see SLO Configurator of Specified Fixture for input (aka “consumed”) wattage

- Houses 2 remote LED Drivers or 1 LED Driver and one EM Battery Pack. Can also house 1 LED Driver and GTD or other UL Listed linear form factor devices. Consult factory for more information.
- EM test switch installed on side of driver box for EM versions.
- Available in SA Silver Anodized, WP Matte White, BP Matte Black and CC Custom Color finishes.
- D, DN, DD1 driver options up to 180 input watts. Each of the 2 driver cannot exceed 90 input watts individually
- DL5, DL1, DE and DDE driver options up to 160 input watts. Each of the 2 drivers cannot exceed 80 input watts individually.
- DL2 driver option up to 90 input watts. Each of the 2 drivers cannot exceed 45 input watts individually.
- Remote Driver distance cannot exceed 32’ for D, DN, and DD1 driver options, 10’ for DL5, DL1 and DL2 driver options and 46’ for DE and DDE driver options or ½ these listed dimensions if the driver is paired with EM Battery Pack.
- Dual Driver box needed for Direct/Indirect fixtures with different light levels selected for Uplight and Downlight sides, certain higher wattage specifications or 2C 2 Circuit specifications with independent control for Uplight and Downlight Outputs.



Decorative Driver

SINGLE DRIVER BOX

For driver input watts see SLO Configurator of Specified Fixture for input (aka “consumed”) wattage

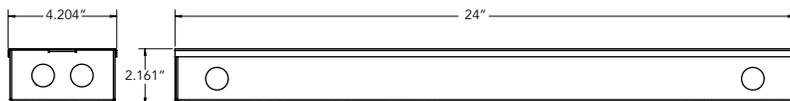
- Houses 1 remote LED Driver
- Finish is raw galvanized steel
- D, DN, DD1 driver options up to 90 input watts
- DL5, DL1, DE and DDE driver options up to 80 input watts
- DL2 driver option up to 45 input watts.
- Remote Driver distance cannot exceed 32’ for D, DN, and DD1 driver options, 10’ for DL5, DL1 and DL2 driver options and 46’ for DE and DDE driver options.
- Compatible for single circuit Direct/Indirect fixture only if Uplight and Downlight Outputs specifications are identical and total luminaire wattage does not exceed values above.
- Suspended fixtures have AWM feeds factory prewired, 6” longer than aircraft cable specification and remote driver Surface Mount fixtures have 10’ AWM leads out of fixture.



DUAL DRIVER BOX

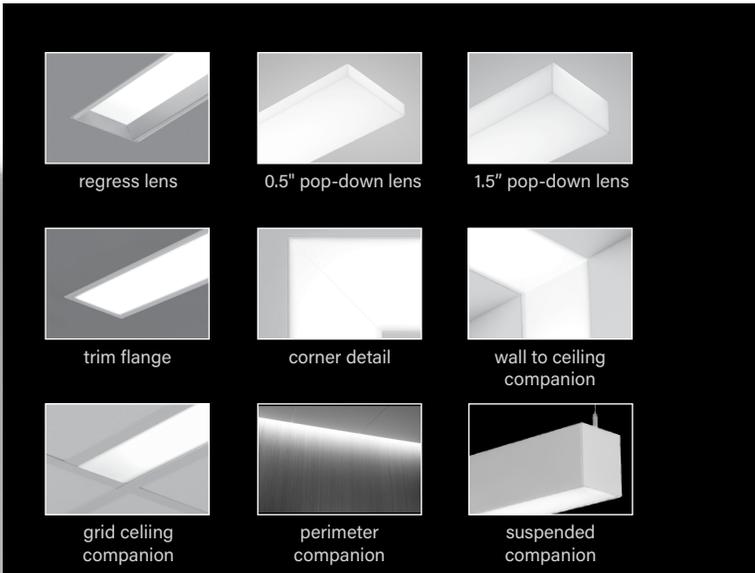
For driver input watts see SLO Configurator of Specified Fixture for input (aka “consumed”) wattage

- Finish is raw galvanized steel
- EM test switch installed on lid of driver box for EM versions.
- Houses 2 remote LED Drivers or 1 LED Driver and one EM Battery Pack.
- Can also house 1 LED Driver and GTD or other UL Listed linear form factor devices. Consult factory for more information.
- D, DN, DD1 driver options up to 180 input watts. Each of the 2 drivers cannot exceed 90 input watts individually
- DL2 driver option up to 90 input watts. Each of the 2 drivers cannot exceed 45 individually.
- DL5, DL1, DE and DDE driver options up to 160 input watts. Each of the 2 drivers cannot exceed 80 input watts individually.
- Remote Driver distance cannot exceed 32’ for D, DN, and DD1 driver options, 10’ for DL5, DL1 and DL2 driver options and 46’ for DE and DDE driver options or ½ these listed dimensions if the driver is paired with EM Battery Pack.
- Dual Driver box needed for Direct/Indirect fixtures with different light levels selected for Uplight and Downlight sides, certain higher wattage specifications or 2C 2 Circuit
- specifications with independent control for Uplight and Downlight Outputs.

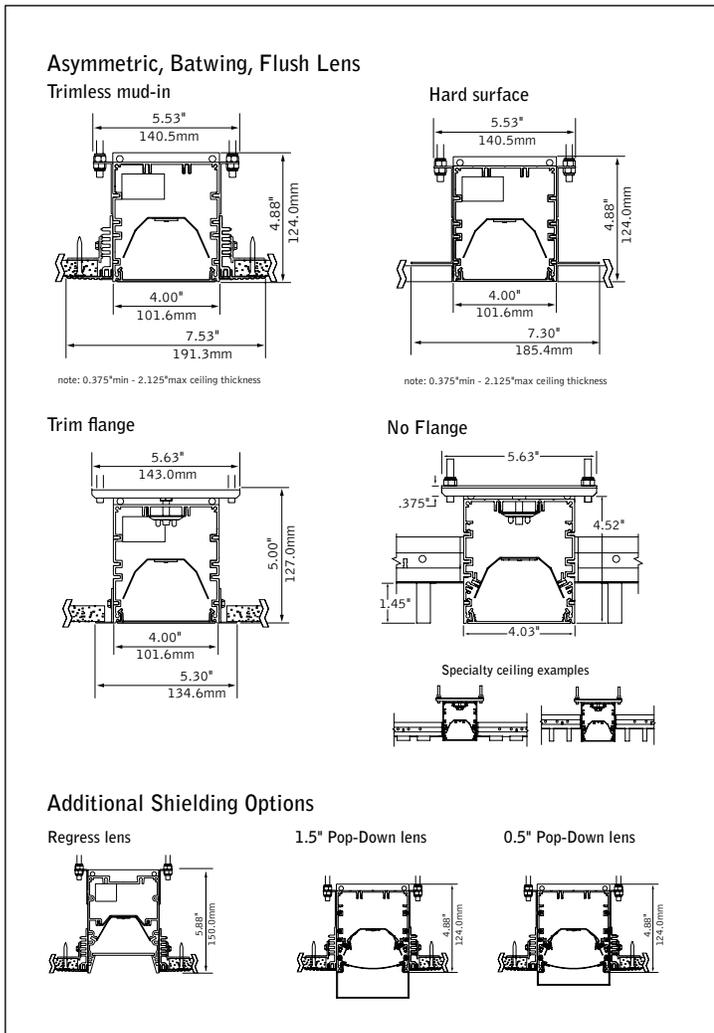


Seem® 4 Drywall/Hard/Specialty Ceiling

LED



DIMENSIONAL DATA



FEATURES

Extruded aluminum 4" aperture recessed slot LED integrates with drywall or hard ceilings or walls in a variety of mounting styles for a clean, unobtrusive aesthetic.

Individual units and continuous runs in 1" increments.

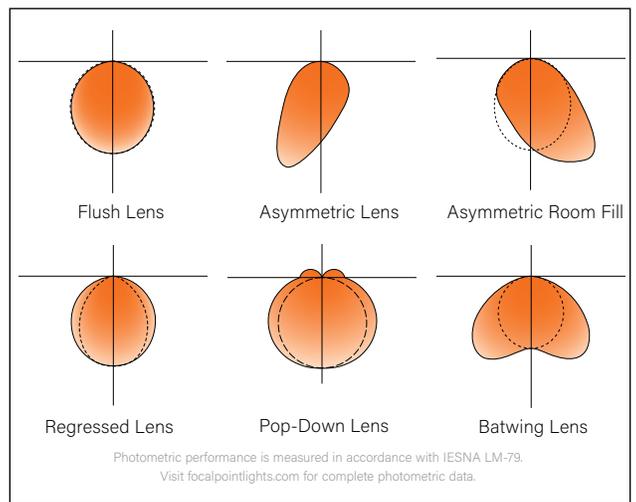
Available in flush, asymmetric, asymmetric room fill, batwing, regress, 0.5" or 1.5" pop-down lens.

Tunable White: Supports human activity, well-being, and preferences with a light quality that evolves throughout the day.

Connected Solutions: Integrates with wired and wireless building lighting control systems.

PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires.

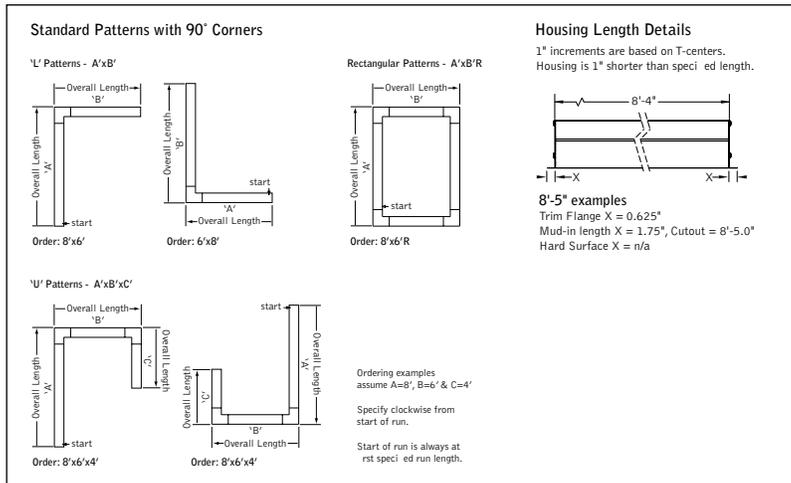
DISTRIBUTIONS



fixture:

project:

DETAILS



TYPE L27

TUNABLE WHITE

Luminaire Series	FSM4L	FSM4L
Seem 4 LED	FSM4L	
Shielding		
Batwing Lens	BW	
Flush Satin Lens	FL	
0.5" Pop-Down Lens (750LF max.)	PD05	
1.5" Pop-Down Lens (750LF max. individual units only)	PD15	
Regress Lens*	SR	
Regress High Performance Lens*	SRXP	
*(1000LF max. Ceiling applications only)		
Lumen Output		
275 Lumens per foot (BW, FL, SR & SRXP 3' min. with D1TW)	275LF	
375 Lumens per foot (BW, FL, SR & SRXP 3' min.)	375LF	
625 Lumens per foot	625LF	
750 Lumens per foot (Pop-Down Lenses only)	750LF	
875 Lumens per foot	875LF	
1000 Lumens per foot	1000LF	
1125 Lumens per foot	1125LF	
Color Temperature		
Tunable White: 2700-6500K, 80+ CRI	2765T	
Tunable White: 2700-6500K, 90+ CRI	92765T	
Circuits & Zones		
1 Circuit, non-emergency	1C	
Consult Ordering Guide on page 6 for multiple circuiting and zoning options	_C_Z_DL	
Voltage		UNV
120/277 UNV Volt	UNV	
Control System & Dimming Level		
DALI 1% Dimming	D1TW	
(Default driver offers DT6 control. It requires two addresses, one for intensity & one for CCT tuning. Consult factory for DT8. Extended lead time applies.)		
Lutron Athena Wireless Sensor**	LAWS	
Enlighted Smart Sensor - 1% Dimming**	ENL1	
(**Consult factory. Not available with Pop-Down lenses. See sensor layout guide)		
Ceiling Configuration		
No Flange for specialty ceilings (Ex. slat, panel, cloud systems. 3' minimum with Lutron.)	NF	
Trim Flange Drywall (3' minimum with Lutron)	TF	
Trim Flange Wood (3' minimum with Lutron)	TFW	
Mud-in Trimless, pre-set for 1/2" Drywall	XF1	
Mud-in Trimless, pre-set for 5/8" Drywall	XF2	
Mud-in Trimless, set thickness in field (Mounting equipment assembled in field)	XFF	
Non-Drywall Hard Surface	XFN	
Hard Surface, Wood	XFW	
Factory Options		
(See page 6 for ordering details for DC, EC, EM & ECD.)		
Chicago Plenum (Not available with Flex Whip)	CP	
Daylight Circuit	_DC	
Emergency Circuit	_EC	
Emergency Battery Pack†	_EM	
Emergency Control Device†	_ECD	
†(Consult factory.)		
6' New York City Flex Whip 120V or 277V	FNY1 or FNY2	
6' Flex Whip	FW	
Finish		WH
Matte White Housing	WH	
Luminaire Length		ft in
Specify luminaire/row length in 1" increments (2' minimum. Housing length is 1" shorter than specified. Leave blank for patterns.)	_ft_in	
Pattern Options		
(4' min. length. Not available with Pop-Down Lenses. Consult factory for other pattern options.)		
'L' pattern	A' x B'	
'U' pattern	A' x B' x C'	
Rectangular pattern	A' x B' R	

TW 4' PERFORMANCE CHART

Lumen Output	Nominal Lumens	Tested System Watts	LPW	
			BW	FL
275LF	1100	13.30	87.3	83.2
375LF	1500	17.34	90.8	86.5
625LF	2500	27.84	94.0	89.5
875LF	3500	37.22	98.9	94.2
1000LF	4000	42.39	99.2	94.4
1125LF	4500	50.27	93.9	89.4

Based on 2700K, 80CRI, 4' lengths. Lumen output may vary +/- 5%. Actual wattage may vary +/- 5%.

TW 4' PERFORMANCE CHART - REGRESS

Lumen Output	Delivered Lumens	Tested System Watts	LPW	
			SR	SRXP
275LF	1100	14.72	74.4	88.6
375LF	1500	19.36	77.5	92.3
625LF	2500	31.47	79.6	94.8
875LF	3500	42.01	83.4	99.4
1000LF	4000	50.68	79.2	94.3

Based on 2700K, 80CRI, 4' lengths. Lumen output may vary +/- 5%. Actual wattage may vary +/- 5%.

TW 4' PERFORMANCE CHART - POP-DOWN

Lumen Output	Nominal Lumens	0.5"		1.5"	
		Tested System Watts	LPW	Tested System Watts	LPW
275LF	1100	17.14	64.7	16.33	67.3
375LF	1500	22.79	66.5	21.58	70.0
625LF	2500	35.49	70.6	33.96	73.8
750LF	3000	42.39	70.8	40.28	74.5

Based on 2700K, 80CRI, 4' lengths. Lumen output may vary +/- 5%. Actual wattage may vary +/- 5%.

Lumen Multipliers

CRI	Multiplier
80+	1.00
90+	0.89

Wattage Multipliers

CCT	Multiplier
2700K	1.00
3000K	0.92
3500K	0.88
4000K	0.86
5000K	0.85
5700K	0.87
6500K	0.90



Seem® 4 LED

Focal Point provides flexibility in meeting the needs of each project by integrating with several building lighting control systems. A variety of sensors, drivers and other components can be specified that allow the luminaires to communicate with wired and wireless networks. All zoning can be digitally reconfigured through the application software. Daylight harvesting, occupancy sensing, integration with HVAC systems, and individual controls enable the monitoring and modulating of light levels and temperature in order to save energy, reduce costs and maximize occupants' comfort. All Connected Solutions luminaires require a compatible building control system.†

Connected Solution	Ordering Code	Model #**	Protocol	Compatible Networks*	Occupancy & Daylight	Temperature Reporting	Communication to Luminaire	Drivers
 legrand ® WATTSTOPPER®	LMFS1	LMFS-601 & LMFI-111	DLM Wireless	DLM	Enabled	No	Wireless	Advance by Signify
	LMFSD	LMFS-601						Optotronic by eldoLED (Dexal)
 COOPER Lighting Solutions	WLXP	OEM-WAA	WaveLinx Wireless	WaveLinx Pro Trellix	Enabled	No	Wireless (WaveLinx Pro Wireless Area Controller)	Advance by Signify
 CRESTRON	D11	Specified Driver	DALI	Crestron Züm Wireless & SpaceBuilder	Enabled	No	Wired	eldoLED ECOdrive
	L11		0-10V					Advance by Signify
 Enlighted	ENL1	SU-5E-IOT	Enlighted RF	Enlighted	Integrated	Yes	Wireless	Advance by Signify
 LUTRON	LAWS	A-WN-D01-OCC-WH	DALI, 0-10V	Athena Wireless	Integrated	No	Wireless	Advance by Signify
	LH1	LDE1	EcoSystem	Quantum, Energi Savr Node, Energi TriPak	Enabled	No	Wired	Lutron Hi-Lume

*Not all compatible networks may be listed. **For performance data and additional control system details please visit the connected solutions manufacturer websites. Primary drivers are listed in **bold**. To specify a particular driver please consult factory. †Controls systems supplied by others.

Ordering Guide

Direct Only Linear Circuitry, Zones & Factory Options

TYPE L27



FOCAL POINT®

HOW TO USE THIS GUIDE

Fill out the worksheet on the following page to specify your requirements for circuitry, zones, and factory options.

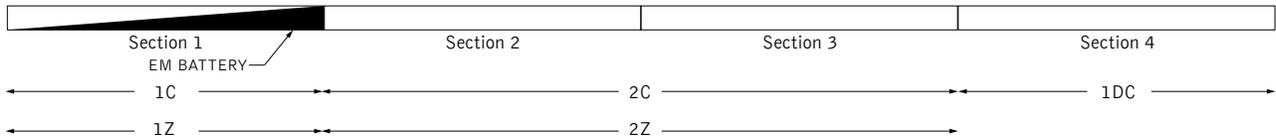
Refer to the run chart for standard run configurations, consult factory for custom configurations.

Complete the Totals / Ordering Codes at the bottom of the worksheet and add to your ordering logic on the cut sheet.

Submit the worksheet along with your order.

TOTAL RUN LENGTH: <u>32ft</u>		JOB NAME: _____			FIXTURE TYPE: _____			
HOUSING SECTION	SECTION LENGTH	SHARED ELECTRICAL FEED, NORMAL POWER			FACTORY OPTIONS			
		SWITCHING CIRCUIT	DIMMING ZONE	DAYLIGHT ZONE	SEPARATE ELECTRICAL FEEDS			EM
					DAYLIGHT CIRCUIT	EMERGENCY CIRCUIT	ECD	
1	8	1C	1Z					1EM
2	8	2C	2Z					
3	8	2C	2Z					
4	8				1DC			
Totals / Ordering Codes		2C	2Z		1DC			1EM

ORDERING: FSM4L-FL-625LF-35K- **2C2Z** -UNV-LD1-G2- **1DC-1EM** -WH-32ft



KEY	
C = Switching Circuit Switched Hot / Shared Neutral	DC = Daylight Circuit Switched Hot / Separate Neutral
Z = Dimming Zone Dimming Control Wires	EC = Emergency Circuit Switched Hot / Separate Neutral
DL = Daylight Zone Daylight Dimming Control Wires	EM = Emergency Battery Unswitched Hot / Shared Neutral
	ECD = Emergency Control Device Unswitched Hot / Separate Neutral

DEFAULTS

- Zones and Factory Options illuminate entire sections from 4' to 8' in length.
- One shared or isolated circuit and zone required per housing section.
- Limit of one EM or ECD per housing section.
- Additional electrical feed required for applications greater than three shared circuits and zones.
- Each DC, EC and ECD require an additional electrical feed.
- ECD not available in the same housing section as EC.
- Longer lead times and additional pricing may apply for custom run configurations.

CUSTOM LENGTHS

- If partial illumination of emergency or daylight section is required, indicate in ordering guide and add "partial illumination" in Order Notes. Drawing required.
- Engineering validation required, longer lead times may apply.



Ordering Guide Worksheet

Linear Circuitry, Zones & Factory Options

TOTAL RUN LENGTH: _____		JOB NAME: _____			FIXTURE TYPE: _____			
HOUSING SECTION	SECTION LENGTH	SHARED ELECTRICAL FEED, NORMAL POWER			FACTORY OPTIONS			EM
		SWITCHING CIRCUIT	DIMMING ZONE	DAYLIGHT ZONE	SEPARATE ELECTRICAL FEEDS			
DAYLIGHT CIRCUIT	EMERGENCY CIRCUIT				ECD			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Totals / Ordering Codes		_C	_Z	_DL	_DC	_EC	_ECD	_EM

WORKSHEET

Combine to create Circuits & Zones ordering code

Enter as individual Factory Options

RUN CHART

Run length (ft)	Housing Configuration Section Lengths	Run length (ft)	Housing Configuration Section Lengths	Run length (ft)	Housing Configuration Section Lengths	Run length (ft)	Housing Configuration Section Lengths
9	5 + 4	21	8 + 8 + 5	33	8 + 8 + 8 + 5 + 4	45	8 + 8 + 8 + 8 + 8 + 5
10	6 + 4	22	8 + 8 + 6	34	8 + 8 + 8 + 6 + 4	46	8 + 8 + 8 + 8 + 8 + 6
11	7 + 4	23	8 + 8 + 7	35	8 + 8 + 8 + 7 + 4	47	8 + 8 + 8 + 8 + 8 + 7
12	8 + 4	24	8 + 8 + 8	36	8 + 8 + 8 + 8 + 4	48	8 + 8 + 8 + 8 + 8 + 8
13	8 + 5	25	8 + 8 + 5 + 4	37	8 + 8 + 8 + 8 + 5		
14	8 + 6	26	8 + 8 + 6 + 4	38	8 + 8 + 8 + 8 + 6		
15	8 + 7	27	8 + 8 + 7 + 4	39	8 + 8 + 8 + 8 + 7		
16	8 + 8	28	8 + 8 + 8 + 4	40	8 + 8 + 8 + 8 + 8		
17	8 + 5 + 4	29	8 + 8 + 8 + 5	41	8 + 8 + 8 + 8 + 5 + 4		
18	8 + 6 + 4	30	8 + 8 + 8 + 6	42	8 + 8 + 8 + 8 + 6 + 4		
19	8 + 7 + 4	31	8 + 8 + 8 + 7	43	8 + 8 + 8 + 8 + 7 + 4		
20	8 + 8 + 4	32	8 + 8 + 8 + 8	44	8 + 8 + 8 + 8 + 8 + 4		

Standard run configurations, consult factory for custom configurations.

UNILUME LED SLIMLINE

PRODUCT FEATURES

- A low-profile solution designed at less than 1" height and 3" wide for task lighting great for residential and commercial spaces.
- Available in four sizes (7", 13", 19", 31") and two finishes (black and white).
- 90 CRI. Choose from 3 color temperatures: 2700K, 3000K, 3500K.
- Standard On/Off switch.
- Link up to 70 units together with a connector (not included).
- Protected by a 5-year warranty. Please visit the "About Us" page on techlighting.com for more for warranty details.



7" WHITE
(SHOWN OFF)



13" BLACK
(SHOWN ON)

LAMPING

With four convenient lengths, the ability to power up to 70 linked units from a single outlet, a standard on/off switch, a reliable integrated driver, and color temperature/CRI options; Unilume LED Slimline is perfect for residential or commercial use.

ACCESSORIES

JUMPER CONNECTORS

Can be used to link one undercabinet housing to another or to a splice box. The maximum wattage for a single run is 600 watts. Use female to female connector to create longer lengths or contact us for custom lengths. Nominal length.

700UCJC	LENGTH*	COLOR
01	1"	B BLACK
03	3"	W WHITE
06	6"	
12	12"	
24	24"	



*FOR CUSTOM LENGTHS, CONTACT OUR FACTORY

FEMALE TO FEMALE CONNECTOR

Joins two jumper connectors together.

700UCFFC	COLOR
B	BLACK
W	WHITE



SPLICE BOX

Required for hardware applications. Conduit is fed into the back and Jumper Connector ports on each side can feed power to Unilume LED Slimline runs in two directions. The 1" Jumper Connector can be used to place the Splice Box next to the undercabinet housing. Longer Jumper Connectors can be used to place the Splice Box in a more convenient or remote location. Includes 3/8" conduit connector.

700UCSB	FINISH
B	BLACK
W	WHITE



PLUG-IN WALL FEED

Can be used to plug one undercabinet housing directly into an outlet.

700UCPL	LENGTH*	COLOR
24	24"	B BLACK
72	72"	W WHITE



*FOR CUSTOM LENGTHS, CONTACT OUR FACTORY

ORDERING INFORMATION

700UCF	LENGTH	CRI	CCT	FINISH	LAMP TYPE
07	7.2"	9	90 CRI	2 2700K	B BLACK -LED LED
13	13.2"			3 3000K	W WHITE
19	19.2"			5 3500K	
31	31.3"				

700UCF _____

JOB NAME _____

NOTES _____



UNILUME LED SLIMLINE

DIMENSIONS

	7"	13"	19"	31"
HEIGHT	.7"	.7"	.7"	.7"
WIDTH	2.8"	2.8"	2.8"	2.8"
LENGTH	7.2"	13.2"	19.2"	31.3"
NET WEIGHT	1	2	3	4.5

LAMPING SPECIFICATIONS

	7"	13"	19"	31"
INTEGRATED LED	Yes	Yes	Yes	Yes
DELIVERED LUMENS	240	527	693	1224
WATTS	4W	8.5W	10.5W	18W
EFFICACY	60 lms/W	62 lms/W	66 lms/W	68 lms/W
MAX WATTAGE	4W	8.5W	10.5W	18W
INPUT VOLTAGE	120V			
DIMMING TYPE*	ELV (down to 15%)			
CCT	2700K, 3000K or 3500K			
CRI	90			
LED LIFETIME	50,000 hours to 70%			
FIELD SERVICEABLE LED	No			
LAMP BASE	Integrated LED			
LAMP INCLUDED?	Yes			
WARRANTY**	5 years			

*Dimming information available at www.techlighting.com/Downloads#dimming

**Visit techlighting.com for specific warranty limitations and details.

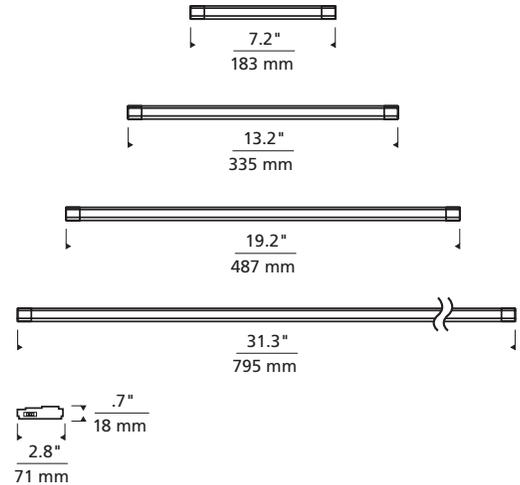
SPECIFICATIONS

HARDWARE MATERIAL	Aluminum
SHADE MATERIAL	Glass
DAMP LISTED	Yes
MOUNTING DETAILS	
GENERAL LISTING	ETL
INCLUDES	

T20/T24 INFORMATION

	INTEGRATED LED	REPLACEMENT LED LAMP	NO LAMP*
This product can be used to comply with California Building Energy Efficiency Standards 2016 Title 24 Part 6.	Yes		
This product meets California Appliance Efficiency Standards 2016 Title 20 and may be shipped to and sold in California.	Yes		

*If a light fixture or component does not include a lamp or light source, it is the responsibility of the customer to select a lamp that meets the T24 and T20 requirements.



ACCESSORIES

REPLACEMENT MEDIA

- SFL-CY1X-03** Soft Focus Lens
- HCL-CY1X-03** Honeycomb Louver *
*(Not available for Warm Dim)
- CGL-CY1X-03** Clear Glass Lens *
*(Not available for Warm Dim)
- FGL-CY1X-03** Frosted Glass Lens
- FSFL-CY1X-03** Frosted Soft Focus Lens
- FLSL-CY1X-03** Frosted Linear Spread Lens
- CGL-HCL-CY1X-03** Clear Glass Film W/ Honeycomb Louver
- SFL-HCL-CY1X-03** Soft Focus Film W/ Honeycomb Louver

STATIC WHITE REPLACEMENT OPTICS

- RO-50-15-S** 15° optic
- RO-50-20-S** 20° optic
- RO-50-25-S** 25° optic
- RO-50-40-S** 40° optic
- RO-50-60-S** 60° optic

WARM DIM REPLACEMENT OPTICS

- RO-50-20-W** 20° optic
- RO-50-25-W** 25° optic
- RO-50-40-W** 40° optic
- RO-50-60-W** 60° optic

TUNABLE WHITE REPLACEMENT OPTICS

- RO-50-15-T** 15° optic
- RO-50-20-T** 20° optic
- RO-50-25-T** 25° optic
- RO-50-40-T** 40° optic
- RO-50-60-T** 60° optic

SUCTION CUP TOOL

- CYX-TOOL-SUCTION** Baffle removal tool, provided with every 5 fixtures

EMERGENCY LIGHTING - REMOTE MOUNT ONLY

During disruption of main power, emergency battery inverter provides temporary 120V or 277V to fixture.

- EMB-S-25-120/277-LEDX** 25 watt max capacity, 120 or 277 VAC 60Hz
- EMB-S-100-120-LEDX** 100 watt max capacity, 120 VAC 60Hz, 0-10V dimmable
- EMB-S-100-277-LEDX** 100 watt max capacity, 277 VAC 60Hz, 0-10V dimmable
- EMB-S-250-120/277-LEDX** 250 watt max capacity, 120 or 277 VAC 60Hz

***SHUNT REQUIRED FOR USE WITH ATHENA AND CASAMBI CONTROLS, CONSULT FACTORY FOR DETAILS.**

POWDERCOAT FINISHES



ALUMINA FINISHES BY LUCIFER LIGHTING™



STATIC WHITE PERFORMANCE - 3000K

LUMEN PACKAGE	WATTS	10° OPTIC FIELD REDUCER		15° OPTIC SOFT FOCUS LENS		20° OPTIC SOFT FOCUS LENS		25° OPTIC SOFT FOCUS LENS		40° OPTIC SOFT FOCUS LENS		60° OPTIC SOFT FOCUS LENS	
		DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW	DLVD	LPW
80S11A	11	-	-	891	76	1080	98	1088	98	1002	91	1104	100
80S17A/C	17	779	46	1451	73	1623	95	1624	95	1495	88	1643	96
90S11A	11	-	-	846	76	931	84	938	85	864	78	952	86
90S17A/C	17	671	39	1251	73	1399	82	1400	82	1291	75	1416	83
97S11A	11	-	-	744	67	819	74	825	75	760	69	838	76
97S17A/C	17	579	34	1101	64	1231	72	1232	72	1136	66	1246	73
90W18AL (2700K-1800K)	18	-	-	-	-	1049	61	1023	60	930	54	997	58
90W18AD (3000K-1800K)	18	-	-	-	-	1039	61	1014	59	934	54	979	57
90T17ATR (4000K-1800K)	17	-	-	1112	65	1230	72	1234	72	1157	68	1291	75
90T17ATH (5000K-2700K)	17	-	-	1100	64	1213	71	1215	71	1174	69	1251	73

OUTPUT MULTIPLIER

CCT	CCT SCALE
2400K	0.76
2700K	0.957
3000K	1.000
3500K	1.019
4000K	1.030

MEDIA LIGHT LOSS FACTOR

MEDIA	LIGHT LOSS FACTOR
No Lens	1.07
CGL	0.99
SFL	1.00
FGL	0.90
FSFL	0.84
FSL	0.85
HCL	0.68
SFL+HCL	0.63



JA8-2022 INDICATED BY SHADING

UNIFIED GLARE RATING

10° OPTIC FIELD REDUCER	15° OPTIC SOFT FOCUS LENS	20° OPTIC SOFT FOCUS LENS	25° OPTIC SOFT FOCUS LENS	40° OPTIC SOFT FOCUS LENS	60° OPTIC SOFT FOCUS LENS
<16	<16	<10	<10	<10	<16

TUNABLE WHITE MULTIPLIER

CCT	5000K-2700K	4000K-1800K
5000K	1.16	-
4000K	1.08	1.14
3500K	1.04	1.07
3000K	1.00	1.00
2700K	0.96	0.92
2400K	-	0.84
1800K	-	0.69

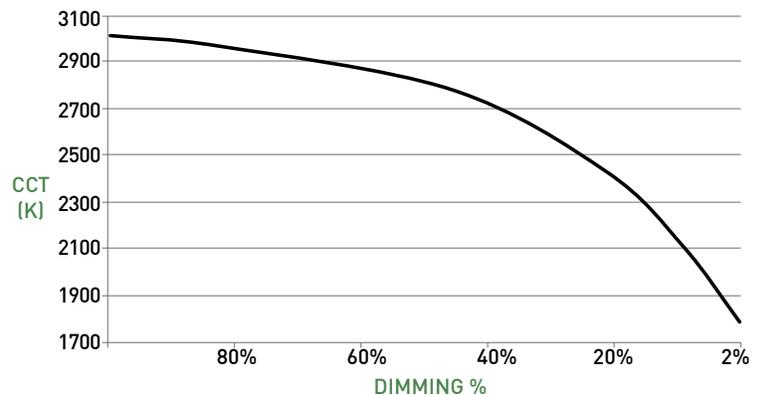
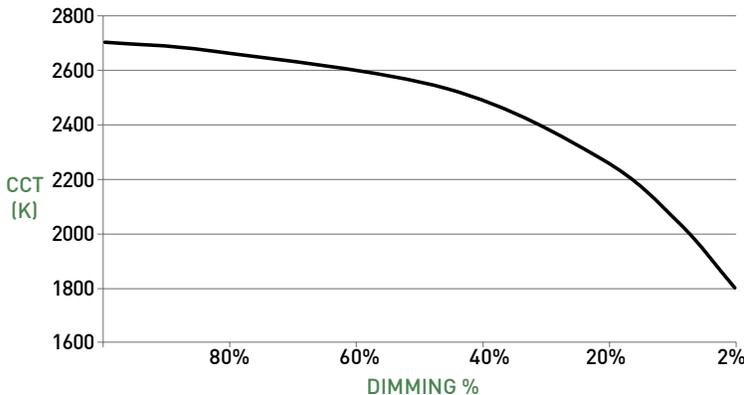
WARM DIM PERFORMANCE - SOFT FOCUS LENS - 60° OPTIC

INCANDESCENT DIMMING PROFILE

90W18AL 2700K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	2700	2650	2620	2520	2180	1950	1800
Light Output (Lm)	1216	973	851	608	243	122	24
Power (W)	18	14	13	9	4	2	0.4
Efficacy (LPW)	67	67	67	67	67	67	67

HALOGEN DIMMING PROFILE

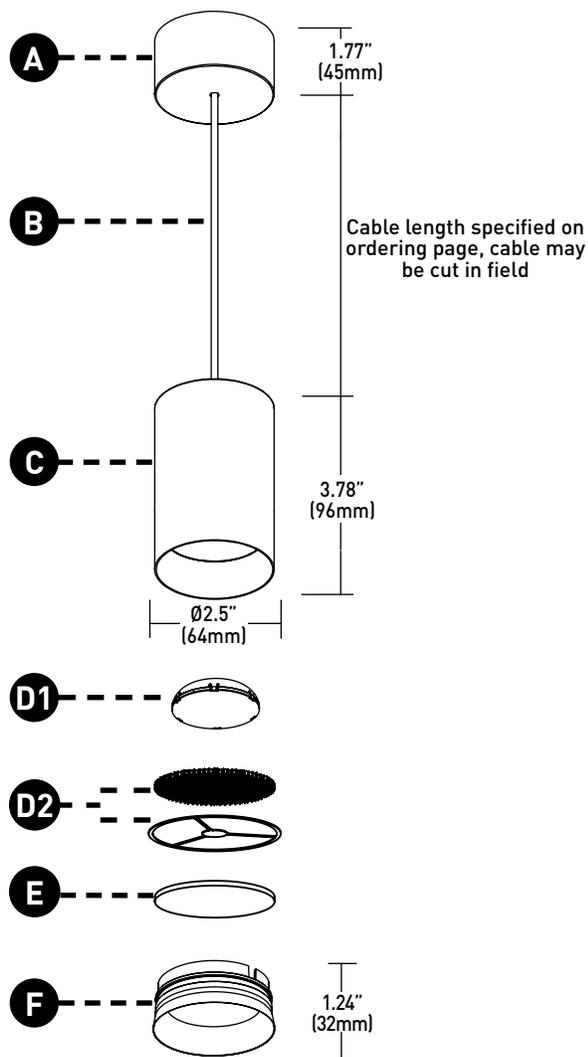
90W18AD 3000K - 1800K	Full on 100%	Dimmed to 80%	Dimmed to 70%	Dimmed to 50%	Dimmed to 20%	Dimmed to 10%	Dimmed to 2%
CCT (K)	3000	2950	2920	2775	2375	2000	1800
Light Output (Lm)	1202	962	841	601	240	120	24
Power (W)	18	14	13	9	4	2	0.4
Efficacy (LPW)	66	66	66	66	66	66	66



PENDANT

- A CANOPY**
Die-cast 1.77" (45mm) canopy accommodates flat and slope ceiling conditions. Conceals hidden twist-on mounting hardware. Available with integral or remote driver.
- B CABLE**
Black or white cable available; up to 192.0" length; cable may be cut in field.
- C LUMINAIRE**
Die-cast body with integral heat sink and LED.
- D1 OPTICS**
Robust light engine with optimized optic pairing integrates Reflection, Refraction, and TIR offering 10°, 15°, 20°, 25°, 40° & 60° beams.
- D2 10° FIELD REDUCER**
Soft Focus Lens, Honeycomb Louver, and Field Reducer provided with 10 degree beam selection. Reduces field angle by 10%.
- E MEDIA**
Cylinder baffle assembly can accept 2 lenses; soft focus lens or no lens standard and sealed in place.
- F BAFFLE**
Die-cast baffle minimizes aperture glare and conceals view into fixture.

DIMENSIONS / DRAWINGS



MOUNTING

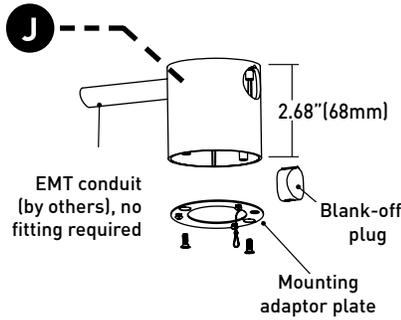
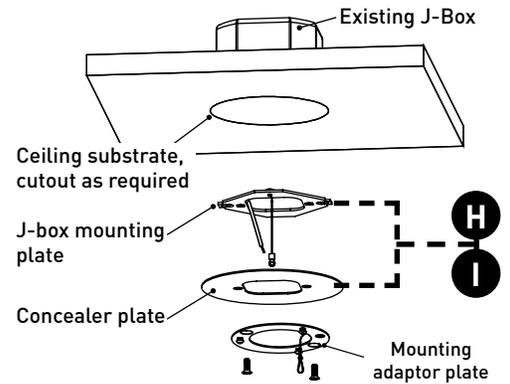
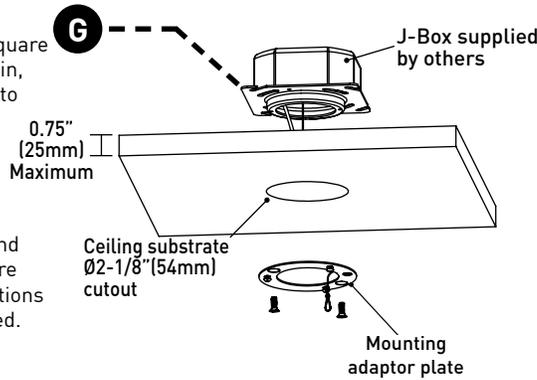
G JBMP
 Mounting plate (concealed) for standard 4" square or 4" 4/0 j-box. To be installed during rough-in, prior to substrate, for ceiling thicknesses up to 0.75". Fixture to mount flush with minimalist transition to ceiling.
 Part Number - CP1X-JBMP

H SMK3
 Surface mount kit includes mounting plate and 4" concealer plate that installs between fixture and standard 3" 3/0 j-box for existing applications where standard j-box cutout is to be concealed.
 Part Number - CP1X-SMK-3/0-(FINISH)

I SMK4
 Surface mount kit includes mounting plate and 5" concealer plate that installs between fixture and standard 4" 4/0 j-box for existing applications where standard j-box cutout is to be concealed.
 Part Number - CP1X-SMK-4/0-(FINISH)

J CMJB
 Ceiling mount junction box perfectly matches the cylinder profile for a continuous, integrated look where exposed ceiling mount junction box and conduit applications apply. For use with 1/2" and 3/4" EMT conduit only. Features two conduit entrances on either side and one conduit knockout on top of j-box. J-box is IP10 rated; painted finishes only. Blank off plugs included.
 Part Number - CP1X-CMJB-(FINISH)

DIMENSIONS / DRAWINGS



MOUNTING NOTES

- JBMP not recommended for use with pancake style j-box.
- Fixtures are surface mount and must have access to free air. For applications involving slat ceilings or confined mounting, consult Comprehensive Install Guide for required clearances for proper air flow and servicing.

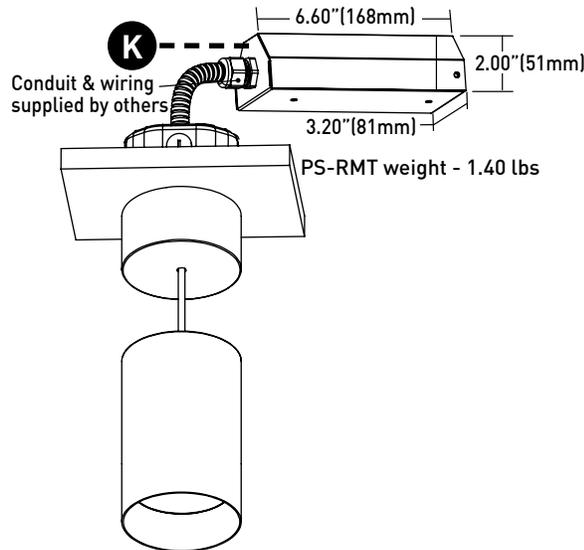
REMOTE POWER SUPPLY

K PS-RMT
 Remote power supply must be mounted in accessible area. Mounting device still required. Consult page 7 for dimming compatibility list. Consult install guide for complete details of suitable controls, wiring diagrams, and maximum allowable secondary run lengths between PS-RMT and cylinder.

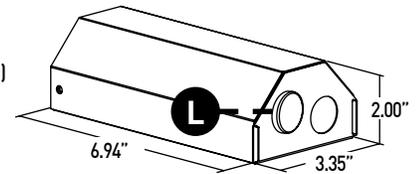
L ATHENA / CASAMBI CONTROL
 Controls integrated into remote driver assembly. All equipment is serviceable.
 Athena Model Number: A-WN-D01-RF-BL & DC-OEM-DBI
 Casambi Model Number: BT-S1E1-5400

M ATHENA / CASAMBI EM SHUNT
 Included with drivers specified as ASR, ADR, CSR, or CDR. One required for each wireless EM fixture, requires class 2 control wiring between fixture and shunt. Features integrated test switch.
 Model Number: PS-RMT-SHUNT

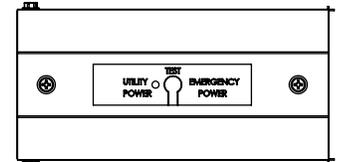
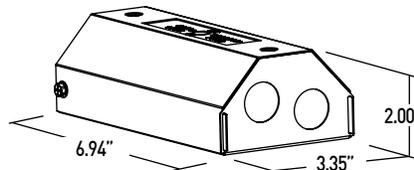
STANDARD ENCLOSURE



ATHENA / CASAMBI ENCLOSURE



ATHENA / CASAMBI EM SHUNT



TECHNICAL

CONSTRUCTION

Pendant: Die-cast aluminum body with integrated heat sink; painted finishes are granulated powder coat. Alumina finishes are anodized aluminum.

CMJB: Die-cast aluminum body; painted finishes are granulated powder coat.

Remote Power Supply: 22 Gauge galvanized steel.

STATIC WHITE LED

2-step MacAdam ellipse LED module available in 80+, 90+ and 97+ CRI configurations in color temperatures of 2700K, 3000K, 3500K and 4000K.

3-step MacAdam ellipse LED module available in 90+ CRI configuration in color temperature of 2400K. Average rated lamp life: 50,000 hours. LED and driver assemblies are field-replaceable.

Average rated lamp life of 50,000 hours. LED and driver assemblies are field-replaceable.

WARM DIM LED

3-step MacAdam ellipse warm dim LED module available in 90+ CRI configuration. 3000K or 2700K at full brightness, warming to 1800K at full dim. Average rated lamp life of 50,000 hours. LED and driver assemblies are field-replaceable.

TUNABLE WHITE LED

3-Step MacAdam ellipse tunable white LED module available in 90+ CRI configuration. Features tuning range of 2700K to 5000K and 1800K to 4000K. Average rated lamp life of 50,000 hours. Driver assemblies are field-replaceable.

POWER SUPPLY PERFORMANCE AND DIMMING INFORMATION

Power Supply	PHASE		0-10V							ECO	DALI			ATHENA	CASAMBI
	1CE/1RE	1TR	UCA/URA	UAN	ULN	UEG	UEN	UDG	UDN	ULH	UED	ULD	UDD	UAS/UAD	UCS/UCD
Minimum °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	-20 °C	0 °C	-20 °C	-20 °C	-20 °C	0 °C	-20 °C
Maximum °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Dimming %	1.0%	2.0%	1.0%	1.0%	1.0%	0.1%	0.1%	0.1%	0.1%	1.0%	0.1%	0.1%	0.1%	0.1%	

Note: For 1TR, UAN, ULN, UEG and UEN drivers consult chart on page 7 to confirm appropriate dimming curve for compatibility with selected control.

MAXIMUM ALLOWABLE REMOTE DRIVER WIRING DISTANCES

DRIVER	WIRE AWG				
	12	14	16	18	20
URA, 1RE	-	164'	105'	66'	40'
1TR, UAN, ULN	285'	180'	113'	71'	45'
ULH	60'	40'	25'	15'	-
UEG, UEN, UED, ULD, DD1, DG1, DN1, UAS, UCS, UAD, UCD	-	-	118'	72'	46'

MOUNTING

Cylinder is supplied with a mounting adaptor plate, which integrates with required additional mounting accessories specified separately according to field application conditions, providing a minimalist transition from standard 4/0 or 4" square junction boxes and accommodating ceiling thicknesses of 0.44" (12mm) to 0.75" (19mm). Ceiling-mount junction box available for 1/2" (13mm) and 3/4" (19mm) conduit and feature concealed internal clamps for clean fitting-free conduit exit and entry.

LISTING

cTUVus listed to UL1598 standard for Dry / Damp (IP30) locations.

Title 24 JA8-2022 Listed. NEMA 410 compliant. Buy American Act Compliant.

DECLARE

LBC Declared

FIXTURE WEIGHT

CP1X - 0.9 lbs

Remote Driver - 1.4 lbs

LIMITED WARRANTY

Manufacturer's 1-year warranty guarantees product(s) listed to be free from defects in material and workmanship under normal use and service. 5-year warranty on LED and power supply to operate with 70% of the original flux and remain within a range of 3 duv. 10-year Lutron Advantage limited warranty available on Lutron equipped systems. Warranty period begins from the date of shipment by Seller. Consult [website](#) for full warranty terms and conditions.

CHANGE LOG

1. 03/15/2024: ADDED 10 DEGREE FIELD REDUCER, UPDATED 10 DEGREE PERFORMANCE DATA.

2. 07/22/2024: REMOVED L2 DRIVER.

DIMMING COMPATIBILITY

PHILIPS DRIVER COMPATIBILITY

Power supply 1TR Manufacturer	Family/Model #
Lutron Electronics	DV-600P
Lutron Electronics	DVELV-303P
Lutron Electronics	NTELV-600
Lutron Electronics	MAELV-600
Lutron Electronics	SELV-300P
Lutron Electronics	DVLV-600P
Lutron Electronics	NFTU-5A
Lutron Electronics	CTCL-153P
Lutron Electronics	GL-600H
Lutron Electronics	S-600P
Lutron Electronics	PHPM
Power supply UAN / ULN Manufacturer	Family/Model #
Lutron Electronics	DVTV plus PP-DV
Lutron Electronics	DVSCTV plus PP-DV
Lutron Electronics	DVSTV
Lutron Electronics	DVSCSTV
Lutron Electronics	QSGRJ-XP plus GRX-TVI
Lutron Electronics	QSGRJ-XE plus GRX-TVI
Lutron Electronics	QSGR-XE plus GRX-TVI
Lutron Electronics	NFTV plus PP-DV
Lutron Electronics	NTSTV
Lutron Electronics	RMJ-5T
Lutron Electronics	RMJS-8T
Lutron Electronics	FCJS-010
Leviton	IlLumaTch IP7 series
Philips	Sunrise - SR1200ZTUNV

LUTRON DRIVER COMPATIBILITY

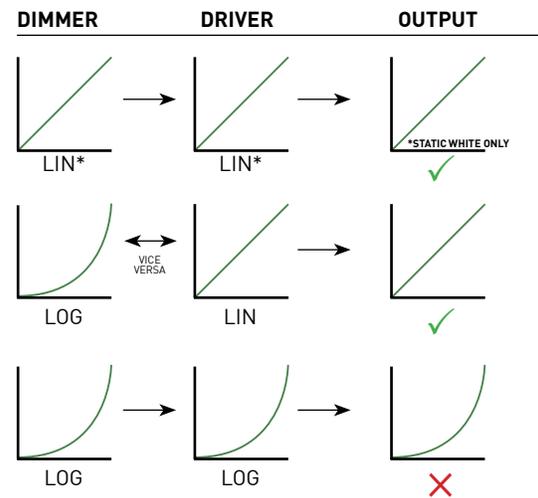
Power supply ULH Lutron Product Family	Part No.
PowPak Dimming Modules	RMJ-ECO32-DV-B
PowPak Dimming Modules	FCJ/FCJS-ECO
Energi Savr Nodes	QSN-1ECO-S
GRAFIK Eye QS control unit	QSN-2ECO-S
Homeworks QS control unit	QSN-2ECO-S
GRAFIK Eye QS control unit	QSGRJ-_E (wireless)
Homeworks QS control unit	QSGR-_E
Quantum Hub	QP2-_ _ 2C
Quantum Hub	QP2-_ _ 4C
Quantum Hub	QP2-_ _ 6C
Quantum Hub	QP2-_ _ 8C
Homeworks QS power module	LQSE-2ECO-D
myRoom Plus power module	LQSE-2ECO-D



eldoLED DRIVER COMPATIBILITY

Power supply UEG / UEN Dimmer / Switch Control Manufacturer	Family/Model #
Busch-Jaeger	2112U-101
Jung	240-10
Leviton Lighting Controls	IP710-DLX
Lightolier Controls	ZP600FAM120
Lutron Electronics	Nova T® - NTFTV
Lutron Electronics	Divia® - DDTV
Lutron Electronics	Nova® - NFTV
Merten	5729
Pass & Seymour	CD4FB-W
The Watt Stopper	DCLV1
Sensor Switch	nI0 EZ
Synergy	ISD BC
Power supply UEG / UEN Dimmer / Switch Control Manufacturer	Family/Model #
Dimmer / Switch Control Manufacturer	GraxiEye® GRX-TVI w GRX3503
Dimmer / Switch Control Manufacturer	Energy Savr Node™ - QSN-4T16-S
Lutron Electronics	TVM2 Module
Crestron®	GLX-DIMFLV8
Crestron®	GLXP-DIMFLV8
Crestron®	GLPAC-DIMFLV4-*
Crestron®	GLPAC-DIMFLV8-*
Crestron®	GLPP-DIMFLVEX-PM
Crestron®	GLPP-1DIMFLV2EX-PM
Crestron®	GLPP-1DIMFLV3EX-PM
Crestron®	DIN-A08
Crestron®	DIN-4DIMFLV4
Crestron®	CLS-EXP-DIMFLV
Crestron®	CLCI-1DIMFLV2EX
ABB	SD/S 2.16.1

ANALOG DRIVERS AND DIMMERS



LIN = LINEAR
 LOG = LOGARITHMIC
 *LIN-TO-LIN NOT COMPATIBLE FOR WARM DIM

SECTION 265500

LIGHTING CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide a complete lighting control system as indicated on the Contract Documents and as specified herein.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 QUALITY ASSURANCE

- A. Equipment and materials shall be of the quality and manufacture indicated in their respective sections of the specifications. The equipment specified is based upon the acceptable manufacturers listed. Equipment types, device ratings, dimensions, etc. correspond to the nomenclature dictated by those manufacturers.
- B. Installation shall be accordance with NFPA 70 (National Electrical Code), energy conservation codes, state codes, local codes, and requirements of authority having jurisdiction.
- C. Equipment shall be designed, manufactured, assembled, and tested in accordance with the latest revisions of applicable published ANSI, NEMA and IEEE Standards.
- D. All equipment shall NRTL tested.
- E. All components and assemblies are to be factory pretested.
- F. The controls provider must:
 - 1. Provide equipment from manufacturers for which they maintain a contract, distributorship, are an agent, or other formal arrangement for which documentation can be produced showing authority to sell and service the equipment in this territory.
 - 2. Demonstrate that they have successfully installed similar systems, utilizing their standard products, for a minimum period of five (5) years.
 - 3. Employ service technicians who are trained in accordance with the systems manufacturer's recommendations.
 - 4. Own and demonstrate proficiency in the use of the required test equipment, tools, etc. for the proper installation, set-up, testing and maintenance of the system.

If requested, must provide a listing of tools and/or equipment and where appropriate, certifications in the proper training and use of the tools and/or equipment.

1.4 SUBMITTALS

- A. Submit the following equipment, materials, and products including all components and accessories:
 - 1. General Equipment
 - 2. Vacancy/occupancy Sensors
 - 3. Digital Lighting Control System
 - 4. Lighting Control Panels
 - 5. Emergency Lighting Control Devices
 - 6. Wiring diagrams
 - 7. Commissioning Plan
- B. Submit the shop drawings and the product data specified below at the same time as a single submittal package.
- C. Product Data: Provide equipment data sheets, specifications, wiring diagrams and installation instructions for all required system components.
- D. Shop drawings shall include the following at a minimum:
 - 1. Composite custom wiring and/or schematic diagram of each control circuit as proposed to be installed (standard diagrams will not be accepted). Wiring diagrams shall include all system components, including but not limited to: room controllers, digital switches, vacancy/occupancy sensors, photocells, isolated relays, digital I/O interfaces to conference room A/V systems, network interfaces, lighting control panels and associated components.
 - 2. Scaled drawing for each area showing exact location of each room controller(s), digital switch(es), vacancy/occupancy sensor, daylight sensor, lighting control panel and other associated system components.
 - 3. All system devices shall be located per the system manufacturers recommendations. All devices shall be suitable for the building configuration and intended operation.

1.5 SYSTEM DESCRIPTION

- A. The lighting control system and/or components, as specified and indicated on the drawings to provide the intended and required control of the lighting systems.

PART 2 - PRODUCTS

2.1 GENERAL EQUIPMENT

A. Switches

1. Toggle/Snap

- a. Unit shall be quiet operation, quick make/quick break, rated for 20A/120-277V/1hp at 120/277V, 90° rear plug in termination with pig tail, with nylon/polycarbonate toggle, self grounding mounting screw clip plate (not staple), ground terminal and silver alloy contacts. Units shall meet latest Federal Specification WS-896, NEMA WD-1 and UL Test 20.
- b. Acceptable Manufacturers (for single pole units, provide two pole, three way, four way, illuminated handle, keyed, etc. type of the same quality and model).
 - 1) Hubbell HBL1221
 - 2) P&S 20AC1
 - 3) Leviton 1221-2

2. Low Voltage

- a. Unit shall be button type switch that is configurable from one button to eight buttons using point-to-point low voltage wiring for control of single or multiple loads. Each button shall provide a momentary contact and all share a common return. The switch shall be totally passive and contain no active electronics or power supply. Operation is dependent upon a Class 2 connection to a compatible relay panel or other device that can react to a momentary contact signal.
- b. Each button shall have an LED indicator light that can serve as a status indicator or as a locator light. The LED indicators shall be powered by a 24VDC source originating from the lighting control panel or other device. The button quantities shall be as indicated on the plan views.
- c. Acceptable Manufacturer
 - 1) Wattstopper LVSW series (Design Make)
 - 2) Acuity Brands

- 3) Hubbell
 - 4) Approved Equal per Cornell Standards.
3. All device colors shall match the surrounding devices and shall be selected by the Architect.

B. Lighting Dimmers

1. Provide lighting dimmer where indicated suitable for the type of luminaire for even continuous control. Unit shall be rated for the indicated connected load plus 25% minimum (even when ganged). Review luminaire schedule and plans for type and loading. Provide for three-way control as indicated.
2. Low voltage dimming shall be as recommended by the luminaire manufacturer for magnetic or solid state.
3. LED dimmers shall be as recommended by the luminaire manufacturer and be listed for use with the associated driver.
4. Device color shall match the other project devices.
5. Acceptable Manufacturers:
 - a. Lutron (Design Make)
 - b. Crestron
 - c. Acuity Brands
 - d. Leviton
 - e. Approved equal per Cornell Standards

C. Time Switches:

1. [Digital Lighting Controller:
 - a. Photosensor and manual inputs, battery back-up.
 - b. Astronomic control with holiday, 7 day and 56 point scheduling.
 - c. 120/277V input/control, SPDT 20A output.
 - d. NEMA 3R corrosion resistant enclosure with clear cover.
 - e. Design Make: NSI-Tork DGLC200A.
2. Electromechanical Controllers:
 - a. DPST, 40A per pole: NSI-Tork 120V - 7002Z, 277V - 7202Z

- b. 3PST, 40A per pole at 277 volt: NSI-Tork 7302Z.
 - c. Two-circuit lighting control center: NSI-Tork T-920L.
 - d. Three-circuit lighting control center: NSI-Tork T-903-L.]
3. Digital Time Switch (for use with Lighting Contactor):
- a. SPDT, 7-day with 14 set points.
 - b. Digital, AM/PM Clock with LCD display.
 - c. Battery backup to keep program in memory for approximately seven (7) days.
 - d. 120V Make: NSI-Tork EW120 or equal.
 - e. 277 Make: NSI-Tork EW120-3 or equal.
4. Time switches shall be provided with NEMA 1 general purpose, surface mount enclosures unless otherwise noted.
- D. Elapsed Time Switches:
- 1. Mechanical spring wound timer, which requires no electricity to operate the timing mechanism. Device shall fit a standard 2-1/2 in. deep wall box. Switch contacts shall break current carrying contacts at the end of the timed cycle.
 - a. 0-30 Minutes: NSI-Tork A530M or equal.
 - b. 0-4 Hours: NSI-Tork A504HH or equal.
 - c. 0-12 Hours: NSI-Tork A512 or equal.
- E. Digital Programmable Time Switch:
- 1. Programmable countdown time switch to automatically turn lighting or other loads off when the programmed on-time expires. 120VAC, 60Hz, neutral required with a 0-600W load rating suitable for incandescent, LED, fluorescent, magnetic low voltage, electronic low voltage and 1/6HP motor. Adjustable on-time from 5-55 minutes (5 minute increments) to 1-12 hours (15 minutes).
 - a. Wattstopper RT-100 (Design Make)
 - b. Acuity Brands
 - c. Hubbell

F. Photoelectric Controls:

1. Heavy Duty, 1/2 in. Conduit Mounting:
 - a. 120 volt, SPST, 2000 watt: Tork Model 2101.
 - b. 277 volt, SPST, 2000 watt: Tork Model 2104.
2. Combination Photoelectric Control and Contactor:
 - a. 120 volt, DPST, 3000 watt per pole: Tork Model 5403.
 - b. 277 volt, DPST, 3000 watt per pole: Tork Model 5404-3.
 - c. 208 volt, DPST, 3000 watt per pole: Tork Model 5404.

G. Lighting Contactors

1. Similar to magnetic motor starters without overloads. Refer to specification 262000.
2. Mechanically held, electrically operated with control as indicated.
3. NEMA 12 enclosure.
4. Supply with appropriate accessories to interface with 2-wire and 3-wire control devices as required by the Construction Documents.
5. 22,000 ampere withstand at 250V.
6. 30 ampere continuous current rating per pole at 600VAC.
7. Number of poles as indicated.
8. Manufacturers: Subject to compliance with Contract Documents, the following manufacturers are acceptable:
 - a. ASCO 918 Series.
 - b. Square D Class 8902
 - c. Eaton
 - d. GE

2.2 VACANCY/OCCUPANCY SENSORS

A. Vacancy/occupancy Sensors:

1. Vacancy/occupancy sensors shall comply with the following as a minimum:
 - a. Zero crossing switching operation (switch on/off only where sine wave is at zero volts) suitable for linear, non-linear and electronic/magnetic fluorescent ballasts for the loads indicated. Where the load to be controlled exceeds the sensor load rating provide a separate relay of adequate rating.
 - b. Failure of the unit shall be to the on/closed position or manual operation.
 - c. Motion sensitivity adjustment (dip switch or dial) and time delay adjustment (5 to 30 minutes minimum, dip switch or dial).
 - d. Line voltage input and switching. Field selectable for 120 or 277 VAC, 60 Hz.
 - e. UL listed and have a five (5) year manufacturer full replacement warranty.
 - f. Test mode feature to override the set time delay to allow adjusting of the sensitivity.
 - g. Sensor locations shall be adjusted during construction and at occupancy as recommended by the manufacturer for optimal sensing and operation.
 - h. Operation shall be field selectable with vacancy sensor being manual "on" with close switch/contact upon motion sensing and open after the set amount of time delay without motion or occupancy sensor being automatic on upon motion sensing.
 - i. Adjustable controls/settings shall only be accessible when the front cover is removed or from the back of the unit.
 - j. Unit color shall match the project devices except for the ceiling-mounted units which shall match the ceiling color. All color selections shall be by the Architect.
 - k. Ultrasonic sensing shall not be affected by air movement and shall operate at 32 kHz minimum (shall not interfere with hearing aids or other equipment).
 - l. Provide components as needed for the indicated control.
 - m. A factory-authorized representative shall coordinate and instruct the startup services of the sensors providing placement recommendations, connection guidance and startup supervision and adjustment.

2. Ceiling Mounted - Ultrasonic (Subscript "U"):
 - a. Unit shall mount to standard octagonal box, have auxiliary contact (Form C, 0.5A at 24 VDC), and utilize ultrasonic sensing.
 - b. Shall have self-contained rated contacts or control a separate switch pack. If a self-contained unit, then the ratings and function shall meet or exceed the switch pack specifications.
 - c. Sensing shall be 360 degrees with a minimum operating area of:
 - 1) Major Motion (Walking/Arm Wave): 50 ft. x 30 ft.
 - 2) Minor Motion (Small Motion at Desk): 40 ft. x 20 ft.
 - d. Corridor (Major Motion): 50 ft. x 16 ft.
 - e. Units shall be suitable for overlap of motion detection areas without reduction in spacing and false operation.
 - f. Sensing shall be suitable for a ceiling/mounting height of up to 12 ft. minimum.
 - g. Ambient light level sensing (adjustable 20-300 fc) to prevent "On" operation when the ambient light level is greater than the setpoint level.
 - h. The maximum depth shall be 1.5 in. below the ceiling/box.
 - i. Acceptable Manufacturers:
 - 1) Wattstopper WT Series (Design Make)
 - 2) Hubbell
 - 3) Eaton
 - 4) Acuity Brands
3. Ceiling Mounted - PIR Technology (No Subscript):
 - a. Unit shall mount to standard octagonal box, have auxiliary contact (Form C, 0.5A at 24 VDC), and utilize PIR technology motion sensing.
 - b. Shall have self-contained rated contacts or control a separate switch pack. If a self-contained unit, then the ratings and function shall meet or exceed the switch pack specifications.
 - c. Sensing shall be 360 degrees with a minimum operating area of:
 - 1) Major Motion (Walking/Arm Wave): 50 ft. x 30 ft.

- 2) Minor Motion (Small Motion at Desk): 40 ft. x 20 ft.
- d. Units shall be suitable for overlap of motion detection areas without reduction in spacing and false operation.
- e. Sensing shall be suitable for a ceiling/mounting height of up to 12 ft. minimum.
- f. Ambient light level sensing (adjustable 20-300 fc) to prevent "On" operation when the ambient light level is greater than the setpoint level.
- g. The maximum depth shall be 1.5 in. below the ceiling/box.
- h. Acceptable Manufacturers:
 - 1) Wattstopper CI-24 (Design Make)
 - 2) Hubbell
 - 3) Eaton
 - 4) Acuity Brands

B. Switch Pack:

1. Provide a minimum of one (1) switch pack for each ceiling-mounted vacancy/occupancy sensor. Provide additional units for multiple circuits (quantity to match the quantity of circuits).
2. Unit shall be plenum rated with line voltage side into a metallic box.
3. Low voltage power shall be suitable for a minimum of three (3) sensors. Multiple sensors shall be able to control a single switch pack.
4. Minimum switching capacity shall be 20A (all types of loads) at 120/277 VAC.
5. Shall have enough spare contacts provided at each sensor for HVAC system connection

2.3 DIGITAL LIGHTING CONTROL SYSTEM

A. General:

1. All associated system components shall be supplied from a single manufacturer and shall be compatible for communication as part of a digital lighting control network. All digital lighting controls shall be implemented without a broad digital lighting control network and without external communication. Separate rooms shall not be interconnected unless necessary to achieve the control outlined in the documents. Combining multiple manufactures system components to achieve the required system operation is not acceptable.

- B. Vacancy/Occupancy Sensors:
1. Wall or ceiling mounted (to suit installation) dual technology digital (passive infrared and ultrasonic) occupancy sensor. Provide unit to accommodate the square-foot coverage requirements for each area controlled.
 2. Sensors shall have adjustable settings and features as noted below. Sensor shall be adjusted through one of the following: graphic LCD display, push button or via software from handheld device.
 - a. Sensitivity: 0-100% in 10% increments.
 - b. Time Delay: 1-30 minutes in 1 minute increment. Time delay shall be set 30 minutes.
 - c. Detection Technology: Dual technology activation and or re-activation. The sensor shall be capable of being set to either PIR & Ultrasonic, PIR Only or Ultrasonic Only as required by the space being controlled as recommended by the manufacturer.
 - d. Test mode – Five second time delay
 - e. Walk-through mode
 - f. Selectable operating parameters shall include as a minimum Auto (Occupancy) / Manual (Vacancy) - ON, blink warning, and daylight enable/disable when photosensors/day-light sensors are included in the digital network.
 3. Sensing shall be 360 degrees with a minimum operating area of:
 - 1) Ultrasonic: 25 ft. x 25 ft.
 - 2) Passive Infrared: 32 ft radial.
 4. RJ-45 port(s) for connection to digital lighting control network.
 5. Two-way infrared (IR) transceiver to allow remote programming through handheld configuration device and control by remote personal controls.
 6. Assignment of occupancy/vacancy sensor to a specific load within the room without wiring or special tools.
 7. Manual override of controlled loads.
 8. Multiple occupancy sensors shall be installed in a room if required by the size/configuration by connecting them to the open topology digital lighting control network. No additional configuration shall be required.

9. Provide wall or ceiling mounted sensors as indicated on the drawings. Final locations of all sensors shall be in accordance with the manufacturer's recommendations.

C. Digital Daylight Sensor:

1. Digital daylighting sensor shall work with load controllers and relay panels to provide automatic switching, bi-level, or tri-level or dimming daylight harvesting capabilities for any load type connected to the controller or panel. Daylighting sensors shall be interchangeable without the need for rewiring.
 - a. Closed loop sensors measure the ambient light in the space and shall control a single lighting zone.
2. Digital daylighting sensors shall include the following features:
 - a. Sensor's internal photodiode shall only measure lightwaves within the visible spectrum. The photodiode's spectral response curve shall closely match the entire photopic curve. Photodiode shall not measure energy in either the ultraviolet or infrared spectrums. Photocell shall have a sensitivity of less than 5 percent for any wavelengths less than 400 nanometers or greater than 700 nanometers.
 - b. Sensor light level range shall be from 1-6500 foot-candles (fc).
 - c. Capability of ON/OFF, bi-level, tri-level switching or dimming, for each controlled zone, depending on the selection of load controller(s) and loads assigned to controller(s).
 - d. For switching daylight harvesting, the daylight sensor shall provide a field-selectable deadband, or a separation, between the "ON Setpoint" and the "OFF Setpoint" that will prevent the lights from cycling excessively after they turn off.
 - e. For dimming daylight harvesting, the daylight sensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a field-selectable minimum level.
 - f. Daylight sensors shall have a digital, independently configurable fade rate for both increasing and decreasing light level in units of percent per second.
 - g. Daylight sensors shall provide adjustable cut-off time. Cut-off time is defined by the number of selected minutes the load is at the minimum output before the load turns off. Selectable range between 0-240 minutes including option to never cut-off.

- h. Integral infrared (IR) transceiver/sensor for configuration and adjustment using a handheld configuration device.
 - 1) Configuration LED status light on device that blinks to indicate data transmission.
 - 2) Status LED indicates test mode, override mode and load assigning.
- i. Recessed switch on device to manually turn controlled load(s) ON and OFF.
- j. RJ-45 port(s) for connection to digital lighting control network.
- k. A choice of accessories to accommodate multiple mounting methods and building materials. Daylight sensors shall be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox. Unit mounting shall be suitable for the intended location.
- l. Any load or group of loads in a room shall be assignable to a daylighting zone.
- m. Each load within a daylighting zone shall be individually enabled or disabled for discrete control (load independence).
- n. All digital parameter data programmed into a daylight sensors shall be retained in non-volatile memory within the daylight sensors itself. Memory shall have an expected life of no less than 10 years.

D. Digital Wall Controller

- 1. General - Digital controllers may consist of multiple configurations and devices including but not limited to digital switches, dimmers and scene controllers. The digital controllers shall provide the control intent indicated on the drawings and connected to the digital lighting control network. Individual device operation shall meet the features indicated below.
- 2. Digital Switch - low voltage momentary pushbutton switches to have 1, 2, 3, 4, 5 and 8 button configurations; colors to be white, light almond, ivory, grey and black; compatible with wall plates with decorator opening. The color shall match the other devices and be coordinated with the Architect. Wall switches shall include the following features at a minimum:
 - a. Fully configurable and adjustable using a handheld configuration device.
 - b. Label each button and/or controller with custom silk screen labeling. Labeling identification shall be coordinated with the Owner for identification once the system has been configured.

- c. Button covers shall be field replaceable. Button replacement may be completed without removing the switch from the wall.
 - d. Indicating LED on each switch that blinks to indicate data transmission.
 - e. Scene Status LED on each switch button with the following characteristics:
 - 1) Bi-level LED that is field configurable.
 - 2) LED status indicates power to switch
 - 3) Bright status level indicates that load or scene is active
 - f. RJ-45 port(s) for connection to digital lighting control network.
 - g. Multiple digital wall switches shall be installed in a room by connecting them to the open lighting control network. No additional configuration shall be required to achieve multi-way switching.
 - h. The following switch attributes shall be changed or selected using a handheld configuration device:
 - 1) Load and Scene button function reconfigured for individual buttons (from Load to Scene, and vice versa).
 - 2) Individual button function may be configured to Toggle, On only or Off only.
 - 3) Individual scenes may be locked to prevent unauthorized change.
 - 4) Switch buttons may be assigned to any load on any room controller and are not load type dependent; each button may be assigned to multiple loads.
3. Digital Dimming Switch - shall have the same features as the digital switches. Dimming switches shall have a raise/lower buttons that include LEDs to indicate the load dimming level. Buttons shall be labeled "UP" and "DOWN". The dimmer shall provide full function dimming control in multi-way applications, such as 3-way, 4-way and beyond.
- a. The following dimmer switch attributes shall be changed or selected using a handheld configuration device:
 - 1) Fade Up and Fade Down times for individual scenes and loads adjustable from 0 seconds to 18 hours.
 - 2) Ramp rate adjustable for each dimmer switch from 0 to 10 minutes.

4. Digital Scene Selector - shall have the same features as the digital switches. Scene selector switches shall have four programmable preset scene buttons and a separate master button to allow dimming raise/lower and all-on/all-off control of the individual scenes. The buttons shall have suitable labels.

E. Room Controllers

1. Room Controllers automatically assign the room loads to the connected devices in the space without the use of any tools. Room Controllers shall be provided to match the room lighting load and control requirements. The controllers shall not have, dip switches, potentiometers or require special configuration. The Room Controllers shall provide on/off/dimming control and shall include the following features as a minimum:
 - a. Replacement: Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.
 - b. Device status LEDs to indicate:
 - 1) Data transmission
 - 2) Device has power
 - 3) Status for each load
 - c. Installation features:
 - 1) Standard junction box mounting
 - 2) Low voltage connections using standard RJ-45 patch cable
 - d. UL 2043 plenum rated system.
 - e. Manual override and LED indication for each load
 - f. Dual voltage input (120/277VAC, 60 Hz).
 - g. Maximum of 20A combined load per Room Controller. Each relay rated for the following at 120/277VAC, 60 Hz:
 - 1) 20A magnetic ballast or incandescent.
 - 2) 16A electronic ballast or LED driver (meet NEMA 410 ratings).
 - 3) 1/2 HP motor load.
 - h. Zero cross circuitry switching for each load.

- i. One, two or three relay configuration. Provide additional room controllers networked together to accommodate the quantity of zones indicated on the drawings and as indicated in the room sequence of operation.
- j. Equipment shall be suitable for the operating conditions within the intended locations.
- k. RJ-45 digital lighting control network ports with the ability to connect all required room control devices for communication to the digital lighting control network.
- l. Class 2 output to digital lighting network room devices suitably sized to power the devices within the room.
- m. One (1) 0-10VDC analog class 2 dimming control signal per channel for control of compatible dimming ballasts and LED drivers.
- n. The following dimming attributes shall be capable of being changed or selected using a handheld configuration device:
 - 1) Establish preset level for each load from 0-100%
 - 2) Set high and low trim for each load
 - 3) Fade time from 0 seconds to 18 hours.
 - 4) Set controller for switched or dimmed applications

F. Digital Lighting Control Network

- 1. The system network is to be an open topology lighting control physical connection and communication protocol designed to control the lighting in a area of a building. Digital room devices shall connect to the network using CAT 5e cables with RJ-45 connectors to provide both data and power to room devices. Features shall include:
 - a. Plug n' Go automatic configuration, communication and assigning of occupancy/vacancy sensors, switches and lighting loads connected together within a room or space.
 - b. Replacement of any device in the digital lighting control network with a standard off the shelf unit shall be capable of automatically configuring and operating using the factory default settings without custom configuration or setup.

G. Handheld Configuration Tool

1. Provide a configuration tool to facilitate optional customization of digital lighting control system, and used to set up open loop daylighting sensors. The handheld configuration tool shall either be a separate device using wireless infrared communications or be a downloadable application to a user's cell phone using wireless communications.
2. Features and functionality of the handheld wireless configuration tool shall include:
 - a. Two-way infrared (IR) communication with system devices within a range of approximately 30 feet.
 - b. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.
 - c. Read, modify and send parameters for occupancy/vacancy sensors, daylighting sensors, room controllers and buttons on digital wall switches and network settings.
 - d. Save up to nine occupancy sensor setting profiles, and apply profiles to selected sensors.
 - e. Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting.
 - f. Adjust or fine-tune daylighting settings established during auto-commissioning, and input light level data to complete commissioning of open loop daylighting controls.
3. Provide a total of two (2) configuration tools or free access to the downloadable cell phone application. The units shall be turned over to the Owner to allow for future modifications to the digital lighting control system setup and programming.

H. Acceptable Manufacturers:

1. Wattstopper: Digital Lighting Management - DLM, (Design make).
2. Acuity Controls: nLight
3. Crestron Controls: GLPAC
4. Hubbell NX

2.4 EMERGENCY LIGHTING CONTROL DEVICES

A. Emergency Lighting Relay

1. Emergency Lighting Relay – To be a UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit shall provide normal ON/OFF or dimmed and dimming control of emergency lighting to match the normal lighting. Upon normal power failure the emergency lighting circuit shall close, forcing the emergency lighting ON until normal power is restored. Features to include:
 - a. 120/277VAC, 60 Hz, 20A LED driver or electronic ballast rating. The relay voltage ratings shall match the lighting branch circuits.
 - b. Push to test button. Final button locations shall be coordinated with the Owner.
 - c. Auxiliary dry contact control for remote test switch or fire alarm system interface operation.
 - d. Provide separate auxiliary shunt relay when used with dimming driver/ballast to automatically open the 0-10VDC dimming control signal to automatically for the emergency luminaires to 100% output.
2. Acceptable Manufacturer:
 - a. Wattstopper - ELCU-200 (Design Make)
 - b. Functional Devices - ESRN
 - c. Acuity Brands

B. Emergency Lighting Bypass/Shunt Relay

1. Emergency Lighting Bypass/Shunt Relay - To be a UL 924 listed device that is suitable for shunting around wall/dimmer control switches in order to turn on emergency lighting when normal utility power is lost. Upon normal power failure, the relay coil is deactivated and the normally closed contact falls closed bypassing the lighting control switches or dimming controls to automatically turn the emergency lighting ON. Features to include:
 - a. 120/277VAC, 60 Hz, 20A LED driver or electronic ballast rating. The relay voltage ratings shall match the lighting branch circuits.
 - b. Provide SPDT or DPDT application based on the specified lighting control system and the relay manufacturer's requirements.
2. Acceptable Manufacturer:
 - a. Functional Devices - ESR Series (Design Make)

- b. Iota
- c. Acuity Brands

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide all required system components, interconnection wiring and branch circuit power connections as required by the lighting control system manufacturer to meet the intended sequence of operation and system performance requirements. All system wiring shall be in accordance with the system manufacturer's requirements at a minimum.
- B. When using wire for connections other than the digital lighting control network (Category 5e with RJ-45 connectors), provide detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify contractor termination requirements. All Category 5e cabling and connectors shall be terminated and tested to meet the system manufacturer's requirements. Category 5e cabling shall have a green thermoplastic jacket to easily identify from other building network cabling, building management system, or other low voltage systems cabling.
- C. All line voltage wiring shall be installed in conduit. Terminations shall be done above accessible ceilings or within utility rooms and within a 4"x4" back box and have a suitable cover provided. Digital network devices (room controllers, isolated relays, plug load controllers, etc.) shall be mounted to a junction box and connected as recommended by the system manufacturer.
- D. All low voltage control cabling shall be plenum rated. Cabling shall be installed in minimum 3/4" conduit in vertical runs in walls/partitions and inside mechanical/utility rooms. Provide suitable back box as required by the system manufacturer for the device being installed.

Above accessible ceilings all control cabling shall be installed within separate J-hook supports located at 3' on center with the cabling neatly bundled. All cabling inside utility rooms without ceilings shall be installed in conduit.

3.2 SYSTEM PROGRAMMING

- A. Upon completion of the installation, the system shall be programmed by the manufacturer's factory authorized representative who shall verify a complete fully functional system.
- B. The system manufacturer shall include separate individual site visits scheduled to complete the system programming and perform the following functions:
 - 1. Initial system startup/programming (time shall be suitable to setup all system devices). A minimum of [two] days shall be accounted for the system initial setup.

2. Coordination with the owner to develop preferred lighting control scenes, scene illumination levels, button operation and coordinate day lighting requirements prior to final system programming. Once verified with the owner all system components shall be fully programmed and setup.
3. Verification of the system operation (time shall be suitable to test and verify day lighting functions are operating properly). The manufacturer shall provide light meters for verification; time shall be as required for proper testing of the system.
4. The lighting control system manufacturer shall coordinate all room names and scheduling with the owner prior to final setup.
5. The presence of the system manufacturer's service technicians to assist the installing electrician in all of the above is a requirement of this project and proof of time expended shall be provided to the Owner's Representative.

3.3 SYSTEM COMMISSIONING

- A. The electrical contractor shall provide both the Owner and the electrical engineer with a minimum of ten working days written notice of the system startup and configuration date.
- B. Refer to the lighting control details that are part of the Construction Drawings for sequence of operation and commissioning requirements of the project lighting control scenarios.
- C. All lighting control systems and components shall be commissioned to verify sensor location, time delay/sensitivity is properly set, auto-on/manual-on, override times, controls, day-lighting control, communications between control panels, and timeclock controls are operating as intended.
- D. Calibrate all sensor time delays, sensitivity settings and properly aim to guarantee proper detection of occupants and energy savings.
 1. Adjust time delay so that controlled area remains lighted for [15] minutes after occupant leaves area.
- E. Exterior photocells shall be aimed per the manufacturer's installation instructions. Locate and aim to be facing to the north and avoid being blocked by the building architectural features.
- F. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:
 1. Sensor parameters, time delays, sensitivities, and daylighting set points.
 2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
 3. Load Parameters (e.g. blink warning, etc.)

- G. Re-commissioning – After 60 days from occupancy re-calibrate all sensor time delays and sensitivities to meet the Owner’s Project Requirements. Provide a detailed report to the Engineer / Owner of re-commissioning activity.

3.4 SYSTEM TRAINING

- A. The Contractor shall provide instruction to the Owner's Representative with regard to use and operation of the system. Obtain signed receipt from Owner's Representative that instruction has been given.
- B. The lighting control system's manufacturer shall supply at least one (1) service technician after all systems have been tested and in full operation as described above to assist the installing electrician to demonstrate and instruct the Owner's Representative on the operation, programming and any uniqueness of the control system. Minimum time required for Owner instruction of the system is [one (1) eight (8) hour session]. Provide additional instruction and training to the owner to as required to verify the owner is comfortable with the system operation. Time of demonstration and instruction to be at Owner's convenience during normal working hours and shall be scheduled a minimum of ten working days prior.

3.5 WARRANTY

- A. Provide a five year complete manufacturer’s warranty on all products to be free of manufacturers’ defects.

3.6 MAINTENANCE

- A. Spare Parts:
 - 1. Provide the following spare parts/components to be used for the owner’s maintenance.
The spare parts shall be fully tested for proper operation and turned over to the owner in the original boxes:
 - a. Digital Light Control System
 - 1) (3) Ceiling mounted occupancy/vacancy sensors
 - 2) (1) Digital daylight sensor
 - 3) (2) Isolated relay interfaces
 - 4) (3) Room controllers
 - 5) (2) Digital switches
 - 6) (2) Digital dimmers
 - 7) (1) Scene Control Switch

- 8) 500' of spare cabling that meets the manufacturers wiring requirements.

END OF SECTION

SECTION 270000
COMMUNICATIONS

GENERAL SPECIFICATIONS AND REQUIREMENTS FOR COMMUNICATIONS

1. GENERAL

- a. This document specifies the use of a CAT6/6A/CMP copper end to end structured cabling platform as manufactured and warranted by Panduit. No substitutions are permitted.
- b. All communications product for this installation shall be new unused unless otherwise described in these documents.
- c. Contractor must be a certified installer of the proposed solution and capable of providing the warranty on materials and labor directly from the proposed cabling system solution manufacturer.
- d. Certification by third party or any other means is not acceptable.
- e. The contractor shall supply a minimum 20 year manufacturer warranty.
- f. Contractor shall submit their certification documents for their proposed solution at time of bid.
- g. Contractor must identify all products with their bids including manufacturer and part numbers.
- h. Contractor is responsible for reading all telecommunications drawings as well as electrical and architectural drawings.
- i. Contractor is obliged to contact the telecommunications designer for any clarification on scope, materials, and any discrepancies encountered on the project.
- j. Contractor shall confirm all dimensions and clearances prior to ordering and installing equipment.
- k. Refer to the architectural/interior designer's drawings for exact locations, dimensions, mounting heights, and finishes of devices prior to commencement of work. Where discrepancies occur, contractor to confirm with architect, interior designer, and/or consultant prior to commencement of work.
- l. Any network equipment is to be provided and installed by the client unless specifically noted otherwise.
- m. Any cost incurred by failing the points stated above will have to be covered by the contractor.

2. SITE CONDITIONS

- a. The communication contractor is required to be on site during each phase/move and provide for eight (8) hours support on the phase/move on weekends. Include all necessary allowances for overtime work on weekends and/or after regular hours to suit project schedule and furniture delivery plan.
- b. Contractor is responsible for complete handling, delivery, storage, and installation of all materials used in the performance of the work.
- c. Contractor is responsible for keeping the workplace clean, safe, and free from debris at all times. All debris must be removed from the site on a daily basis.
- d. Costs for cleaning are the responsibility of the contractor.

- e. Contractor will bear any costs for damage caused by them or clean-ups and debris removal that remain on site one day after the completion of the communications cabling installation.
- f. Contractor shall coordinate with furniture and carpet installers for disconnect/reconnect of furniture.
- g. Contractor to neatly bundle and secure loose cables with split loom. Spiral wrap is not acceptable.
- h. Route horizontal cabling through in-ceiling j-hooks, cable tray, conduit, and under floor ducts. See drawings for details.
- i. Contractor is not permitted to install or de-install equipment on customer premises without prior approval from owner or general contractor.
- j. Contractor is not allowed to remove any equipment installed by another trade. Where the movement of equipment not controlled by the contractor is required, the contractor must inform the owner or the general contractor and they will direct accordingly.
- k. Contractor is required to consider where cables will be installed and if any lifts or additional equipment is required to install the cabling.
- l. All communications contractor employees shall have working at heights and WHIMIS certification.
- m. Contractor is not permitted to core/drill or penetrate any walls, ceilings, floors or any other areas without permission from the owner or general contractor.
- n. Any cables passing through a fire rated partition must be fire stopped with a UL/CSA listed assembly. Refer to architectural details.

3. DOCUMENTATION/PROJECT CLOSE OUT

- a. Contractor shall submit warranties, certifications, as-built drawings, and all cable test results as part of the project closeout documentation.
- b. Contractor shall prepare as-built drawings identifying all voice/data outlets, patch panels, and IDC connections as per the requirements of ANSI/TIA 606-C.
- c. As-built drawings shall be provided in AutoCAD, soft copy format, PDF, and hard copy full size drawings.
- d. Drawings shall describe cable ID's on drawings.
- e. As-built drawings shall include floor layouts and backbone diagrams.
- f. This project requires the contractor to provide the manufacturer warranty, which combines an extended product warranty with an applications assurance warranty, along with contractor's warranty.
- g. Contractor shall provide the warranty certificate as the final deliverable to signify completion of work.
- h. Documentation for test results shall include soft copies and one (1) binder with color documents.
- i. The documentation binder and soft copy case shall be marked with the project name, project description, and date of project completion (day, month, and year).
- j. Test results shall include full test results and summary, in the native format of the certification tester, with included reader software, on cd or flash drive.
- k. Cable id on the test results shall match the id on the as-built drawings.

4. WARRANTY

- a. Product shall be warranted free of defects in material or workmanship.
- b. Product shall be warranted to perform the intended function within design limits.
- c. Field-applied paint coatings on raceway, boxes, plates or fittings shall be excluded from raceway manufacturer's warranty.
- d. Installed cabling components shall be granted a permanent link or channel warranty by the manufacturer under the conditions stated below.
- e. Construction is performed by an installer that is certified by the manufacturer's training program.
- f. Contractors performing the certified installation are properly registered in the manufacturer's warranty program.
- g. Permanent link or channel components are supplied entirely by the manufacturer (including patch cords for channel).
- h. A warranty from the contractor is not accepted in lieu of manufacturer warranty/certification.
- i. Contractor to provide hard copy evidence of manufacturer's certification with tender submission and upon completion of the project.
- j. Contractor to provide the manufacturer's warranty under the client's name and shall be transferable.

27 00 01 SCOPE OF WORK FOR STRUCTURED CABLING COMMUNICATIONS

1. The specific structured cabling scope of work for this project includes but is not limited to the supply and install of:
 - a. Horizontal copper cabling
 - b. Cabinet/racks and accessories
 - c. Plywood backboard
 - d. Cable tray/j-hooks/cable slings
 - e. Contractor to provide labor to install client provided access points (WAP)
 - f. Contractor to supply and install brackets for access point (WAP)(bracket info and WAP provided by client)
 - g. All fire stop materials/mechanisms for all communication cabling penetrations
 - h. All close out documentation requirements needed as per section 27 00 00.

27 05 44 FIRE STOPPING FOR COMMUNICATIONS PATHWAY AND CABLING

1. Any cables passing through a fire rated partition must be fire stopped with a UL/CSA listed assembly. Refer to architectural details.

27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

1. Grounding to tie into a single ground point only.
2. All metallic enclosures, racks, cable tray, patch panels, voice cables shall be bonded to the mesh-BN, SBB or PBB using a minimum sized conductor of 6 AWG.
3. Cabinets, racks, and other enclosures shall not be bonded serially; each shall have their own dedicated bonding conductor to the mesh-BN, SBB, PBB or TEBC.
4. Raised floor pedestals shall be bonded using a minimum sized conductor of 6 AWG.

5. Ground cable shall be insulated green jacket, copper wire installed in each communication room that connects to the building ground system.
6. Communications cabling contractor to follow ANSI-TIA 607-C standard to ground and bond systems.

27 05 28 PATHWAYS FOR COMMUNICATIONS SYSTEMS

1. CABLE TRAY

- a. Communications cabling contractor to supply and install cable tray (refer to drawings for size and location).
- b. The communications contractor shall be responsible for measuring and confirming cable pathways prior to installation to ensure no cabling will exceed the specified distance limitations. Where the distance limitations are exceeded, the communications contractor shall inform the communications consultant prior to installation.
- c. All cabling extending beyond cable tray shall be supported using conduit, j-hooks and/or cable slings.
- d. Telecommunications wire basket tray shall be secured independently to the structural ceiling, building truss system, wall or floor using manufacturer's recommended supports and appropriate hardware as defined by local code.
- e. When the pathway is overhead, wire mesh cable tray shall be installed with a minimum clearance of 12 inches above the tray. 12 inches must be left in-between the tray and the ceiling/building truss structure. Multiple tiers of wire mesh cable tray shall be installed with a minimum clearance of 12 inches in-between the trays.
- f. When installed under a raised floor, wire mesh cable tray shall be installed with a minimum 3/4 inch clearance between the top of the tray and the bottom of the floor tiles or floor system stringers (whichever are lower in elevation). Wire mesh cable tray shall be supported by manufacturer's specifications.
- g. Separations from EMI sources:
 - i. From electrical equipment rating less than 2 kva: a minimum of 2-1/2 inches.
 - ii. From electrical equipment rating between 2 and 5 kva: a minimum of 6 inches.
 - iii. From electrical equipment rating more than 5 kva: a minimum of 12 inches.
- h. Telecommunications wire basket tray shall be supported at least every 1.5 m (5 ft) centers unless they are designed for greater spans. A support shall also be placed within 0.6 m (2 ft) on each side of any connection to a fitting.
- i. The quantity of cables within the tray shall not exceed a whole number value equal to 50 percent of the interior area of the tray divided by the cross-sectional area of the cable. Cable fill will not exceed the depth of the cable tray's side rail (2, 4, or 6 inches).
- j. Telecommunications wire basket tray shall be bonded to the secondary bonding busbar (SBB) overhead or under floor bonding conductor grid system using an approved ground lug on the wire basket tray and a minimum #6 AWG grounding wire or as recommended by the AHI. Verify bonds at splices and intersections between individual cable tray sections and supports. Cable

pathway should be electrically continuous through bonding and attached to the SBB.

2. J-HOOKS

- a. J-hooks to be installed parallel with or perpendicular to the building grid.
- b. J-hook support: j-hook supports to be provided by the contractor at 4' feet interval.
- c. J-hook capacity sizing and installation guidelines must meet the manufacturer guidelines.

3. CONDUITS

- a. Any cabling routed through open ceilings or drywall ceilings shall be installed in conduit.
- b. Conduit shall be extended from faceplate to the nearest accessible ceiling or cable tray.
- c. Conduits shall not contain continuous sections longer than 100ft without a pull box.
- d. Pull boxes should not be used in lieu of a bend.
- e. Maintain conduit bend radii per best practice and industry standard. Greater than 2-inch conduit: 10x internal diameter. 2-inch or less: 6x internal diameter.
- f. Conduits shall be fitted with bushings and equipped with pull cords.

4. VELCRO WRAPS

- a. Communications cabling contractor to use Velcro ties to tie bundles of cable, nylon cable ties will not be accepted.
- b. Velcro wraps shall be supplied and installed to support and neatly bundle all horizontal and vertical cabling.

5. INNERDUCT

- a. Innerduct shall be supplied and installed non-plenum (CMR) or plenum (CMP) rated to suit the fire rating at the location of installation.
- b. Innerduct shall be colored for use with different cabling as follows:
 - i. Multi-mode fiber: orange
 - ii. Single-mode fiber: yellow
 - iii. Copper: white or clear

6. SPLIT LOOM

- a. Communications cabling contractor shall supply split loom to dress the cabling from the wall/floor feed to furniture feed locations.
- b. The split loom shall be sized and color matched to suit each location.

27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

1. Contractor shall label each cable by using self-adhesive, self-laminating labels in accordance with this specification and ANSI/TIA-606-C.
2. All labels shall be machine-generated; hand written labels are not acceptable.

- a. Cable labeling: all cabling shall be labeled in four (4) locations, each end of the cable four (4) inches from the end, on the corresponding faceplate, and patch panel/idc mount.
 - b. Pigtail labeling: all cabling shall be labeled in three (3) locations, each end of the cable four (4) inches from the end, and on the corresponding faceplate.
 - c. Patch cord labeling: all patch cables shall be labeled in two (2) locations, at each end of the cable.
3. Labeling scheme shall be as follows:
- a. Data outlets to be labeled: Room number - sequential letter (A-Z in clockwise direction around room) example; 210-A, 210-B, etc.
 - b. WAP outlets to be labeled: AP, floor number-sequential number, example; AP2-01, AP-2-02, etc.
 - c. Camera outlets to be labeled: CAM, floor number-sequential number, example; CAM2-01, CAM2-02, etc.

27 08 00 COMMISSIONING OF STRUCTURED CABLING SYSTEMS

1. The installation shall be tested and warranted to the category of cable being installed and tested to the standard as detailed in ANSI/TIA documents 568-C.0, 568-C.1, 568-C.2, 568-C.3.
2. All existing cabling that is remaining shall be tested.
3. All relocated cabling shall be tested.
4. Testing of telecommunications cabling shall be done at the time of installation.
5. All cabling is to be tested and certified.
6. Testing of backbone cabling shall be done prior to the delivery of the system.
7. Contractor to use a level iv tester or higher, capable of testing the specified cable to the performance levels indicated in this document.
8. Tester shall have the latest version of firmware and software.
9. Testing of UTP cabling shall be done with Fluke's DSX series, ideal network, or equal testers.
10. The acceptable optical loss must be less than the allowable loss that will support the client network protocol.
11. All fiber strands shall be tested end-to-end insertion loss using an OLTS power meter and source.
12. Test multimode cables by using ANSI-TIA 526-14 revision C, and single-mode cables using ANSI-TIA 526-7 (single-mode). Test shall be performed bidirectional at 850 and 1300 nm for multimode, and 1310 and 1550 nm, for single mode unless otherwise required.
13. For OSP single mode fiber, bidirectional OTDR testing is required.
14. All test results shall be delivered to the manufacturer and both a soft copy and hard copy shall be delivered to Cerami for review of the results.
15. Cable used in the installation shall be qualified and recognized by the manufacturer of the cabling solution.
16. Links or channels in the installation are properly documented and tested with a 'pass' result, conditional/marginal passes (pass*) must be fixed and retested until they achieve a clean pass.
17. Required test results and project documentation shall be submitted to manufacturer by the registered contractor, in order to obtain proper system certification.

27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

1. The communications contractor shall supply and install cabinet/racks as per drawing.
2. The cabinets/racks shall be bonded to building ground.
3. The cabinets/racks shall be new and free of defects.
4. If cabinets/racks are existing and are to be re used the contractor shall inspect the cabinets/racks and determine that all new equipment can be properly installed.
5. Horizontal cable managers shall be compatible with 19" standard cabinets/racks.
6. Vertical cable managers shall be installed to run the full height of the rack.
7. Shelves shall be rated for no less than 200lbs.
8. Cable drop controls / waterfalls shall be installed in locations where the cable drops into cabinets and or racks.
9. Plywood backboards shall be supplied and installed by using ¾" thick, fire rated, 4' x 8' good one side, as per location noted on drawing.
10. All plywood backboards shall be painted with two (2) coats of fire retardant non-conductine white paint. "fire rating" stamp shall be left unpainted to allow for verification of rating.

27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

1. All horizontal UTP cabling shall be terminated on modular, black patch panels.
2. All modular patch panels shall be populated with UTP modules with the category meeting the requirements set out in section 27 15 43.
3. All UTP modules shall meet the color requirements set out in section 27 15 43.
4. All fiber optic cabling shall be terminated in rack mounted patch panels.
5. Blank filler strips shall be provided for all unused openings.
6. Modular copper 24 port patch panels, specified product: Panduit
7. Modular copper 48 port patch panels, specified product: Panduit

27 11 26 COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

1. The power cords shall be a minimum of nine (9) feet to reach up to the cable tray or down to the floor where it will plug into a receptacle supplied by division 26.
2. Supply and install UPS/PDUs as per locations on drawings.
3. UPS, specified product: Powerware 9125 2000VA w/48 EBM extended battery module.

27 13 13 COMMUNICATIONS COPPER BACKBONE CABLING

1. All backbone cabling shall comply with manufacturer's recommended bundling practices for installation; cables shall not be scratched, dented or otherwise damaged before, during, or after the installation.
2. The communications cabling contractor shall ensure that all installed cabling does not exceed the minimum bend radius at any point in the link.
3. Lubrication: in order to reduce cable friction when installing communication cables in conduits, it is permissible for the contractor to use an approved pulling lubricant providing it meets or exceeds the manufacturer's specifications and guidelines.

4. All backbone links shall be point-to-point with no splices.
5. Vertical runs of more than 30 feet or 3 floors shall be restrained every 30 feet with split mesh grips or caddy vertical grips.
6. All penetrations of the fire rated slabs or partitions must be fire stopped with CSA/UL listed assembly to maintain the original fire rating.
7. Multi-pair backbone cabling, specified product: xxxxxxxxxxxxxxxx

27 13 23 COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

1. All backbone cabling shall comply with manufacturer's recommended bundling practices for installation, cables shall not be scratched, dented, or otherwise damaged before, during, or after the installation.
2. The communications cabling contractor shall ensure that all installed cabling does not exceed the minimum bend radius at any point in the link.
3. Lubrication: in order to reduce cable friction when installing communication cables in conduits it is permissible for the contractor to use an approved pulling lubricant providing it meets or exceeds the manufacturer's specifications and guidelines.
4. All backbone links shall be point-to-point.
5. All strands of the optical fiber shall be fusion spliced on to pigtail.
6. Vertical runs of more than 30 feet or 3 floors shall be restrained every 30 feet with split mesh grips or caddy vertical grips.
7. All penetrations of the fire rated slabs or partitions must be fire stopped with csa ulc assembly to maintain the original fire rating.
8. Refer to riser diagram for fiber types.

27 15 13 COMMUNICATIONS COPPER HORIZONTAL CABLING

1. All cabling must be terminated using ANSI-TIA 568A configuration, unless specifically noted otherwise.
2. All cable slack shall be neatly coiled and secured to the pathway with velcro.
3. Contractor shall ensure that all installed specified category cabling does not exceed the minimum bend radius at any point in the link.
4. All cable bundles shall not exceed 12 cables per bundle.
5. Communications cabling specified product:
 - a. Panduit GenSPEED CAT6
 - b. Panduit GenSPEED CAT6A
6. All UTP cables shall meet requirements identified below:

SYSTEM	CATEGORY	RATING	COLOR
DATA	6	CMP	BLUE
WAP	6A	CMP	BLUE
CAMERA	6	CMP	BLUE
AV	6	CMP	BLUE

27 15 43 COMMUNICATIONS FACEPLATES AND CONNECTORS

1. UTP termination modules shall be of the same category as the UTP cabling solution to ensure the manufacturer's end-to-end warranty.
2. All WPO (weatherproof outlet) shall be installed with corrosive resistant UTP jack module.
3. UTP jack module specified product:
 - a. Category 6: Panduit Mini-com CJ688TG
 - b. Category 6A: Panduit Mini-com CJ6X88TG
4. All UTP connectors shall meet requirements identified below:

SYSTEM	CATEGORY	RATING	COLOR
DATA	6	CMR	BLUE
WAP	6A	CMR	BLUE
CAMERA	6	CMR	BLUE
AV	6	CMR	BLUE

5. Coaxial connectors shall be compression style F-type and have a screw type coupling for quick connect/disconnect of coaxial cable at both ends.
6. Optical fiber connectors shall be fusion spliced and be of the same manufacturer as the cable installed.
7. Optical fiber shall be terminated with LC connectors.
8. The connector polish shall be UPC for SM fiber.
9. The connector polish shall be PC for MM fiber.
10. Optical fiber adapter strips shall be of the same manufacturer and style to suit the cabling installed.
11. Workstation faceplates and adapters:
 - a. Workstation outlets shall be of the same manufacturer and style to suit the connectors installed.
 - b. Modular furniture faceplates shall have a minimum of three (3) ports and blanks shall be installed for all un-used ports.
 - c. Decora/faceplates shall have a minimum of two (2) ports and blanks shall be installed for all un-used ports.
 - d. Wall faceplates shall have a minimum of two (2) ports and blanks shall be installed for all un-used ports.
 - e. Wall faceplate for mounted phones shall made of steel and have one (1) port and shall have two (2) mounting posts to support client provided phone.
 - f. Surface mounted boxes shall have a minimum of two (2) ports and blanks shall be installed for all un-used ports.
12. Systems furniture:
 - a. Communications contractor shall route cables through the channel/compartments of the systems furniture.
 - b. Communications contractor shall coordinate with furniture vendor for specific faceplate and mounting requirements.
13. Floor boxes:
 - a. Communications contractor shall coordinate with electrical/general contractor to ensure termination hardware compatibility in specified floorboxes and/or poke-throughs.

27 16 19 COMMUNICATIONS PATCH CORDS, STATION CORDS, AND CROSS-CONNECT WIRE

1. The communication contractor shall supply all patch cords at both ends.
2. Patch cords shall be of the same manufacturer and category to provide a complete end to end solution.
3. Patch cords at the telecom room shall be reduced diameter. Max jacket diameter 0.199”.
4. The communication contractor shall assume all ports shall be patched and used cable management/velcro while maintaining cable bend radius.
5. Supply and install two (2) CMR rated patch cords for every horizontal cable installed.
6. Supply and install one (1) CMR rated patch cord for every voice cable installed (at patch panel end).

SYSTEM	CATEGORY	RATING	COLOR	LENGTH	LOCATION
DATA	6	CMR	BLUE	5' 7'	TELECOM RM
WAP	6A	CMR	BLUE	5' 7'	TELECOM RM
CAMERA	6	CMR	BLUE	5' 7'	TELECOM RM
AV	6	CMR	BLUE	5' 7'	TELECOM RM
DATA	6	CMR	BLUE	7'	USER END
WAP	6A	CMP	BLUE	15'	USER END
CAMERA	6	CMP	BLUE	10'	USER END
AV	6	CMR CMP	PICK	7'	USER END

7. Supply and install two (2) CMR rated duplex fiber optical patch cord for every two (2) fiber optical strands installed.
8. Supply and install xxx CMR rated duplex fiber optical patch cords.

CATEGORY	END A	END B	LENGTH	LOCATION
OM3 OM4	LC ST SC	LC ST SC	5' 7' 10'	IDF LAN RM.
OM3 OM4	LC ST SC	LC ST SC	5' 7' 10'	IDF LAN RM.
OS2	LC ST SC	LC ST SC	5' 7' 10'	IDF LAN RM.

SECTION 274116
AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work of this Section includes but is not limited to the following:
1. Audiovisual systems and equipment
- B. Related Documents and Sections: Examine Contract Documents for requirements that directly affect or are affected by Work of this Section. Other Documents and Sections that directly relate to work of this Section include, but are not limited to:
1. General provisions of the Contract, including General and Supplementary Conditions, and Division 01 General Requirements Specification Sections.
 2. Division 26 Specification for Communications cabling, cabling pathways, termination and physical mounting of cable hangers and cable trays.
 3. Division 26 Specification Sections for room lighting fixtures, dimmers, power receptacle outlets, and interconnecting wiring for these circuits.
 4. Division 27 Specification Sections for all telecommunications requirements - including LAN connections, analog and digital telephone lines, digital data circuits, high speed internet access and building horizontal cabling.
 5. Audiovisual (TA) drawings and equipment lists.
- C. The publications listed below form a part of this specification to the extent referenced:
1. ANSI/INFOCOMM 2M - (2010) Standard Guide for Audiovisual Design and Coordination Processes
 2. ANSI/INFOCOMM 10 - (2013) Audiovisual Systems Performance Verification
 3. ANSI/INFOCOMM A102.01 - (2017) Audio Coverage Uniformity in Listener Areas
 4. AVIXA F502.01 - (2018) Rack Building for Audiovisual Systems
 5. AVIXA F502.02 - (2020) Rack Design for Audiovisual Systems
 6. INFOCOMM F501.01 - (2015) Cable Labeling for Audiovisual Systems
 7. ANSI/BICSI 001 - (2017) Information and Communication Technology Systems Design and Implementation Best Practices for Educational Institutions and Facilities
 8. ANSI/BICSI N1 - (2019) Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure
 9. ANSI/BICSI N3 - (2020) Planning and Installation Methods for the Bonding and Grounding of Telecommunication and ICT Systems and Infrastructure
 10. ECIA EIA/ECA 310-E - (2005) Cabinets, Racks, Panels, and Associated Equipment
 11. Extron Electronics GUI Design Guide - (2020; 4th Edition) Graphical User Interface Design Guide
 12. Middle Atlantic Whitepaper - (2018) Controlling the Temperature Inside Equipment Enclosures
 13. TIA-568.0 - (2020e) Generic Telecommunications Cabling for Customer Premises
 14. TIA-568.1 - (2020e) Commercial Building Telecommunications Infrastructure Standard
 15. TIA-568.2 - (2018d) Balanced Twisted-Pair Telecommunications Cabling and Components Standards

16. TIA-568.3 - (2016d; Add 1 2019) Optical Fiber Cabling Components Standard
17. TIA-568.4 - (2022e) Broadband Coaxial Cabling and Components Standard
18. TIA-569 - (2019e; Add 1 2022) Telecommunications Pathways and Spaces
19. TIA-607 - (2019d) Generic Telecommunications Bonding and Grounding
20. NFPA 70 - (2020; TIA 22-1; ERTA 1 2022) National Electrical Code
21. 36-CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SCOPE OF WORK

This Specification Section outlines the minimum requirements and installation methods for the integrated audiovisual System, hardware, software, cables, accessories, and acceptance testing. System refers to the complete and functional assemblage of equipment required to achieve the specified functionality, performance, and design intent. This includes but is not limited to:

- A. Audio equipment: Speakers, mixers, amplifiers, microphones, signal processing equipment, and source equipment.
- B. Video equipment: Displays, signal routing and processing equipment, and source equipment.
- C. Video projection screens
- D. Remote control equipment including touch panels, control processors, software, and programming.
- E. Equipment racks and associated hardware such as rack screws, power distribution products, cooling products, and blank panels.
- F. Cables, snakes, connectors, plates, and wiring.
- G. Other similar parts that may be required for normal operation such as projector bulbs and lenses.
- H. Mounts, rigging, and required hardware such as all-thread, unistrut, chains, and cables.
- I. System commissioning
- J. Training
- K. Documentation
- L. Communication and coordination with all team members and trades to fulfill the requirements of this Specification.

1.3 EXCLUDED SCOPE OF WORK

- A. Cutting and patching
- B. Painting, refinishing and finishes
- C. Floor boxes

- D. Display wall boxes
- E. AV lecterns and technical furniture
- F. Credenzas and millwork furniture
- G. Work specified in other Specification Sections.

1.4 SUBMITTALS

Approval is required for submittals detailed below. Submit the following in accordance with Section 013300 SUBMITTAL PROCEDURES:

- A. Qualifications
- B. Bid Pricing
- C. Shop Drawings
- D. Status Reports and Meeting Minutes
- E. Record Drawings
- F. Operation and Maintenance (O&M) Manuals

1.5 QUALIFICATIONS

A. General

1. Comply with all Division 01 (General Requirements) standards including Section 011400 WORK RESTRICTIONS.
2. Bidders may be rejected based upon qualifications and their ability to conform to the specified technical or licensing requirements of this Section. Bidders that do not have the specified qualifications will not be acceptable and will not be allowed to perform the work of this Section.
3. Acceptability of any Bidder will be based on submitted and verified documentation that substantiates that the Bidder has the qualifications specified in this Section.
4. Submit documented verification of the specified qualifications for approval prior to bid. The Project maintains the right to request, inspect and verify references and resumes of all technical and managerial personnel assigned to the project.

B. Bidder Qualifications

The bidder must:

1. Be licensed in the project jurisdiction as required to perform the work included in this Specification.
2. Be regularly engaged in the system application design, documentation, installation, testing, training, and maintenance of the type of system specified in this Section.
3. Have a minimum of five (5) years of experience with a primary project focus of assembly, installation, and configuration of systems exhibiting the same depth and quality of features and functions as the system specified within this Section.

4. Submit three (3) project references of similar or greater magnitude on which the bidder was the primary installation contractor. Include a summary of the bidder's scope for each listed project along with contact names and valid telephone numbers for project references.
5. Be capable of providing manufacturer-specified installation, programming, training, maintenance, and repair for all equipment provided.
6. Have an office within a 120 mile radius of the project site that can provide all specified service and support.
7. Be responsible for any required low voltage permits.
8. Utilize a Project Manager with a CTS certification.
9. Utilize a Project Engineer with a CTS-D certification.
10. Utilize a Lead Installer with a CTS-I and/or current EST-L2 certification.
11. Utilize a Control System and Digital Signal Processor (DSP) Programmer certified by the manufacturer(s) of the product(s) used in the project.
12. Submit qualification package materials including:
 - a. Corporate Profile and History
 - b. Location of Corporate Headquarters
 - c. Number of offices and locations
 - d. Years in business
 - e. Any former names under which the organization operated
 - f. Date and state of incorporation
 - g. Officer names and contact
 - h. Project related ligation details within the past five (5) years
 - i. Non-Project related ligation details within the past five (5) years
13. Submit names and resumes of key personnel that will be assigned to the project including:
 - a. Project Executive
 - b. Project Manager
 - c. Project Engineer
 - d. Lead Installer/Crew Chief
 - e. Control System Programmer (as required)
 - f. Digital Signal Processor Programmer (as required)

1.6 BID PRICING

The bidder must provide:

- A. Complete and accurate listing of all equipment to be used in assembling the system(s).
- B. Itemized pricing for all equipment. Include sales tax where applicable.
- C. Itemized costs for all pertinent labor/installation categories.
- D. Itemized costs for any optional items such as Add/Deduct Alternates and Extended Warranties.
- E. Any shipping and administration fees.

1.7 SHOP DRAWINGS

The following must be submitted and approved prior to the purchase, assembly, or installation of any equipment:

- A. A complete integration drawing set including:
 - 1. Drawing Index and Title Page.
 - 2. Symbols Legend showing all devices, cable types, labelling scheme and any other information required to decipher symbols in the submittal package.
 - 3. Floor Plans, Reflected Ceiling Plans, and Sectional View drawings as required to completely document all devices, dimensional locations, and infrastructure requirements.
 - 4. System wiring diagrams showing make and model of equipment, logical wire traces, cable types, and any other identifying labels for wiring or ancillary devices.
 - 5. Rack Elevations showing rack identifiers, equipment location within each rack, per-outlet power distribution details, and any rack accessories.
 - 6. Plate and Panel drawings showing connections, size, finish, color, engraving, and any other information required to document fit and finish of wall plates or floor boxes.
 - 7. Riser diagrams showing cable routing between wall plates, floor boxes, ceiling devices, racks, and any other devices as required.
 - 8. Additional drawings as required, including but not limited to custom furniture and millwork, custom display details and equipment mounting.
 - 9. Patch Panel and/or Network Switch Layouts that show port numbering schemes and IP information as required.
- B. Product data sheets for equipment and cabling, organized logically by system type and indexed for reference. Any parts used but not approved may be rejected at any time.
- C. Material samples as required.
- D. Project schedule, including key milestones including but not limited to submittal packages, material procurement, rack fabrication and shop testing, installation milestones as applicable, acceptance testing, and completion.
- E. Images of proposed touch panel layouts (as required), with functional descriptions of buttons and pages. Two iterative edits will be included in the project based on project reviewer comments.

1.8 STATUS REPORTS AND MEETING MINUTES

- A. Provide weekly status reports outlining progress on the project. These reports must include information on the work completed since the previous report, the work to be completed before the next report, and any potential scheduling issues.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. All costs for shipping to the site, along with those for any unusual storage requirements, are to be a part of this Specification.
- B. Make appropriate arrangements, and coordinate with authorized personnel at the site, for the proper acceptance, handling, protection, and storage of equipment so delivered.

- C. Prior to site conditions safely supporting the installation of the AV equipment, some AV equipment must be received and stored offsite in suitable environmental conditions for sensitive electronic equipment. This equipment must be made available for inspection by the Project as required.

PART 2 PRODUCTS

2.1 GENERAL

- A. All materials must be new, free from defects and not less than the quality specified. Materials must be designed to ensure satisfactory operation and operational life in the environmental conditions which will prevail where they are being installed.
- B. At the time of submittal, supply the latest model for each piece of equipment.
- C. All products used must be manufactured no more than one year prior to installation.
- D. All products must be provided with the latest version of all software/firmware.
- E. All equipment must be UL 62368-1 or equivalent listed or industry standard and comply with the NEC NFPA 70.
- F. Equipment installed in air handling spaces must be UL 2043 listed.
- G. No substitutions or variances are allowed without the written consent of the Project's approved representative.
- H. Substitute equipment must meet or exceed the performance specifications of the basis of design equipment and be at no additional cost.
- I. Substitute equipment must not impact the existing architectural, mechanical or electrical designs.
- J. Submit equipment pricing based on the specified equipment herein. Any substitute equipment or new proposed equipment necessary to fulfill the design intent, must be clearly categorized and priced individually on a separate page as an alternate to the specified equipment. Pricing for the original specified equipment must still be provided.

2.2 SYSTEM DESCRIPTIONS

- A. Digital Signage
 - 1. Quantity: 3
 - 2. Locations: 225J, 223, 3rd floor corridor
 - 3. Description:
Includes a wall mounted 55" LED backlit display. The AV source will be a digital signage player managed over a LAN connection. System control and scheduling will be accomplished by using the digital signage management software.
- B. Small & Medium Conferencing Space
 - 1. Quantity: 7

2. Locations: 225H, 323A, 423A, 421A, 421B, 321A, 325B
3. Description:
Includes a wall mounted large format display, sized according to viewing distance, and a media bar with integrated camera, speakers, and microphone array. Conferencing and presentation functions to be actuated through the Zoom Room control panel included with the media bar. AV system input source is a hard-wired HDMI connection at the tabletop with companion USB. System equipment will be mounted in an in-wall box behind the display.

C. Large Conferencing Space

1. Quantity: 1
2. Locations: 425
3. Description:
Includes a wall mounted large format display, sized according to viewing distance, and a media bar with integrated camera, speakers, and microphone array. Extension microphones will also be utilized on the table. Conferencing and presentation functions to be actuated through the Zoom Room control panel included with the media bar. AV system input source is a hard-wired HDMI connection at the tabletop with companion USB. An assistive listening emitter will be included and connected to an installed boundary microphone to capture all audio in the room. System equipment will be mounted in an in-wall box behind the display.

D. Cafe

1. Quantity: 1
2. Locations: 231
3. Description:
Includes two [2] wall mounted 55" LED backlit displays mounted at the server area for displaying digital menus. The AV source for the digital menu boards will be a digital signage player managed over a LAN connection with control and scheduling accomplished by using the digital signage management software.
The Café seating area includes a wall mounted 75" LED backlit display with input from an IPTV decoder. An audio system will be included in the seating area with ceiling speakers, input from the IPTV display and a wall audio input for events, and a wall mounted control panel for volume and source selection.

E. Large Flexible Meeting Room

1. Quantity: 1
2. Locations: 221
3. Description:
Supports local presentation and conferencing functionality, featuring multiple camera angles for near and far end capabilities. Includes two [2] wall mounted 86" LED backlit displays on the north wall, and a large, ceiling recess projection screen on the east wall to support a flexible front of the room. Video conferencing will utilize three [3] installed PTZ cameras, and beam forming microphones mounted in the ceiling, along with a far end display monitor mounted on the south wall. Voice lift capability will be supported through an installed microphone at the lectern. AV system functions will be actuated through a lectern mounted button panel interface. AV system input source options include a hard-wired HDMI and USB connection at the lectern, BluRay

player, and installed computer. An assistive listening emitter will be included and connected to the AV system audio system. System equipment will be mounted in an equipment rack within a connected AV rack closet.

F. Multipurpose Room

1. Quantity: 1
2. Locations: 525
3. Description:

Supports local presentation and conferencing functionality, featuring projection screens for flexible seating, and multiple camera angles for near and far end capabilities. Includes two [2] large installed projection screen and projector, one on the north wall, and the other on the west wall. Video conferencing will utilize four [4] installed PTZ cameras, and beam forming microphones mounted in the ceiling. Voice lift capability will be supported through wireless microphones. AV system functions will be actuated through a lectern mounted button panel interface with a technical operator's touch panel also in the AV booth for manually operated events. AV system input source options include a hard-wired HDMI and USB connections at three [3] lectern locations. An assistive listening system will be included and connected to the AV system audio system. System equipment will be mounted in an equipment rack within a connected AV rack room.

2.3 EQUIPMENT LIST

- A. See attached AV Equipment List

PART 3 EXECUTION

3.1 EXAMINATION

Details within this Specification represent design intent, installation of fully functional systems, obeying all established industry standards is the responsibility of the AV integrator. After becoming familiar with the details of the work and working conditions, verify dimensions and equipment locations in the field, and advise the Project of any discrepancies before performing the work.

3.2 GENERAL INSTALLATION STANDARDS

- A. Coordinate the installation of all equipment, wiring, and associated hardware to be compatible with the work of other trades and with the overall construction completion schedule.
- B. Protect all finishes, furniture, and equipment, and maintain a clean work environment while working and when finished each day.
- C. Perform installation in strict accordance with AVIXA standards and best practices, general industry standards and best practices, and any other governing codes.
- D. Keep a complete and accurate set of installation drawings at the job site. Note any changes made during installation on the drawings. Include a final set of as-built drawings with the Operation and Maintenance manuals.

- E. Install all equipment following the manufacturers' recommendations and broadcast standards. Adjust and test to assure that all components are functioning properly by themselves and in conjunction with their associated components.
- F. Install all equipment in appropriate cabinets or consoles at the locations designated in this document or on the associated contract drawings.
- G. Apply no advertising to equipment, and accessories. Service contact information should be included on no more than one rack panel at each rack location.

3.3 MOUNTING, RIGGING, AND SEISMIC RESTRAINT

- A. Design and build equipment racks in accordance with AVIXA F502.01, AVIXA F502.02, and ECIA EIA/ECA 310-E
- B. Mount equipment in accordance with 36 CFR 1191
- C. Securely fasten all equipment in place unless requirements of portability dictate otherwise. Fasteners, blocking, and supports must be adequate to support their loads with a safety factor of at least five.
- D. Provide seismic protection, including supports and hangers, as required by applicable code.
- E. Install all boxes and equipment plumb and square per the manufacturer's recommended mounting practice.
- F. Securely fasten and support all equipment without hindering proper equipment operation.
- G. Provide shaft locks or security covers on all non-user-operated equipment having front panel controls.
- H. Provide structural/rigging calculations for mounting equipment more than 500 pounds. Mounting details may require review and approval by the Project's Structural Engineer.
- I. Equipment racks will be designed to ensure proper thermal management. Maximum constant operating temperature of equipment should not exceed 85 degrees Fahrenheit. Where cooling fans are provided in racks located in sensitive areas, select fans to minimize the noise impact in the area. Refer to Middle Atlantic Whitepaper.

3.4 GROUNDING AND SHIELDING

- A. Install grounding in accordance with NFPA 70, TIA-607, ANSI/BICSI N3, and all Division 26 Specification Sections.
- B. As a minimum, provide individual equipment racks with a rack grounding stud or bus bar and a #12 stranded bonding jumper connected to the grounding and bonding stud on the primary power distribution unit that is plugged into the power receptacle serving the rack. Isolate the rack from the floor with plastic or rubber wheels/leveling feet.
- C. Verify the integrity of grounding systems prior to connection of equipment.

3.5 GENERAL WIRING STANDARDS

- A. Provide, install, terminate, and test all cabling in accordance with TIA-568.0, TIA-568.1, TIA-568.2, TIA-568.3, TIA-568.4, TIA-569, ANSI/BICSI N1, AVIXA F502.01, AVIXA F502.02, and other industry best practices.
- B. All wiring runs must not be spliced, unless unavoidable. Splices are not permitted in conduit, outside of listed splice boxes.
- C. Cable routed in conduits or equipment racks is to have non-plenum (PVC) rated jacket. All other cables are to have a plenum rated jacket.
- D. Cables routed above ceilings must be suspended above the ceiling tiles in J-hooks or cable tray and secured with hook and loop band fasteners, tie wraps are not acceptable.
- E. Provide outdoor-rated, direct burial, or other similar specialty rated cable types where required based on installation conditions and applicable codes.
- F. The following denotes the most common cabling types and the minimum performance requirements. All cabling specifications are to be verified based on the actual equipment provided.
 - 1. Microphone and Line Audio Cable
 - a. 22 AWG (7x30) stranded twisted shielded pair with overall shield
 - b. Nominal Capacitance (Conductor to Conductor): less than or equal to 35 pF/ft
 - c. Nominal Capacitance (Conductor to Conductor and Shield): less than or equal to 67 pF/ft
 - 2. Low Impedance Loudspeaker Cable
 - a. 14 AWG (19x27) stranded twisted pair
 - b. Nominal Capacitance (Conductor to Conductor): less than or equal to 36 pF/ft
 - 3. Low Impedance Loudspeaker Cable:
 - a. 12 AWG (19x25) stranded twisted pair
 - b. Nominal Capacitance (Conductor to Conductor): less than or equal to 36 pF/ft
 - 4. Low or High Impedance Loudspeaker Cable
 - a. 16 AWG (19x29) stranded pair
 - b. Nominal Capacitance (Conductor to Conductor): less than or equal to 36.5 pF/ft
 - 5. High Impedance Loudspeaker Cable (70V / 100V)
 - a. 18 AWG (7x26) stranded pair
 - b. Nominal Capacitance (Conductor to Conductor): less than or equal to 34 pF/ft
 - 6. Antenna Cables - RG58 - Wireless Microphone and Assisted Listening
 - a. 50 ohm RG-58 19 AWG solid center conductor
 - b. Nominal Capacitance (Conductor to Shield): less than or equal to 27 pF/ft
 - c. Nominal Attenuation at 900MHz: less than or equal to 12.5 dB/100 ft
 - 7. Antenna Cables - RG213 - Wireless Microphone and Assisted Listening
 - a. 50 ohm RG-213 13 AWG solid center conductor
 - b. Nominal Capacitance (Conductor to Shield): less than or equal to 31 pF/ft
 - c. Nominal Attenuation at 900MHz: less than or equal to 6.5 dB/100 ft
 - 8. Antenna Cables - RG8/U - Wireless Microphone and Assisted Listening
 - a. 50 ohm RG-8/U 10 AWG solid center conductor
 - b. Nominal Capacitance (Conductor to Shield): less than or equal to 25 pF/ft
 - c. Nominal Attenuation at 900MHz: less than or equal to 4 dB/100 ft

9. Video Tie Line Cable:
 - a. RG59/U coaxial cable 20 AWG solid bare copper
 - b. Nominal Capacitance (Conductor to Shield): less than or equal to 16.5 pF/ft
 - c. Nominal Attenuation at 3000MHz: less than or equal to 22 dB/100 ft
10. Video Tie Line Cable:
 - a. RG6/U coaxial cable 18 AWG solid bare copper
 - b. Nominal Capacitance (Conductor to Shield): less than or equal to 16.5 pF/ft
 - c. Nominal Attenuation at 3000MHz: less than or equal to 18 dB/100 ft
11. Video Tie Line Cable:
 - a. RG11/U coaxial cable 14 AWG solid bare copper
 - b. Nominal Capacitance (Conductor to Shield): less than or equal to 16.5 pF/ft
 - c. Nominal Attenuation at 3000MHz: less than or equal to 10.5 dB/100 ft
12. Video Tie Line Cable Five (5) Conductor - Mini High-Res:
 - a. 5 x 26 AWG coaxial cable with overall jacket
 - b. Nominal Capacitance (Conductor to Shield): less than or equal to 17 pF/ft
 - c. Nominal Attenuation at 1000MHz: less than or equal to 21.5 dB/100 ft
13. Video Tie Line Cable Five (5) Conductor - RG59:
 - a. 5 x 24 AWG coaxial cable with overall jacket
 - b. Nominal Capacitance (Conductor to Shield): less than or equal to 17.5 pF/ft
 - c. Nominal Attenuation at 1000MHz: less than or equal to 13.5 dB/100 ft
14. Digital Video SUTP Tie Line Cable
 - a. 4 x 26 AWG solid bare copper, shielded twisted pair
 - b. Nominal Capacitance (Conductor to Shield): less than or equal to 25 pF/ft
 - c. Nominal Attenuation at 500MHz: less than or equal to 20.5 dB/100 ft
15. Data Tie Line Cable:
 - a. Refer to telecommunications specifications for project-standard data cabling information
16. RS-232 Control Cable
 - a. 22 AWG (7X30) Two pair twisted, individually shielded with drain wire
 - b. Nominal Capacitance (Conductor to Conductor): less than or equal to 17 pF/ft
17. Specialty Control Cable - AXLINK, CRESNET:
 - a. 22 AWG (7X30) shielded twisted pair with drain wire and 18 AWG unshielded pair in single jacket
 - b. Nominal Capacitance (Conductor to Conductor): less than or equal to 14 pF/ft
18. Multimode Optical Fiber:
 - a. 50/125 micron as required per transmission equipment manufacturer recommendation. If transmission equipment does not support 50/125 micron, 62.5/125 micron shall be permitted.
 - b. Strand count per functional drawings; minimum of two strands for each run outside the main equipment cabinet.
 - c. Shall support 10Gbps transmission speed for length of run
 - d. Each optical fiber strand shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification and all TIA-568.3 performance parameters
19. Single-Mode Optical Fiber:
 - a. 8.3/125 micron
 - b. Each optical fiber strand shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification and all TIA-568.3 performance parameters.

- 20. Unshielded Ethernet:
 - a. 4Px24 AWG UTP
 - b. Cat6 with a minimum TIA-568.2 standard rating
- 21. Shielded Ethernet:
 - a. 4Px24 AWG STP
 - b. Cat6 with a minimum TIA-568.2 standard rating

- G. Use digital video cable as specified by the product manufacturer to obtain a signal at the maximum capable system resolution that is free from all artifacts at each display from each source location. Use shielded cabling and connectors as required. Where multiple cabling options are provided by a manufacturer, use the option resulting in the greatest performance.
- H. All Category cabling and connectors are to be rated at CAT6 or greater with a minimum TIA-568.2 standard rating.
- I. All Category cabling and connectors to be terminated to the T568A standard unless otherwise required.
- J. Use color-coded ruggedized and lockable (Neutrik EtherCON or similar) shielded panel connectors and shielded inline connectors for all Contractor provided signal distribution equipment that requires RJ-45 style connectors at wall panel or floor box panel connections, except for those connecting a piece of AV equipment to the LAN. Maintain all cable shielding as required.
- K. Each digital AV over RJ-45 receptacle, permanently installed cable, equipment cord, and patch panel will be of a color or have markings that are non-standard with the voice/data system, and be plainly and permanently labeled "AV Only".
- L. Arrange, route, and isolate wiring according to signal level to minimize crosstalk, hum, or spurious signals. Wiring categories must consist of: microphone level (minus 80 dBm to minus 20 dBm), line level (minus 20 dBm to plus 30 dBm), loudspeaker level (plus 30 dBm and above), AC power, and DC control or emergency power.
- M. Select cable color according to signal type. Submit color scheme to Project for approval as a part of the Shop Drawing submission package.
- N. Install all cabling in an orderly and professional manner. Provide service loops to allow access to the rear of equipment.

3.6 LABELING

- A. Label all cables and equipment in accordance with TIA-606 and INFOCOMM F501.01.
- B. Use white labeling with black text unless requested otherwise by the Project.
- C. Provide the wire run list as an Excel spreadsheet and include as a part of the Operation and Maintenance Manuals.
- D. Clearly and logically label external devices such as audio mixers, wireless microphones, belt packs, and assistive listening receivers.

- E. Label relevant inputs and outputs on switchers, matrices, and mixers. This includes digital/virtual labelling of audio channels and video inputs and outputs.
- F. Label telephone numbers, ISDN numbers and IP addresses of pertinent devices.
- G. Label rack devices with black limacoid plastic engraved with white lettering.
- H. Label cabling wherever it is exposed in junction or pull boxes.

3.7 REMOTE CONTROL SYSTEM PROGRAMMING

- A. Design graphical user interfaces in accordance with industry standards such as noted in Extron Electronics GUI Design Guide.
- B. At a minimum, the remote-control systems (where provided) will be programmed for the following general functionality as appropriate for each audiovisual system:
 - 1. Power sequencer: Rack power on/off.
 - 2. Projection screen: Up/down. Screen must automatically lower when the projector is turned on and automatically raise when the projector is turned off.
 - 3. Projector lift: Up/down. Provide the following lift preset positions: projector off (fully up), show position (projector in normal operating position), and service position (fully down).
 - 4. Displays: Power on/off, input source selection, video mute, lamp life monitoring. Automatic power on when a source is selected for display.
 - 5. Video matrices: Source routing.
 - 6. Video cameras: Pan/tilt/zoom, preset store and select.
 - 7. CATV/Satellite TV tuner: Manual channel select, preset channel store and recall.
 - 8. Media player: Standard transport and menu controls.
 - 9. Recorder: Standard transport and menu controls, record source select.
 - 10. Audio matrix: Dialing, privacy, local and remote volume up/down/mute, pick up/hang up.
 - 11. Video codec: Dialing, privacy, volume up/down/mute, pick up/hang up, camera controls, menu navigation, source send selection.
- C. Where all room video sources are portable, use video sync sensing to automatically power on the room display system upon connection of a video source and automatically power off the display upon disconnection of a video source.
- D. Provide separate Program and Microphone audio level controls with mute function. Include a technician's page with access to individual microphone level controls. Include a preset button to recall default levels.
- E. UPS: System monitoring. Provide a technician page for the monitoring of the UPS. Feedback will be provided to monitor the following conditions as available by the UPS: Utility Voltage, Output Voltage, Current Load, Load Percentage, Wattage Load, Battery Capacity, Battery Voltage, Remaining Battery Time, Remaining Charging Time, and Cabinet Temperature. Provide alerts for the detection of any system faults, warnings, or abnormal conditions as available
- F. Lighting system: Preset 1-4 recall, all lights on, all lights off, individual lighting zone raise/lower, all lights raise/lower

- G. Shades: Open, close, stop. Provide individual controls for each shade zone and type, such as sun control and blackout.
- H. Room combining: In room combined mode, all video sources must be made available to all video destinations and all microphone sources must be made available to all audio destinations. The audio from the last routed video source is to become the local program audio source. One control system touch panel is to become the master (or multiple touch panels can track together). In rooms with operable partition sensors, use the sensors to automatically recall the room combination presets.
- I. In the absence of pre-defined touch panel templates, propose draft touch panel pages for review and approval by the Project prior to programming. A minimum of one meeting must be provided to present these pages. Provide modifications as necessary based on comments resulting from the meeting.
- J. Program the control system to automatically power down the AV systems each day at a time specified by the Project. Fully power off (or place in stand-by mode) all non-critical equipment.
- K. Where applicable, provide web browser-based control of each room in addition to the room touch panels.
- L. Coordinate all required control system LAN settings with the Project.
- M. Include eight hours of additional programming time as a part of this Specification for any requested control system modifications after initial system acceptance but prior to the expiration of the warranty period.

3.8 SYSTEM TESTING AND ADJUSTMENT

- A. Perform in accordance with ANSI/INFOCOMM 10.
- B. Demonstrate that all audio system coverage is in accordance with ANSI/INFOCOMM A102.01.
- C. Demonstrate that the entire scope of work defined is complete and fully functional per the scope of this specification and drawings, as well as any additional approved modifications and revisions.
- D. Prior to conducting acceptance testing with the Consultant, complete an internal quality review including a minimum of the following:
 - 1. Verify that all equipment has been delivered and installed per specifications. Provide a detailed equipment list sorted by room number and rack complete with make, model and serial number.
 - 2. Verify that all other trades have completed the work associated with the functioning of the audiovisual systems and that any installed third-party devices such as screens, shades, and lights work properly with the AV systems.
 - 3. Power on all equipment and verify the intended functions.
 - 4. Verify signal paths and cable continuity/integrity for all field terminated wiring.
 - 5. Adjust and align all displays for color, contrast, and geometry.
 - 6. Verify all communications services such as POTS, ISDN, and Ethernet.

7. Configure and test the functionality of all audio and video conferencing systems.
8. Load and test all DSP and control system software and provide button by button testing of all control system touch panels.

- E. Provide documentation to the Project that the systems are substantially complete at least one week in advance of acceptance testing with the Consultant.

3.9 TEST EQUIPMENT

Provide all test equipment and test materials relative to the scope of the project to include legal copies of all source media in all appropriate formats and blank recordable media in all appropriate formats.

3.10 COMMISSIONING AND ACCEPTANCE TESTING

- A. Perform integrator system commissioning in accordance with ANSI/INFOCOMM 10
- B. After preliminary system installation, adjustment, and complete integrator system commissioning, conduct acceptance testing with the consultant present.
- C. Schedule acceptance testing to ensure the availability of all required personnel and rooms.
- D. During the acceptance testing, demonstrate the operation of overall system functionality as well as each individual piece of equipment in the system. Also demonstrate that equipment functions according to manufacturer's specifications, industry standards, and as stated in this Specification.
- E. This demonstration must include a minimum of the following:
 1. A physical inventory of all equipment
 2. An evaluation of general workmanship and construction quality
 3. A mechanical check of all system components
 4. The physical operation of all system equipment (audio, video, control, and network) including button-by-button control system testing
 5. The placement of audio and video test calls

3.11 SYSTEM TRAINING AND OPERATION ASSISTANCE

- A. Conduct a training program for a nominal two staff members as designated by the Project to instruct on overall system and individual equipment operation, basic preventative maintenance, and basic system troubleshooting. Provide a nominal eight hours of training which may be scheduled at the Project's request at any time up to one year following system acceptance.
- B. The training program will include a minimum of two sessions. The first session must occur immediately after the acceptance of the systems and cover the basic operation of each system. Provide the second training session within six weeks from the first session. The Operation and Maintenance Manuals for the equipment must be completed and presented at the time of the second session. This training session will be used to train additional people and/or to answer questions/resolve issues developed within the first weeks of system use.

- C. Notify the Project at least 14 days prior to the start of each course.

3.12 RECORD DRAWINGS

Submit as-built documentation upon completion, including but not limited to, the following:

- A. All information contained in the Shop Drawings submittal package as detailed above and edited to reflect final conditions.
- B. Documentation of equipment serial numbers and network/phone/ISDN addressing scheme.
- C. Software files for touch panel interfaces, source code, DSP, and equipment settings, both compiled and un-compiled code for future system modification.
- D. Manufacturer product guides and instruction manuals.
- E. Warranty information and product registration as applicable.

3.13 OPERATION AND MAINTENANCE (O&M) MANUALS

- A. As-built documentation must also contain a custom-generated system operation guide that details the proper setup and usage of each system in all its normal functions and common usage scenarios as defined by the Project. This "Step-by-Step" operation guide must contain information such as a general description of the overall system(s), instructions for general system operation such as turning the system on and off, selecting various video sources for display, routing various audio sources to the speaker systems, setting up audio bridge calls, room combining, making VTC calls, using camera presets, etc. The intent is for this manual to provide simple "how-to" instructions on operating the system. This manual must also be a supplement to the system training specified above.
- B. The operations guide must include screen captures of each touch panel page (where applicable) with descriptions of the functionality of each button.
- C. Submit revisions of manuals that include changes based on feedback from prior training sessions, other government comments, errors in documentation, or any altered control interface programming prior to the second training session.
- D. Complete the operation guide prior to the second training session system and use it for the training.
- E. Post one copy of system specific equipment interconnection drawings (laminated or in a plastic bag to prevent damage) inside the front or rear door of the main equipment for each individual audiovisual system.
- F. All control system software will become the property of the Project with the right to make any desired modifications after the expiration of the system warranty.
- G. At the end of the warranty period, provide an updated copy of the above to account for any modifications that may have occurred during the warranty period.

3.14 WARRANTY AND MAINTENANCE

- A. Guarantee the system for a period of one year from the date of final system acceptance against defective materials, design, workmanship, and improper adjustment. Repair or replace any defective material at no expense to the Project. During the warranty period, respond to any service calls within 24 hours, excluding Saturdays, Sundays, and holidays. Where possible, provide substitute equipment to maintain system operation during repair.
- B. Provide two service calls after the acceptance of the system, at six months one year, to perform routine system maintenance and adjustment.
- C. The above warranty must not void warranties issued by individual equipment manufacturers. Individual warranties valid for greater than one year must remain in full effect.
- D. The above warranty does not pertain to owner furnished equipment.

3.15 WASTE MANAGEMENT

- A. Separate and dispose of waste in accordance with the Project's Waste Management Plan.

END OF SECTION

SECTION 280500

COMMON WORK RESULTS FOR ELECTRONIC SAFETY & SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Provide labor, materials and equipment necessary to complete the work of the Electronic Safety and Security (ESS) Systems, including the following:
 - a. Grounding and bonding for Electronic Safety and Security (ESS).
 - b. Pathways for ESS.
 - c. Lightning and Surge Protection for ESS.
 - d. Vibration and Seismic Controls for ESS.
 - e. Equipment Enclosures for ESS.
 - f. Electronic Components for ESS.
 - g. Exposed Components.
 - h. Cables for ESS.
 - i. Identification for ESS.
 - j. Electronic Safety and Security (ESS) equipment coordination and installation.
2. The Electronic Safety and Security (ESS) Systems, include but are limited to:
 - a. Access Control and System (ACS)
 - b. Intrusion Detection System (IDS)
 - c. Video Surveillance System (VSS).
 - d. Associated cabling, enclosures, and uninterruptible power supplies.
 - e. Coordination:
 - 1) Coordination with door hardware
 - 2) Coordination and interface with the fire alarm system to tie the electrified locks power supplies to the building fire alarm
 - 3) Coordination with other trades

B. Related Sections

1. Section 08 71 00 "Door Hardware"
2. Section 26 05 26 "Grounding and Bonding for Electrical Systems"
3. Section 26 05 29 "Hangers and Supports for Electrical Systems"
4. Section 26 05 33 "Raceways and Boxes for Electrical Systems"
5. Section 27 15 00 "Communications Horizontal Cabling"
6. Section 28 10 00 "Access Control"
7. Section 28 20 00 "Video Surveillance"
8. Section 28 31 00 "Intrusion Detection"

1.2 SUBMITTAL PROCEDURES

- A. Refer to Cornell University's General Conditions.

1.3 SUBMITTALS

- A. List of Submittals:
1. Pre-Construction Submittals:
 - a. Qualifications and Certificates
 - b. Product Data for every product installed
 - c. Manufacturer Quality Assurance Tests and Source Quality Control Reports
 - d. Shop drawings
 - e. Samples
 2. During Construction:
 - a. Coordination Drawings
 - b. System Labeling
 3. Post Construction:
 - a. Test Plan and Procedures
 - b. Field Quality Control Reports/Test Results
 - c. Record (as-built) Drawings
 - d. Spare Parts List
 - e. Manuals
 - f. Warranties
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and standard colors and finishes. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. It must also include roughing-in diagrams and templates, standard wiring diagrams, controls and performance curves. Where Product Data must be specially prepared or modified because standard printed data is not suitable for use, submit as "Shop Drawings".
- C. Samples: Along with project data and shop drawings, submit one (1) sample for each exposed security device with color and finish options, for review by the Commissioner. The Commissioner must retain these devices as a record of the approved equipment for the length of the project.
- D. Shop Drawings:
1. The shop drawings must include detailed, to-scale, drawings describing the products (systems, equipment, devices and materials) as to precise locations, mounting and installation methods, details and dimensions, schedules, conduit sizing, conduit routing, riser diagrams, point-to-point interconnect diagrams, equipment schedules, zoning schedule, door schedules, VSS camera schedules, system interface schedules or diagrams, power requirement schedules, stand-by/emergency power schedule, and other diagrammatic or written descriptions which must allow a thorough and accurate understanding of the security systems and equipment that are being furnished, how they are intended to function, how they must be installed, and all other necessary information of similar intent.
 2. Indicate accurate locations of conduit, raceway, junction and utility boxes, termination panels, transformers (if any), power supplies, panels, and all other equipment noted.
 3. Illustrate all mounting locations and methods, with particular detail for the installation of intrusion sensors, locking hardware, and request-to-exit devices at doors, sensors located at windows and the mounting of interior and exterior VSS cameras.

4. Include plans, elevations, sections, details, and attachments to other work.
5. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
6. Equipment schedules and details must provide the following information, as appropriate in each case: door number; door type; door position switch; request-to-exit type; request-to-exit location; auxiliary request-to-exit device, if any; lock type; power requirements; emergency power; access control type; special installation requirements; timed-shunt times; shunt type; precise, to-scale mounting location; zone or point designation; remote control of lock by specific and designated control console; VSS camera number activated by sensor or switch closure; input/output programming schedules; CPU output reports structure.
7. Camera schedules and details must provide the following information: camera number; camera type; monitor number for each camera (if any); sequencing [if any]; camera model number; camera features, such as auto-iris; lens specification; power requirements; type of power input; cable type; length of cable run; camera mounts; camera housing; camera housing features, such as heater, etc.; camera drives; switcher position; switcher type; monitor type; cameras displayed on each monitor, especially linked displays; NVR positions; alarm queuing; special installation or carpentry requirements; camera and/or lens controls; alarm homing; termination method; lightning, ground loop, etc. protection.
8. Illustrate the fields of view of each camera, as well as “park” positions for panning and zooming cameras (if any). If the camera is capable of wide-angle and telephoto viewing, both fields of view must be indicated. The installer’s “aiming point” must be indicated. The submittal must clearly identify outdoor camera mounting details and maintenance access concepts and design.
9. System interface schedules or diagrams must clearly identify sensors and switches which queue cameras, as well as the number of cameras activated; video recorder activation logic; VSS monitor switching logic; interfaces, if any, between the access control system; distributed processing capabilities and functions; sensors and switches exclusively used as request-to-exit devices.

E. System labeling: submit labeling scheme and samples.

F. Manuals:

1. Provide complete sets of Operation Manuals for systems and equipment provided.
2. The manuals must be compiled, assembled, and indexed, in an easily identifiable hard cover form. Three (3) sets of manuals must be submitted.
3. The manuals must include the following:
 - a. Complete operating instructions.
 - b. Complete maintenance instructions, wiring diagrams, troubleshooting instructions.
 - c. System service instructions for work which manufacturers recommend user service.
 - d. Complete parts lists for each major item of equipment and/or for each system.

- e. Complete collection of manufacturers' products and catalog literature for equipment and systems installed under this contract.
- f. Manufacturers' warranties.
- g. Operating characteristics, performance data, ratings, and manufacturers' specifications for each item of equipment or system.
- h. Where practical, internal wiring diagrams and schematics.
- i. Software User Documentation: Manual must include operating instructions, programming instructions, technical documentation, and maintenance procedures to permit making changes to system configuration.

G. Record Drawings

- 1. Produce, and keep up to date, a complete record as-built set of prints (black-line bonds) which must be corrected and marked-up to show every change from the original Specifications and Contract Drawings. This set of drawings must be protected against soiling, tears, and similar damage and defacement.
- 2. Upon completion of the work submit a final set of record drawings by updating the AutoCAD/Revit files of the construction set of drawings (to be provided by the Commissioner) with the information from the as-built set. The submittal must include the original record set of black-bonds and the electronic files of the as-built drawings in both AutoCAD format and PDF format.

1.4 QUALITY ASSURANCE

- A. Refer to Cornell University's General Conditions.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Grounding: Comply with ANSI-J-STD-607-A.
- D. Qualification Requirements
 - 1. The installer must be properly trained by manufacturer of the systems installed.

1.5 COORDINATION

- A. Coordinate layout and installation of security equipment in the TR/ER rooms, copper and/or fiber backbone and LAN requirements with the Commissioner and the telecommunications installer.
- B. Coordinate location of power raceways and receptacles with locations of security equipment requiring electrical power to operate.
 - 1. Coordinate arrangement, mounting, and support of electronic safety and security equipment:
 - 2. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 3. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 4. To allow right of way for piping and conduit installed at required slope.

- C. Connecting raceways, cables, wireways, cable trays, and busways must be clear of obstructions and of the working and access space of other equipment.
- D. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- E. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed.
- F. Coordinate routing of the security cables.
- G. Coordinate the installation of the door/frame security package with the door hardware supplier. Security door hardware includes an electrified lock, electric strike, electrified panic hardware, electric power transfers or electrified hinges, magnetic door contacts, lock power supplies, termination cabinets, and final connection of wiring to door security devices and to the appropriate screw terminals on the screw-type termination strips located in the termination box.

1.6 INSTRUCTION

- A. Engage factory-authorized service representatives to train Cornell University personnel to adjust and operate the security systems installed.
- B. Refer to Division 01 Section "Demonstration and Training"

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING FOR SECURITY SYSTEMS

- A. Comply with Section 26 05 26 Grounding and Bonding for Electrical Systems.
- B. Comply with ANSI-J-STD-607-A.

2.2 PATHWAYS FOR ELECTRONIC SAFETY AND SECURITY

- A. Hangers and Supports
 1. Cable Support: NRTL labeled.
 2. All hangers and supports installed in plenum spaces must be plenum rated.
 3. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
 4. Cable hangers and non-continuous supports must be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.
 5. Must have various attachment options for: wall, ceiling, joist, beam, flange, raised floor pedestal and others type of mounting.
 6. Support brackets with cable tie slots for fastening cable ties to brackets.
 7. Lacing bars, spools, J-hooks, and D-rings, straps and other devices.
 8. Cable straps (ties) must be reusable Velcro-style with hook and loop or d-ring, available in various colors and sizes. Plenum rated straps must be used in plenum spaces.

- B. Conduits and Back Boxes:
 1. Provide where indicated on drawings or as required.
 2. Conduit and boxes sizes as shown on the communications drawings.
 3. Comply with requirements in Section 26 05 33 "Raceway and Boxes for Electrical Systems"
 4. Flexible metal conduit must not be used unless specifically noted.

- C. Sleeves for Pathways and Cables
 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water-stop, unless otherwise indicated.

- D. Sleeve Seals and Firestopping
 1. Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
 2. Comply with requirements Section 07 84 13 "Penetration Firestopping".
 3. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
 4. Sealing Elements: Interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
 5. Pressure Plates: Stainless steel. Include two for each sealing element.
 6. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

- E. Grout
 1. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

2.3 LIGHTING AND SURGE PROTECTION

- A. Intrusion detection, access monitoring and control, video circuitry, and communication circuits that connect to outdoor mounted equipment must be protected at both ends against excessive voltages.

- B. This requirement must apply for circuits that are routed both in underground conduits and overhead runs. As a minimum, both primary detection devices, such as three (3) electrode gas-type surge arrestor, and secondary protectors must be installed to reduce dangerous voltages to levels that must cause no damage. Fuses must not be permitted as lightning and power surge protection devices.

- C. Provide fail-safe gas tube type surge arrestors on all exposed security data circuits. Breakdown voltage for the unit must be three hundred to five hundred (300-500) VDC. The unit must have equal performance for bi-polar operation with an automatic reset feature, and a minimum life of one thousand (1000) surges with ten (10) times one thousand (1000) microsecond waveform at one thousand (1000) amperes.

2.4 VIBRATION AND SEISMIC CONTROLS FOR ESS

- A. Security systems components must withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. The term “withstand” means “the unit must remain in place without separation from any parts from the device when subjected to the seismic forces specified and the unit must be fully operational after the seismic event”.
- C. Equipment must be seismically rated and braced according to IBC 1621.

2.5 IDENTIFICATION FOR SECURITY ESS

- A. The identification for the communications systems must meet all the requirements of a Class 3 facility as defined by ANSI/TIA/EIA 606-A, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
- B. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- C. Identify all the components of the security systems.
- D. For fire-resistant plywood, do not paint over manufacturer's label.
- E. All labels must be preprinted or computer-printed type.
- F. Type, format, wording, printing, and placement of labels must be coordinated with Cornell University's existing administration plan.
- G. Labeling System
 1. PC-based software, WINDOWS compatible, capable of supporting alpha numeric characters and Windows True Type Fonts.
 2. Compatible with laser printers.
 3. Label sizes supported:
 4. Minimum: 0.8" W x 0.2" H.
 5. Maximum: 3.0" W x 12.0" H.

2.6 EQUIPMENT ENCLOSURES FOR ESS

- A. Cabinets or housings, power supply enclosures, terminal cabinets, multiplexer, data gathering panels, wiring gutters, and other component housings, collectively referred to as enclosures, must be so formed and assembled as to be sturdy and rigid.
- B. Thickness of metal in cast and sheet metal enclosures of all types must not be less than those in Tables I and II, UL six-hundred-eleven (UL-611). Sheet steel used in fabrication of enclosures must be not less than fourteen (14) gauge. Doors and covers must be flanged. Where doors are mounted on hinges with exposed pins, the hinges must be of the tight pin type, or the ends of hinge pins must be tack welded to prevent ready removal. Doors having a latch edge length of less than twenty-four (24) inches must be provided with a single lock. Where the latch edge of a hinged door is twenty-four (24) inches or more in length, the door must be provided with a three (3)-point

latching device with lock; or alternatively with two (2) locks, one (1) located near each end.

- C. Any ventilator openings in enclosures and cabinets must conform to the requirements of UL six-hundred-eleven (UL-611).
- D. Unless otherwise indicated, sheet metal enclosures, excluding control console enclosures, must be designed for wall mounting with top holes slotted. Mounting holes must be in positions which remain accessible when all major operating components are in place and the door is open but must be inaccessible when the door is closed. Covers of pull and junction boxes provided to facilitate initial installation of the system must be held in place by tack welding, brazing, or one-way screws. Zinc labels must be affixed to such boxes indicating they contain no connections. These labels must not indicate that the box is part of the security system.
- E. Excluding the cabinets and other enclosures located in Security or Telecommunications Rooms, all enclosures, cabinets, housings, boxes, raceways, and fittings of every description having hinged doors or removable cover plates which contain circuits of the security system and its power supplies, must be provided with cover-operated corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door is moved as little as one quarter (1/4) inch from its normally closed position.
- F. Security Cabinet
 - 1. Used for mounting of security equipment.
 - 2. Wall mounted equipment rack with hinged front and back for access.
 - 3. Dimensions: 24" W x 49" H x 32" D
 - 4. Rack shall be 4 feet high, 308"-inch minimum depth and 19-inch mountable with standard EIA-310-D hole spacing.
 - 5. Shall be provided with equipment mounting screws (50 per rack minimum).
 - 6. Finish shall be Black.
 - 7. Shall be grounded by a #6 AWG wire with green insulation to building steel. Use lug type connectors at each end.
 - 8. Vented front doors.
 - 9. Provide all required mounting hardware and accessories:
 - a. Two (02) 8" W double sided vertical wire managers.
 - b. Power distribution unit: coordinate power input receptacle with electrical and output receptacles with the equipment installed in the cabinet.
 - c. Grounding accessories as required to bond the cabinet.
 - d. Four (4) fan kits
 - 10. Basis-of-design Product: Subject to compliance with requirements, provide Middle Atlantic Provide DWR-24-32 or comparable product by one of the following:
 - a. Chatsworth Products
 - b. Cooper B-Line
 - c. Or approved equal.

2.7 EXPOSED COMPONENTS

- A. Components exposed and accessible to the public must be of a design and construction typical and suitable for such use. All device fasteners must be an approved security type. All components and materials must be resistant to vandalism and waterproof.

2.8 ELECTRONIC COMPONENTS FOR ESS

- A. All electronic components of the system must be of the solid-state type, mounted on printed circuit boards conforming to UL seven-hundred-ninety-six (UL 796). Boards must be plug-in, quick-disconnect type. Circuitry must not be so densely placed as to impede maintenance. All power dissipating components must incorporate safety margins of not less than twenty-five (25) percent with respect to dissipation ratings, maximum voltages, and current-carrying capacity. All electronic printed circuit boards furnished and installed must be provided with a mildew/fungus-resistant and moisture inhibiting coating.

2.9 CABLES FOR ESS

- A. All cables installed in plenum spaces must be plenum rated.
- B. Jacket color must be yellow for all security cables.
- C. Composite cable:
 - 1. Element 1: (lock power): 16 or 18 AWG, 4 conductor, non-shielded, plenum
 - 2. Element 2: (car reader): 22 AWG, 6 conductor, overall shield, plenum
 - 3. Element 3: (door position switch): 22 AWG, 4 conductor, non-shielded, plenum
 - 4. Element 4: (request-to-exit device): 22 AWG, 4 conductor, non-shielded, plenum
- D. Plenum-Type, RS-232 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, and individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage; PVC jacket. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.
- E. Plenum-Type, RS-485 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and fluorinated-ethylene-propylene jacket.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.
- F. Plenum-Type, Paired, Readers and Wiegand Keypads Cable: Paired, 3 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, individual aluminum foil-polypropylene tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and fluorinated-ethylene-propylene jacket.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.

- G. Plenum-Type, Multiconductor, Readers and Wiegand Keypads Cable: 6 conductors, No. 20 AWG, stranded (7x28) tinned copper conductors, fluorinated-ethylene-propylene insulation, overall aluminum foil-polyester tape shield with 100 percent shield coverage plus tinned copper braid shield with 85 percent shield coverage, and fluorinated-ethylene-propylene jacket.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.
- H. Plenum-Type, Paired Lock Cable: 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.
- I. Plenum-Type, Paired Lock Cable: 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and plastic jacket.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.
- J. Plenum-Type, Paired Input Cable: 1 pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, aluminum foil-polyester tape shield (foil side out), with No. 22 AWG drain wire, 100 percent shield coverage, and plastic jacket.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.
- K. Plenum-Type, Paired AC Transformer Cable: 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and plastic jacket.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.
- L. Subject to compliance with requirements, provide products by one of the following manufacturers:
 - 1. Belden.
 - 2. West Penn Wire.
 - 3. Superior Essex.
 - 4. Or approved equal.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

- A. Refer to Cornell University's General Conditions for execution requirements.

3.2 INSTALLATION PROCEDURES

- A. All materials must be installed as per the manufacturers' instructions, unless noted otherwise.

- B. Comply with NECA 1.
- C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange, and install components and equipment to provide maximum possible headroom consistent with these requirements.
- E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications' equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- F. Right of Way: Give to piping systems installed at a required slope.
- G. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- H. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.
- I. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of completion.
- J. Thoroughly clean areas and spaces where work is performed or used as access to work. Remove completely, paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit, and similar features before painting or other finishing is applied. Restore all surfaces to their original condition.
- K. All wall-mounted equipment must be mounted square and plumb.

3.3 ENCLOSURES FOR ESS

- A. All enclosures that are not installed in a secured space, such as Security Room/Closet or Telecommunications Rooms, must have tamper provisions.
- B. Tamper switches must be mechanically mounted to maximize the defeat time when enclosure covers are opened and removed. The minimum amount of time required to depress or defeat the tamper switch after opening or removing the cover must be greater than one (1) second.
- C. Enclosure and tamper switch must function in such a manner as to not allow direct line of sight to any internal components or the tampering of the switch or circuit wiring. Tamper switches must be inaccessible until the switch is activated; have mounting hardware concealed so that location of the switch cannot be observed from the exterior of the enclosure; be under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating; must be spring-loaded and held in the closed position by the door protected; and must be wired so that they break the circuit when the door is disturbed.

- D. Tamper switches on doors which must be opened to make normal maintenance adjustments to the system and to service the power supplies must be of the push/pull set, automatic-reset type. Covers of pull and junction boxes provided to facilitate initial installation of the system need not be provided with tamper switches.

3.4 ALARM ANNUNCIATION

- A. Alarm annunciation must include intrusion detection, tamper, fail safe, line fault, and power loss.
- B. Intrusion Detection: Intrusion detection alarms must include the full range of interior point protection sensors, volumetric space, access control protection sensors, and duress alarms. Duress alarms must be annunciated to clearly distinguish them from other intrusion detection alarms.
- C. Tamper: Enclosures, cabinets, housings, boxes, raceways, and fittings having hinged doors or removable covers, and which contain circuits for the security system and its power supplies, must be provided with cover operated, corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door or cover is moved as little as one quarter (1/4) inch from the normally closed position. Tamper switches must be mechanically mounted to maximize the defeat time when enclosure covers are opened or removed. The minimum amount of time required to depress or defeat the tamper switch after opening or removing the cover must be one (1) second. Enclosure and tamper switch must prevent direct line of sight to any internal components and prevent switch or circuit tampering. Tamper switches must be inaccessible until the switch is activated; conceal mounting hardware so that location of the switch cannot be observed from the exterior of the enclosure; be under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating; must be spring-loaded and held in the closed position by the door or cover protected; and must be wired to break the circuit when the door or cover is disturbed. Tamper switches on doors which must be opened to make normal maintenance adjustments to the system and to service the power supplies must be of the push/pull set, automatic reset type. Tamper alarms must be annunciated to be clearly distinguishable from intrusion detection alarms.
- D. Fail-Safe Alarms: Provide a fail-safe capability in all critical elements of the system. Fail-safe is defined as the capability to monitor for proper system functions and to report an alarm when a failure is detected in any critical system function. This must include, but not be limited to, the capability to monitor communication link integrity and to provide self-test. When diminished functional capabilities are detected, the system must provide annunciation of the fault. Fail-safe alarms must be annunciated to clearly distinguish them from other types of alarms.
- E. Fail-Safe Locking: All locking must be fail-safe to the extent that such locking is permitted. Fail-safe locking must be understood to mean that upon failure, locks must fail in the "unlocked" and "unsecured" position. All locking must be interconnected into the building's fire alarm system and, upon activation of the fire alarm system, must immediately "unlock" to permit emergency egress from the building. Coordinate all interface requirements with the fire alarm system and furnish and install the necessary

interface relays and interconnecting wiring, conduits, and mounting hardware, etc. to affect this operation.

- F. Line Fault: As a minimum, fault isolation at the systems level must have the same geographic resolution as provided for intrusion detection. The communication links of the security system must have an active mode for line fault detection. Active mode is defined as that in which some type of signal is continuously sent across the link, resulting in simple link breaks being readily detected. The system must be either a static system or a dynamic system. In a static system, the "no-alarm" condition must always be represented by the same signal, which must be different than the signal originally transmitted. The dynamic system must represent "no-alarm" with a signal which continually changes with time.
- G. Power Loss: Provide the capability to detect when any critical component of the system experiences loss of primary power and/or is switched over to either emergency power or uninterruptible power and to declare an alarm. The alarm must clearly annunciate the identity of the component experiencing the power loss.

3.5 GROUNDING AND BONDING

- A. Comply with requirements in Section 26 056 16 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.
- C. All cabling used to bond grounds are to be tagged with labels with the point of origin i.e. going to/coming from, with printed labels.

3.6 PATHWAYS INSTALLATION FOR SECURITY SYSTEMS

- A. Comply with NECA 1.
- B. Comply with requirements in Section 26 05 33 "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- C. All conduits must be electrical metallic tubing (EMT), except where otherwise noted. Exceptions must be requested in writing as appropriate, such as for different conduit types for various classes of construction, such as for cast-in-place concrete, and placement in cable ducts. Minimum size of conduit must be three quarter (3/4) inch. Connections must be threadless type fittings or couplings. Fastenings and supports for conduit must be in accordance with the national and local codes.
- D. Submit conduit and wire layout drawings showing circuit numbers, wiring and conduit routings for approval by the Commissioner prior to the initiation of Work. Shop drawings of the security systems conduit routing must be coordinated by Security Contractor with fire wall construction, mechanical duct work, structural components, fire protection, and plumbing.
- E. Install manufactured conduit sweeps and long-radius elbows whenever possible.

- F. Care must be taken to ensure that access to other building components (e.g., air conditioning ducts) is not restricted by cable pathways.
- G. Cable management and support hardware must be UL listed for use in the environments in which they must be employed.
- H. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
- I. Secure conduits to backboard when entering room from overhead.
- J. Extend conduits 3 inches above finished floor.
- K. Provide metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- L. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- M. Pathways must be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. Changes in direction of runs must be made with symmetrical bends or cast metal fittings.
- N. All conduits must be affixed or supported at intervals and using prescribed methods and devices in accordance with governing codes. No run of conduit between outlets or fittings must contain more than four quarter bends (360 degrees). Bends must be made such that the conduit must not be injured, and that the interval diameter must be effectively reduced.
- O. All conduit connections must be tight so as not to create intermittent loss of ground protection. All cut ends entering fittings must be reamed smooth or have a bushing inserted to prevent damage to wire insulation.
- P. Conduit, raceways, and other pathways must be kept at least six inches from uninsulated flues, steam pipes or any pipe containing a hot gas or liquid. So far as practical, avoid traps and dips in conduit runs, which might collect moisture.
- Q. Strict attention must be given to all conduits containing fiber optic cabling to ensure that manufacturer's recommended conduit bend radii limitations/restrictions are followed.
- R. Where conduits connect to sheet steel enclosures, they must be fastened with two (2) locknuts where insulating bushings are used. Bushings must be installed on ends of all conduits where they terminate in pull boxes, outlet boxes, cabinets, etc. and must be of the insulating type and must be securely fastened with locknuts on each side. Crushed or deformed conduits must not be installed. Bushings must not be used as locknuts. Open ends must be sealed around security conductors to be liquid tight using an approved air-drying sealer after capping ends with insulated bushings.

- S. Conduits crossing expansion joints in concrete slabs must be provided with suitable expansion fittings, or other suitable means, to compensate for building expansion and contraction. Conduits traversing hazardous areas must use the penetrations and fittings shown on the drawings and provided under other sections of the contract. Seal the fittings after verifying the integrity of the contained conductors.
- T. Pathways must not block ceiling or equipment access doors. Where conduit or raceway is passed through walls, floors, ceilings or roofs, annular space must be sealed or patched. Openings in firewalls and all corridor walls must be sealed with mineral wool or an approved silicone sealant.
- U. No pathways must be fastened to other pipe or conduit or installed to prevent the ready removal of other pipe or conduit for repairs.
- V. Conduit, panels, devices, and boxes must be secured by means of shields in concrete, machine screws on metal surfaces and wood screws on wood construction material. Threaded studs driven in masonry power charge and provided with either lock-washers and nuts or nail type nylon anchors are not acceptable in lieu of machine screws. Wood plugs must not be used as expansion shields. Unless conditions or Drawings dictate otherwise, panels must be located between 3'-6" and 6'-0" above floor level.

3.7 SLEEVES INSTALLATION FOR SECURITY SYSTEMS

- A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- D. Cut sleeves to length for mounting flush with both surfaces of walls.
- E. Extend sleeves installed in floors 50 mm above finished floor level.
- F. Size pipe sleeves to provide 6.4-mm annular clear space between sleeve and pathway or cable, unless indicated otherwise.
- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

- I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials.
- J. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 25-mm annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- L. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 25-mm annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.8 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly.

3.9 CABLE/WIRES INSTALLATION

- A. Cable/wire runs, and conduit must be installed in accordance with applicable electrical Work standards, national and local codes as well as manufacturers' specifications of installed equipment.
- B. All ESS conductors must be separated from 120V primary power lines. ESS conductors must not share any conduit in which primary power conductors are run. Junction and receptacle boxes carrying 120V, or higher voltage, must not in any way be attached to or carry security systems conductors.
- C. Conductors must be copper and must not have a diameter less than eighteen (18) AWG unless otherwise indicated, except for vendor-provided leads and internal equipment wiring. If required, modify equipment wiring fittings which must not accept eighteen (18) AWG minimum conductors. Conductors for intercom systems and for multiplexer data communications must be a minimum of twenty-two (22) AWG. Other exceptions may be granted for use of smaller gauge conductors upon approval by the Commissioners.
- D. Conductors interconnected to equipment subject to movement must be stranded or must be of a type manufactured specifically for such interconnections.
- E. Wire fill, conductors, and conduit must be sized in compliance with the National Electrical Code. The number of conductors required may vary on the basis of the manufacturers of the selected equipment. Conduit fill must not exceed 40%.
- F. In the event that ESS conductors must share conduit with other low voltage conductors, prior approval is required. All system conductors must be run concealed wherever practical and must be placed in conduit.

- G. All conductors must be run continuously between sensors, processors, junction boxes, terminal strips or panels, and other approved devices. Splices between such locations are not to be permitted. Necessary junctions must be made using screw-type terminal blocks, or in accordance with manufacturer's requirements for equipment connections.
- H. Line supervision requirements must be observed.
- I. All conductors must be color coded and tagged consistently. Transposing or changing color coding of conductors must not be permitted. Conductor identification must be provided within each enclosure where a tap, splice or termination is made, and at the equipment terminal of each conductor. Terminal and conductor identification must match that shown on approved shop drawings. Hand lettering or marking is not acceptable. Marking must be an approved permanent type utilizing an approved method. Tagging devices must be approved and must be permanent, not subject to inadvertent separation. All conductors at control consoles must be bundled, neatly fanned out, and tagged. Cables and wires must be tagged to clearly indicate their electrical characteristics, circuit number and panel designation. Tagging must be such that several conductors may be disconnected and reconnected without the use of drawings.
- J. If required by manufacturers' specifications, shielding requirements must be observed.
- K. Only approved pulling compounds must be used. Pull strengths must not exceed standards established by the National Electrical Code.
- L. Submit conduit and wire layout drawings showing circuit numbers, wiring and conduit routings for approval by the Commissioner. Shop drawings of the security systems conduit routing must be coordinated by Security Contractor with fire wall construction, mechanical duct work, structural components, fire protection, and plumbing.

3.10 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.11 IDENTIFICATION FOR SECURITY SYSTEMS

- A. Identify ALL system components, wiring, and cabling complying with TIA/EIA-606-A.
- B. Paint and label colors for equipment identification must comply with TIA/EIA-606-A for Class 3 level of administration including optional identification requirements of this standard.

- C. All permanent labels must be durable and legible and suited for long term use in the environments in which they are located. Labels must be preprinted or computer-printed type. Handwritten labels are unacceptable.
- D. Label all equipment, enclosures, cables, terminations, and any other components using unique identifiers.
- E. Labeling scheme for all communications systems is subject to prior approval by Cornell University.

3.12 CLEAN, SQUARE INSTALLATION

- A. All equipment must be clean and free of paint and other defacing materials. All installations must be square and plumb. Take care that other trades do not deface equipment and do not move equipment out of square and plumb.

3.13 ELECTRICAL POWER

A. High Voltage Power:

1. The Electrical Contractor must furnish and install wiring, conductors, conduit, and termination for the supply of power to security system components. Except for the interconnection into the door hardware furnished devices, it must be the responsibility of the Security Contractor to furnish and install all low-voltage conductors and to make all final connections of same. The Security Contractor must provide the Electrical Contractor with complete information regarding high voltage power requirements.

B. Low Voltage Power:

1. Low voltage power must be provided using two-winding isolation-type transformers and rectifier circuits and must supply DC voltages, where and as required. Voltage levels must be as rated for the various systems' operational requirements. All low voltage power supplies must be fully regulated, float type, with battery back-up, capable of supporting the operation of all equipment for a minimum of four hours. Low voltage power supplies must be required to provide central lock power, camera power, advanced processor controller power and sensor devices power.

C. Batteries:

1. Provide backup power by dedicated batteries in remotely located system elements such as remote access control panel units. Batteries must be sized to provide continuous stand-by operation for a minimum of four (4) hours without recharge or replacement.

3.14 TESTING

- A. General: Verify that all requirements of this specification are met. Verification must be through a combination of analyses, inspections, demonstrations, and tests, as described below.

- B. **Verification by Inspection:** Verification by inspection includes examination of an item and the comparison of pertinent characteristics against the qualitative or quantitative standard set forth in the cited paragraph. Inspection may require moving or partially disassembling the item to accomplish the verification. Inspection must be made of all equipment installations, proper functioning of all locking hardware and lock controls, mounting and wiring of electrical and signal distribution cabinets and components, and mounting and placement of sensors, VSS cameras, etc. to ensure compliance to the specifications and that the overall installation is accomplished in a professional and workmanlike manner. The Commissioner must have full opportunity to witness the required Security Contractor inspections or to conduct their own inspections of the installation.
- C. **Verification by Test and Demonstration:** Verify by formal demonstrations or tests that the requirements of this Specification have been met.
- D. **Test Verification Requirements:** Paragraphs 1-3 below list specific requirements which must be verified by formal demonstration/test. The Commissioner must be afforded a fourteen (14) day advance notice of all subsystem demonstrations/tests. The Commissioner reserves the right to witness any and/or all the tests described below.
1. **Preliminary Tests:** Following installation, individually test each sensor and other components and verify the proper functioning of each component within a subsystem. Each subsystem must be similarly tested until all detection zones, alarm assessment components, alarm reporting and display, and access control functions have been verified. Any deficiency pertaining to these requirements must be corrected by the Security Contractor prior to final functional and operational tests of the system. When subsystem verification is complete, the entire system must be tested to assure that all elements are compatible and function properly as a complete system.
 2. **System Operation Test:** Following completion of the preliminary tests and the security system and component formal demonstrations, the Security Contractor must conduct a formal test, to be known as the "System Operation Test", in which all components and subsystems of the security system are demonstrated to operate together as an integrated system. The Security Contractor must demonstrate that the security system components and subsystems meet specification requirements in the "as-installed" operating environment during the "System Operation Test". While no formal environmental testing is required, the Security Contractor must measure and record temperature, humidity, and other environmental parameters, and must include this data in the test report to document the environmental parameters and the environment conditions which were encountered during the "System Operation Test".
 3. **Tests Upon Completion of Work:** Upon completion of the Work, the system must be subjected to complete functional and operational tests. When all required corrections have been accomplished, the system must be retested. The Commissioner must be notified in writing fourteen days in advance of the proposed final acceptance testing and inspection date. The advance notice must include certification that the installation is complete and operable and has satisfactorily performed the final tests specified herein. The final inspection must be done in the presence of the Commissioner. Prior to the test date, prepare and submit for approval a complete and detailed final acceptance test check off list

("punch list"). The list must be a complete representation of all specified functions and conditions, including contingency, priority, and abnormal modes of operation. The arrangement of the list must be such as to provide an orderly method of tabulating checks of system features, response and operation. The tests must be structured so that all sensors and controls are stimulated directly in their installed and finally adjusted positions and all audible and visual displays, signals, alarms and other responses are observed and printed. At the time of final acceptance testing all required tests must be repeated and all defects corrected until the system is found to be acceptable to the Commissioner. A log of all test activities and results must be maintained by the Security Contractor. Typed copies of this log must be submitted within seven days of the testing. Final tests must include, but not limited to the following:

- a. Test of all central CPU's, peripherals, and all panel control functions.
- b. Test all graphic control and annunciation panel functions and displays.
- c. Test electrical supervision of all input/output sensor and data communication bus circuits.
- d. Test of all alarm initiating devices.
- e. Test of remote battery and battery chargers.
- f. Test of the UPS system including a battery discharge test
- g. Test of access control system to include tie-in to fire alarm system.
- h. Complete operation tests under emergency power.
- i. Test of fiber optics signal transmission system.
- j. Visual inspection of all wiring.
- k. Verification that all required submittals have been provided and have been accepted.
- l. Demonstrate software and programming/reprogramming functions of all micro-processor systems.
- m. Verification of systems response time.
- n. Carefully plan and coordinate the final acceptance tests so that all tests can be satisfactorily completed during one continuous testing period. Provide all necessary instruments, labor and materials required for tests, the equipment manufacturer's technical representative, and qualified technicians in sufficient numbers to perform the tests within the time limits imposed by this Specification.
- o. Although successful completion of the final acceptance test has been completed, the security system must not be considered accepted until it is determined that the complete security system is continuously trouble-free and operational, in a manner satisfactory to The City of New York, for at least a seven-day period following final acceptance testing. A print-out of the system's activity log can be accepted as proof of compliance with this requirement. In the event that the system fails this operational test, make the necessary adjustments and the seven-day period must restart from the beginning. If the system fails to complete this operational test for four (4) consecutive seven-day restarted test periods, the system must be considered inoperable and unacceptable. Make all necessary repairs, adjustments, and/or replacements, at his cost. When all adjustments have been completed and after proper notice has been given, the complete acceptance test must be re-performed and witnessed from the beginning. The Security Contractor must be liable for all expenses for witnessing the

retest as specified above. Repeated unsatisfactory operation and chronic system failures must be considered cause for the complete system removal and replacement by The City of New York. In this event, the Security Contractor must be liable for all expenses and damages incurred, including legal fees and court costs.

4. Reliability/Maintainability Data: Record hours of component, subsystem, and system operation, together with failure and repair data. This information must be incorporated into the System Test Report to be submitted.

3.15 OPERATING INSTRUCTIONS

- A. Prior to completion of the work, provide field operating instructions with respect to operation functions and maintenance procedures for the equipment and systems installed. Prepare six (6) copies of maintenance and operating instruction manuals prior to application for final payment. Organize operating and maintenance data into suitable sets of manageable size.
- B. All equipment provided under this Section must be placed in operation and must function continuously in an operation test for a period of one week, without shut down due to mechanical failure.
- C. Prior to scheduling the project final inspection and after completion of the entire installation period, provide all work required to adjust all controls, and all maintenance to place the systems in operation to meet the requirements of this Section and Contract Documents.
- D. Provide operating, service, maintenance instruction manuals containing replacement data for the equipment which must require operating, maintenance or replacement and one copy of this literature must be available during the instruction of the operating personnel while the others are checked for completeness.
- E. Sufficient advance notice must be given to The City of New York's designated operating personnel for the specific instruction period. Upon completion of instruction, obtain from the representative(s) written verification that the above-mentioned instruction has been performed. Such verification must be forwarded to The City of New York.
- F. Each copy of the approved operating and maintenance manual must contain copies of approved shop drawings, equipment literature, cuts, bulletins performance charts, pump curves, details, equipment and data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed and bound in a hard back three ring binder. Fly sheets must be placed before instructions covering each section. The instruction sheets must be in 8 1/2 inches by 11 inches with large sheets of drawings folded in neatly. Each manual must have the following minimum contents:
 1. Table of Contents
 2. Maintenance
 - a. Maintenance and Lubricating Instructions
 - b. Replacement Charts
 - c. Preventive Maintenance Recommendations

- d. Trouble-shooting Charts for Equipment Components
 - e. Testing Instructions for each Typical Component
 - f. System Draining and Filling Instructions
 - g. Two typed sets of charts indicating equipment tag number, location of equipment, specific equipment service, greasing and lubricating requirements as recommended, lubricant type and intervals of lubrication.
 - h. Two types of instructions for ordering spare parts. Each set must include name, telephone number and address of where they may be obtained.
3. Manufacturer's Literature
- a. The equipment for which shop drawings have been submitted and approved.
 - b. Wiring Diagrams
 - c. Installation Drawings
 - d. Manufacturer's Representative and Contract Information
 - e. Guarantees

END OF SECTION

SECTION 281000

ELECTRONIC ACCESS CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes the components that shall comprise the Access Control and Intrusion Detection portions of the unified Access Control and Alarm Monitoring System (ACAMS), and the practices to be used when installing these components. All information herein is intended to present minimum standards of performance, quality and construction.
- B. The systems shall include any/all, signage, communications devices, access control panels, intrusion detection panels, I/O boards, card readers, request-to-exit devices, intrusion detection sensors, power supplies, and any conduit, raceways, wiring, cabinets, enclosures, mounting hardware, and/or all other devices required for a complete and fully functional system, whether specified herein or not.
- C. Section Includes:
 - a. Access Control and Alarm Monitoring
 - a. Control Panels
 - b. Credential Readers
 - c. ACAMS Field Devices
 - d. Intrusion Detection Panels, Glass Breaks and Keypads
 - b. ACAMS Cabling and Power Supplies
 - c. Integration with the Video Surveillance System (VSS)
 - d. Coordination with:
 - a. Division 8, Door Hardware Contractor
 - b. Fire Alarm Contractor
 - c. Elevator Contractor
 - d. Any other Trades

1.2 RELATED DOCUMENTS

- A. Division 00 "Procurement & Contracting Requirements Group"
- B. Division 01 "General Requirements"
- C. Division 07 Section "Fire and Smoke Protection"
- D. Division 26 Section "Cable Trays for Electrical Systems"
- E. Division 26 Section "Identification for Electrical Systems"
- F. Division 26 Section "Grounding and Bonding for Electrical Systems"
- G. Division 26 Section "Hangers and Supports for Electrical Systems"
- H. Division 26 Section "Vibration and Seismic Controls for Electrical Systems"
- I. Division 26 Section "Overcurrent Protective Device Coordination Study"

- J. Division 27 Section “Communications Backbone Cabling”
- K. Division 27 Section “Communications Equipment Room Fittings”
- L. Division 28 Section “Common Work Results for Electronic Safety and Security”
- M. Division 28 Section “Electronic Surveillance”

1.3 ABBREVIATIONS AND DEFINITIONS

- A. Refer to Division 28 Section “Common Work Results for Electronic Safety and Security”

1.4 STANDARDS AND CODES

- A. Refer to Division 28 Section “Common Work Results for Electronic Safety and Security”

1.5 SUBMITTALS

- A. Refer to Division 28 Section “Common Work Results for Electronic Safety and Security”

1.6 SUBSTITUTIONS, DEVIATIONS AND CHANGES

- A. Refer to Division 28 Section “Common Work Results for Electronic Safety and Security”

1.7 TRAINING

- A. Refer to Division 28 Section “Common Work Results for Electronic Safety and Security”

1.8 QUALITY ASSURANCE

- A. Refer to Division 28 Section “Common Work Results for Electronic Safety and Security”

1.9 PROJECT CONDITIONS

- A. Refer to Division 28 Section “Common Work Results for Electronic Safety and Security”

1.10 COORDINATION

- A. Refer to Division 28 Section “Common Work Results for Electronic Safety and Security”

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Access Control
 - a. RS2 Technologies
- B. Intrusion Detection
 - a. BOSCH

2.2 SYSTEM DESCRIPTION

- A. The ACAMS system is existing.
- B. The ACAMS should utilize dedicated cabling for communication between Access Control Panels (ACP) and the security devices. The ACPs shall be rack mounted in the SER's on every floor and shall have on-board storage that will allow them to operate on a continuous basis even if there is a network failure.
- C. Access control decisions may be made locally at the access control panel in the event of loss of communication. Upon the network connectivity being restored, the stored alarms in the control panel will then be transmitted to the ACAMS server for storage and report writing.
- D. The Access Control Panels shall be rack mounted in the designated location in each SER.
- E. The ACAMS shall utilize a structured cabling system (SCS) for communication between the ACPs and the server/workstations.
- F. The network switch shall be PoE complaint and provide IEEE 802.11af power. The network switch will be provided by the Owner.
- G. The Security Contractor shall be responsible for the installation of the CAT 6A cabling required at all the locations. CAT 6A Patch cords shall be used to connect the Rack Mounted ACPs with rack mounted network switches located within the same SER.
- H. The Security Contractor is responsible for the coordination of the installation of the door/frame security package with the Division 8 contractor, and the coordination of Door Hardware Section of the project specifications, for the doors that require security.
- I. The Security Contractor shall generate a spreadsheet as part of their submittals, identifying all the doors to receive electronic security devices and validate that the Division 8 Contractor, door hardware submittal matches the required security functions. Should a conflict in function be identified, the security contractor shall alert the Architect. The Security Contractor shall be responsible for ensuring that the door hardware contractors is aware of all the required security functions of the doors requiring security.
- J. Electronic locksets, Power Transfer Hinges, Door Contact, Balanced Magnetic Switches, and other locking hardware for the new doors will be provided by the Door Hardware Contractor.

- K. The Security Contractor shall coordinate the installation and connection of the Fire Alarm Relay to the Software House system, for the control of the electric locks by Fire Alarm system provided by the Electrical Contractor.
- L. The Security Contractor shall coordinate their installation with all other trades and provide final termination of all cables and conductors.
- M. The Security Contractor shall consult with the Owner to determine the Owner's requirements prior to programming and initialization. The Security Contractor shall transfer and/or enter all data into the Ccure system, including, alarm point database, time zone database, employee cardholder database, reports configuration, device database, I/O database, guard tours, and any other required set-up.
- N. The Security Contractor shall coordinate all the security requirements of this Section with all other trades.

2.3 FUNCTIONAL REQUIREMENTS

- A. The system shall manage the entrance and exit of people through secure areas. In addition to the access control the system shall monitor specific alarm points as well as monitor and record multiple cameras.
- B. To control operational security portals, the contractor shall provide Card Readers, Door Contacts, Balanced Magnetic Switches, electronic locking elements, Request-to-Exit sensors and Push Buttons, Access Control Panels, Power Supplies, Intrusion Detection Panels, Motion and Glass Break sensors, and audible/visual alarm devices, as described herein and on the contract drawings.
- C. The existing ACAMS has the following main functions:
 - a. Access Control
 - b. Alarm Monitoring
 - c. ID Badging
- D. The existing system's operating environment is a fully multi-tasking, multi-threading, Microsoft Windows Operating System. It has an integrated system utilizing a single industry standard database for data storage and manipulation.
- E. RS2/AccessIT Licensed Mercury Hardware:
 - a. The existing employs a standard Windows-based graphical user interface (GUI).
 - b. A mouse and keyboard shall be the primary operator interface with the system.
 - c. Operator screens utilize all standard Windows-style functions such as drop-down menus, context menus, radio buttons, and lists, as appropriate.
- F. The existing RS2 system allows the configuration of multiple alarm monitoring workstations, an administrative workstation and an integrated workstation (which shall include any combination of the above).
- G. The existing alarm monitoring workstation is to be able to connect to and monitor field hardware devices, such as card readers and ACP's. Administrative tasks such as defining access groups, time zones, generating reports, creating maps, etc. are provided at designated workstations licensed to do so.

- H. The existing system integrates with the other security systems provided for this facility: Video Surveillance, Intrusion Detection System, ID Badging, and Video Intercommunications System.
- I. Reports: the existing system provides configurable data reports for database configuration, historical activity (Journal) and audit tracking. Pre-defined reports are available for download and import into the system.

2.4 SYSTEM PARAMETERS

- A. The existing system is configured to support all card readers, cameras, and field devices, as shown in drawings and can expand and add all the new devices.

2.5 SYSTEM PERFORMANCE CRITERIA

- A. Within the context of the overall system performance previously described, the system components shall be designed to operate as described herein.
 - a. Modularity: The Security Contractor shall provide components designed for modular increase or decrease of system capability by installation or removal of plug-in modules. system components shall be designed to facilitate modular subassembly and part replacement.
 - b. Reliability: The Security Contactor shall provide only new, unused components free from flaws or imperfections, which are in current manufacturing production. Components shall be manufactured to meet all the requirements specified herein and shall be free from characteristics or defects which affect the appearance, or which might affect the serviceability or render the equipment unsuitable for the intended purpose. The workmanship shall be of superior quality. The MTBF for any sensor component shall not be less than five thousand (5000) hours. Provide components designed for continuous operation.
 - c. Maintainability: The components shall be capable of being maintained using commercially available standard tools and equipment. Components shall be so arranged and assembled that they are readily accessible to maintenance personnel without compromising the defeat resistance of the various security subsystems.
 - d. Availability: The Security Contractor shall provide products and services available within the project schedule established for the Contractor's Work. Delays due to a manufacturer's inability to deliver the required products and materials within the established schedule shall be regarded as a default in the Agreement between the Contractor and the Owner, subject to the terms and conditions within this Agreement governing default or terms of comparable intent.

2.6 SYSTEM SOFTWARE

- A. The existing system utilizes RS2 Technologies software.

2.7 ACCESS CONTROL PANEL

- B. General
 - a. The access control panel (ACP) shall be a self-contained, microprocessor-controlled field panel. The panel shall serve as the data collection and

communications interface between the Host and the various field devices such as card readers, alarm inputs and control outputs. The ACP shall operate as an elevator control device. The panel shall operate in host controlled, local decision or dial-up mode. Configuration information (i.e. card records, time commands, door/monitor point/control point configuration, etc.) shall be downloaded from the host computer. Local programming at the ACP or the use of EPROMs shall not be required.

- b. The ACP shall be able to communicate back with the database server through industry standard switches and routers and shall not have to be on the same subnet.
- c. The ACP is required to continue to function normally (stand-alone) if it loses communication with the system software. While in this off-line state, the ACP is required to make access granted/denied decisions and maintain a log of the events that have occurred. Events shall be stored in local memory, and then uploaded automatically to the system database after communication has been restored.
- d. Provide all components listed below.

C. Enclosure

- a. The ACP shall be housed in a locking cabinet, suitable for wall mounting or rack mounting. All cabinet locks shall be keyed alike. The cabinet shall be equipped with a tamper switch on the front door and on the back of the unit. Tamper alarms shall automatically report to the host computer when activated. The cabinet shall be suitably sized to allow installation of the panel, all expansion modules and associated field wiring. The cabinet door shall include illuminated diagnostic indicators, which shall indicate the status of the panel.
- b. The ACP shall operate in a temperature range of 0°-70° C. Temperature range for use with battery backup shall be 0° - 50°C.

D. Door Controllers

a. Processor and Memory

- a. The Network Door Controller's microprocessor shall be of enough speed and power to provide on-board AES 256-bit encryption without use of an external encryption device, while providing access decisions within 500 ms on a fully loaded system. The controller shall have at least 2GB of on-board memory for cardholder and event storage. There shall be at least 16GB of on-board FLASH memory that shall be used for boot code and operating system code, and for memory backup.
- b. The controller shall be able to locally store at least 500,000 card holders, using five cards/person and with 10 clearances/person, while also providing room for a transaction buffer of 10,000 alarms and events (minimum) in case communications to the host is lost.

b. Memory Retention and Real Time Clock Backup

- a. The Network Door Controller must include automatic means to back up the system memory, including card holder records, configuration information, and alarm/event information, to onboard non-volatile flash memory in the event of AC power loss or Battery Low alarm. During the power

interruption, the system's real time clock shall be backed up using a lithium coin cell battery such that the time is current when power is restored.

- c. Dual Ethernet Network Ports
 - a. The Network Door Controller shall have two on-board 10/100/1Gb Ethernet ports, using standard RJ-45 connectors. The network ports must support full duplex communications. The controller must provide visual LED indication of transmit and receive activity for the Ethernet communications port. Controllers that do not offer full duplex 1Gb connectivity will not be accepted
 - b. Secondary Communications, Using the dual network ports, the controller must support a primary network communications path and secondary communications path to the system server. Failover operation is described later in this document.
- d. Field I/O Wiring Modules (ACMs)
 - a. The Network Door Controller shall provide terminations for field wiring using modular ACM boards (Access Control Modules). Each module shall support up to 8 readers and 8 doors, and a Network Door Controller may utilize either one or two ACMs, for a total of 16 readers.
 - b. An eight-reader Network Door Controller shall be able to easily be upgraded in the field to a 16-reader controller, through the addition of a second ACM board.
- e. USB Communications
 - a. Communications from each ACM to the Network Door Controller's GCM (General Control Module) shall be made using a standard USB connection.
- f. Network Connectivity
 - a. The Ethernet Door Module shall have one Ethernet port, for TCP/IP communications to the Network Door Controller. The Ethernet port shall support GigE Ethernet compatibility, as well as 10/100bT Ethernet. Door modules that do not support GigE connectivity shall not be considered. Communications to the Network Door Controller shall be encrypted with AES 256-bit encryption. Filtered data for noise rejection to prevent false alarms.
- g. General Inputs for the Network Door Controller shall provide dedicated, normally closed inputs for:
 - a. Enclosure Tamper, in a wall-mount cabinet, the tamper input on the GCM shall be pre-wired to the enclosure door to report opening of the door as a tamper event. In a rack-mount enclosure system, each enclosure's tamper switch shall be pre-wired to either the GCM or ACM tamper input.
 - b. Power Fail, A dedicated input shall be provided for a power failure alarm. When using an external DC power supply to power the unit, this input shall be wired to the power supply's alarm output.
 - c. Low Battery, A dedicated input shall be provided for a low battery alarm. When using external DC power supply to power the unit, this input shall be wired power supply's low battery alarm output.

h. Input Module (IM)

- a. Twenty-four (24) Class A Supervised inputs shall be provided on each ACM module, providing three inputs per reader. All supervised inputs in the system shall be field-configurable to accept either 1K, 5K or 10K ohm terminating resistor networks which may be configured to accept Normally Open (NO) or Normally Closed (NC) switches or contacts. Each EOL resistor network shall be configured such that the circuit reports unique messages for a secure circuit, alarm condition, and an open or shorted input (supervision alarm). Each input must also be capable of reading a non-supervised circuit.
- b. Each two-wire input must be able to be configured individually for its supervisory circuit type.
- c. Each two-wire input must be terminated on its own connector and must not share a connector with another input.
- d. The Monitoring Application Interface shall provide the current status of the inputs and shall log changes in input status. Supervised inputs shall be able to be taken offline for diagnostic purposes and each input shall support being linked directly to an output or to a system event. All input activations shall be reported to the Monitoring Application and stored in the Historical Journal on the System Server.

i. Output Module (OM)

The Network Door Controller shall provide 16 separate outputs on each ACM module, configurable through on-board jumpers as either "wet-lock1" (power sourcing), "wet-lock2" (power sourcing) or as dry contact form C relays. The outputs shall be used to control door locks, local annunciators, and other output devices as required.

- a. Each output shall be individually protected with a PTC resettable fuse, transzorb and snubbers so that power can be directly provided to locking devices without damage to the controller.
- b. When sourcing power to the outputs, one or both lock power inputs may be used. Outputs shall be able to provide at least 0.75A at 12VDC or 24VDC.
- c. Eight of the output relays shall be socketed, designed to control lock circuits, and shall be rated for 5.0A, 30VAC/DC when used as a dry contact control relay.
- d. The other eight relays shall be non-socketed, designed to control local door annunciator devices, and shall be rated for at least 1.0A at 30 VAC/30 VDC when used as a dry contact control relay.
- e. The controller shall provide a LED for visual indication of each output's status.
- f. Each output must be terminated on its own connector and must not share a connector with another output.
- g. The Monitoring Application Interface shall provide the current status of each output and shall allow the manual activation of each output individually or in user-defined groups for diagnostic purposes. All output activations shall be reported to the Monitoring Application and stored in the Historical Journal on the System Server.

- h. Fire Alarm Interlock, each lock output shall be capable of being controlled directly from a fire alarm input on the ACM board, based on a local dip switch setting for each output. When the fire alarm input is activated, the lock output shall be controlled to the door open state, if its fire alarm dip switch was enabled for that lock. Fire alarm control shall be hard-wired and not dependent on any software or firmware function to operate. Fire alarm functionality shall be tested and listed per UL.

A separate fire alarm key switch latch input shall be provided. This input shall be used if manual intervention is required after a fire alarm before the locks are able to return to their normal (locked) condition. The ACM module shall have a key switch enable switch to enable this feature.

- E. Provide RS2/AccessIT Licensed Mercury Hardware MR50 / MR52 panels.

2.7 CREDENTIAL READERS

- A. Card readers shall be contactless type with a wall switch reader assembly consisting of a reader antenna and integrated keypad. The reader antenna shall have the capability to be mounted directly on any standard metal or plastic single gang electrical box or on a flat wall, and a remote electronics module (all readers shall be flush mounted, where applicable, with the gang box recessed within the wall). The unitized reader/keypad with a read antenna and necessary electronics for transmission of the card code to the system all contained in a single package.
- B. The reader shall operate within the temperature range of minus 30 degrees to plus 65 degrees centigrade with relative humidity of 95 percent non-condensing. Reader shall be designed to operate on low voltage AC or DC. An alarm signal shall be provided to indicate failure of any portion of this internal power supply equipment.
- C. A LED on the front surface of the reader shall indicate to the user that the card or tag presented to the reader has been read. An audio beep tone to indicate that the card has been read. Visual indication that a card has been decoded and deemed valid or invalid shall be provided at each reader location by green and red LED's respectively.
- D. Standard housings shall be available for the readers. The housing color shall be submitted to architect for approval. The reader housing shall be secured to the mounting plate with tamper resistant screws.
- E. The reader mounting types (wall or mullion mount), colors and finishes for each card reader location shall be coordinated and approved by Architect via submittals.
- F. Provide Multi-technology readers must be used and at a minimum must support 125KHz proximity and 13.56 MHz (iClass, MIFARE, DESFire)

2.8 FIELD DEVICES

- A. Request-to-Exit (REX) Motion Sensor
 - a. Provide passive infrared technology request-to-exit (REX) motion detectors, for the existing doors, as required.
 - b. All devices shall be specifically designed for request to exit applications. Devices specifically designed for other security related applications shall be unacceptable.

- c. All REX devices shall be interconnected such that they provide a direct input into the associated network controller. Designs where REX devices are directly interconnected with door monitoring switches shall be unacceptable.
 - d. REX devices installed at doors with electro-magnetic locks shall also be interconnected such that the second relay contact in the REX device is wired to interrupt power to the associated electro-magnetic lock whenever the REX device senses motion at the door.
 - e. Shall have adjustable beam to ensure that the coverage does not extend to the unsecure side of door and it is not triggered by people passing by.
 - f. Finishes and mounting details at each door location shall be coordinated with and approved by Architect.
 - g. Provide devices as specified by Cornell Public Safety.
- B. Request-to-Exit (REX) Pushbuttons
- a. Request-to-exit pushbuttons shall be located at locations shown on contract drawings.
 - b. All REX devices shall be interconnected such that they provide a direct input into the associated network controller. Designs where REX devices are directly interconnected with door monitoring switches shall be unacceptable. Each push-button provided shall include an adjustable pneumatic timer. The timer shall allow the door unlock time to be adjustable from 2 to 60 seconds. (Initial set point shall be 30 seconds).
 - c. Finishes and mounting details at each door location shall be coordinated with and approved Architect.
 - d. Provide devices as specified by Cornell Public Safety.
- C. Sounder
- a. Voltages: Regulated 12VDC and 24DC
 - b. Operating Voltage Limits: 8–17.5 and 16–33 Maximum
 - c. Operating Current: At 12VDC– 20.8mA; at 24V– 47.4mA
 - d. Temperature Range: –10°C to +60°C (14°F to 140°F) 0°C to 49°C (32°F to 120°F)
 - e. Sound Output: 74dBA minimum @ 10 feet – 12-volt application 80dBA minimum @ 10 feet – 24-volt application
 - f. System Sensor PA-400 or approved equal.
- D. Door Contact
- a. The contact contains a hermetically sealed magnetic reed switch. Switches shall be reed switches, epoxied and/or potted in the switch housing. Magnets shall be permanent Alnico type, finish to match door jam. Rare Earth Magnet shall be made of neodymium iron boron.
 - b. Contact shall be rated at 30 VDC (50 mA) for 1,000,000 cycles, minimum.
 - c. Housings shall be molded of flame-retardant ABS plastic. Magnetic contact switches shall be protected to deter sticking or freezing.
 - d. The gap distance for wood shall be 1" and steel up to ½".
 - e. The unit shall have a 1" diameter, with open or closed loop operation with an electrical configuration of Single Pole Single Throw (SPST).
 - f. Provide devices as specified by Cornell Public Safety.

2.9 LOCKING DEVICES

A. Electronic Strikes and Mortice Locks

- a. Provided under the Division 8, Door Hardware Specifications.

2.10 INTRUSION DETECTION DEVICES

A. Intrusion Detection Panel

- a. The DACS system is capable of being utilized as a combination Intrusion and Fire system per code. Fully integrated intrusion, access and fire functions allow users to interface with 1 system instead of 3.
- b. Integrated Telephone Line Interface with programmable options for signaling and supervision.
- c. Conettix IP based communication option to provide high-speed, secure alarm transport and control.
- d. 8 programmable areas with perimeter and interior partitioning.
- e. 8 on-board, class B hardwired points with expansion capability for a total of 75 wired or wireless points.
- f. Compatibility with touch-screen color LCD, vacuum fluorescent, ATM style LCD or LED style Alarm Command Centers
- g. Local or remote programming, test, and diagnostic capability via a computer running the Remote Programming Software (RPS).
- h. The system shall support the use of an Apple iOS device for control. Functions to include arming, disarming, control of outputs, lock, unlock, cycle and secure access doors.
- i. Integrated real time clock, calendar, test timer and programmable scheduling capability for relay control and automatic execution of system functions based on a time / event.
- j. Provide 1.4 amps of power for standby operation and 2 amps of alarm power, both rated at 12 VDC.
- k. 2 wet-contact relay outputs and 1 Auxiliary wet-contact relay output with expansion capability for up to an additional 64 dry-contact relay outputs.
- l. Integrated battery charger with reverse hook up protection, battery supervision and battery deep discharge protection.
- m. Supervision of peripheral devices and communications interface(s).
- n. Provide Bosch "G" series panel or approved equal.
- o. Provide Bosch D4020 Ethernet interface module or approved equal.
- p. Provide Bosch D1255 Keypad or approved equal.

B. Door Contact

- a. The contact contains a hermetically sealed magnetic reed switch. Switches shall be reed switches, epoxied and/or potted in the switch housing. Magnets shall be permanent Alnico type, finish to match door jam. Rare Earth Magnet shall be made of neodymium iron boron.
- b. Contact shall be rated at 30 VDC (50 mA) for 1,000,000 cycles, minimum.
- c. Housings shall be molded of flame-retardant ABS plastic. Magnetic contact switches shall be protected to deter sticking or freezing.
- d. The gap distance for wood shall be 1" and steel up to ½".

- e. The unit shall have a 1" diameter, with open or closed loop operation with an electrical configuration of double pole-double throw (DPDT).
- f. Provide devices as specified by Cornell Public Safety.

C. Motion Detectors

- a. Electrical Current (alarm/standby) 10 mA at 12 VDC Voltage (operating) 9 VDC to 15 VDC
- b. Environmental Pet Immunity 1 One or two pets up to 45 kg (100 lb) or numerous rodents
- c. Relative Humidity 0 to 95%, non-condensing For UL Listed product installations 0 to 85%,
- d. non-condensing Temperature (operating) G,
 - a. GE models: -20° C to +55° C (-4° F to +130° F)
 - b. HE models: +5° C to +40° C (+41° F to +104° F)
 - c. For UL Listed product installations, 0° C to +49° C (+32° F to +120° F)
- e. Mechanical Color white
- f. Dimensions 105 mm x 61 mm x 44 mm (4.2 in. x 2.4 in. x 1.7 in.)
- g. Material High-impact ABS plastic
- h. Radio Frequency Interference (RFI) Immunity No alarm or setup on critical frequencies in the range from 150 kHz to 2 GHz at field strengths less than 30 V/m.
- i. Outputs Relay Solid state, supervised, Form A normally closed (NC) contacts rated for ≤100 mA, 25 VDC, 2.5 W.
- j. Provide devices as specified by Cornell Public Safety.

D. Glass Break

- a. Electrical Current: 23 mA at 12 VDC
- b. Voltage: 6 VDC to 15 VDC
- c. Environmental Operating Temperature: -29° C to +49° C (-20° F to +120° F)
 - a. For UL Certificated installations, 0° C to +49° C (+32° F to +120° F)
- d. Radio Frequency Interference (RFI) Immunity: No alarm or setup on critical frequencies in the range from 26 MHz to 950 MHz at 50 V/m.
- e. Mechanical Dimensions (Hx Diameter): 2.1 cm x 8.6 cm (0.83 in. x 3.4 in.)
- f. Material: High-impact ABS plastic enclosure.
- g. Outputs Alarm: Form C reed relay rated 3.5 W, 125 mA at 28 VDC for resistive loads. Tamper: Normally closed (NC) cover-activated tamper switch with separate terminals.
- h. Provide devices as specified by Cornell Public Safety.

E. Duress Push Buttons

- a. Receiver Product Features Two-line text display shows condition of each transmitter, provides log of past events, and displays signal strength Outputs can be configured in follower, latching, momentary, or toggle modes independently Case tamper protection, jam detection and internal antennas for a secure wireless implementation.

- a. Weight: 9.9 oz (280 g)
 - b. Power requirement: 11 - 14 VDC; 400 mA
 - c. Output specifications:
 - a) Form C relay 1A @ 28 VDC, 0.5 A @ 30 VAC resistive load;
 - b) N/O receiver case tamper contact closure,
 - c) N/C receiver jam output indication
 - d. Input specifications: A low is less than .5 V; a high is greater than 2.5 V
 - e. Reset input: Contact closure, momentary low
 - f. Number of points/transmitters: 16
 - g. Number of alarm outputs: Five Form C relay outputs
 - h. Number of fault outputs: One Form C relay output
 - i. Operating environment: Temperature: 32°- 140° F
 - j. Humidity: Up to 90% (non-condensing)
 - k. Provide devices as specified by Cornell Public Safety.
- b. Single Button Transmitter
- a. Typical battery life: 3-5 years
 - b. Battery type (BAT 608): Panasonic CR2 or equivalent
 - c. Operating environment: 0 to 60° C, up to 90% relative humidity non-condensing
 - d. Dimensions: 76 x 41 x 18 mm
 - e. Weight: 61 g
 - f. Operating frequency: 868 MHz
 - g. Output power: 25 mW
 - h. Firmware revision: 90486, v 3.2

2.11 ENCLOSURES FOR ESS

- A. Refer to Division 28 Section “Common Work Results for Electronic Safety and Security”.
- B. Cabinet for ESS equipment installation in the Server Room will be provided by the Division 27 Contractor.

2.12 POWER SUPPLIES

- A. The access control and lock power supplies shall be UL Listed Fire and Access Control Power Supply (UL1481, UL294). It shall be Class 2 rated and NFPA 72 compliant.
- B. The lock power supply shall have a 120VAC, 60Hz input, 10 amps continuous supply current and be field selectable 12VDC or 24VDC. The unit shall contain eight individual power limited outputs. The unit shall have enough batteries as to operate either magnetic locks or electrified strikes for at least four (4) hours from the time of power failure to the lock power supply.
- C. The Access Control Panels and all devices connected shall be fully operational via a battery backup system. The backup system shall provide for four (4) hours of continuous operation without degradation of the system. The host shall be notified if the system goes to battery back-up.

- D. The power supply for the Access Control Panel shall be dedicated only for this panel and will be provided, at each ACP location, along with a separate lock power supply.
- E. The lock power supply shall provide power for each connected electric lock, request to exit motion detector, and sensors where applicable.
- F. The power supply will have a main fuse for the protection of primary side of the power supply. In addition, each of the outputs of the power supply will be fused.
- G. Each supply shall be sized such that its continuous power output rating is 200 percent of the connected load or a minimum of 100 VA whichever is greater.
- H. All power supplies shall be configured for direct hardwired connection to a 120 VAC circuit.
- I. All the power supplies shall be provided with a battery backup, with enough power to hold all the devices for a period of 4 hours.
- J. Provide devices as specified by Cornell Public Safety.

2.13 UNINTERRUPTIBLE POWER SUPPLIES

- A. Uninterruptible Power Supplies (UPS) for Security Servers and PoE Switches
 - a. Provide a rackmount in-line UPS in the MTR/MER for the ACAMS, Video Surveillance Server and the PoE switches supporting the security systems.
 - b. Provide a free-standing tower or rack mounted UPS in each TR/ER for the supporting the IP cameras served by the TR/ER.
 - c. Back-up power duration requirements: minimum 60 minutes.
 - d. Meet FCC Part 15 Class B Conducted and Radiated Emission levels
 - e. Equipped with 19" rail mounting kit for rack mounting.
 - f. Equipped with network management card for remote monitoring and unattended shutdown via the data network.
 - g. APC Smart UPS or approved equal.

2.14 CABLES

- A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security.

2.15 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Insulators shall electrically isolate bus bars from the wall, or other mounting surfaces, thereby controlling the current path.
- C. Provide required stainless-steel hardware to fasten the two-hole ground lugs to the bus bar.
- D. Ensure that dis-similar metals are treated to stop corrosions and to create a good connection.

2.16 LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION PRACTICES

- A. All materials shall be installed as per the manufacturer's instructions, unless noted otherwise.
- B. The Security Contractor shall comply with NECA 1.
- C. The Security Contractor shall bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- D. The Security Contractor shall comply with NECA 1, "Good Workmanship in Electrical Contracting."
- E. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".
- F. All equipment shall be installed according to manufacturers' instructions.

3.2 GENERAL

- A. The Security Contractor with the General Contractor will examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
- B. The Security Contractor will examine rough-in for LAN and control cable conduit systems to PCs, Controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.
- C. The Security Contractor shall proceed with installation only after unsatisfactory conditions have been corrected.
- D. The Security Contractor shall comply with EIA/TIA-606, "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings."
- E. The Security Contractor will obtain detailed Project planning forms from manufacturer of access-control system; develop custom forms to suit Project. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval.
- F. The Security Contractor will record the setup of ACP features and access requirements, for each new location.
- G. The Security Contractor will propose start and stop times for time zones and holidays and match up access levels for all new doors.

- H. The Security Contractor will set up groups, facility codes, linking, and list inputs and outputs for each Controller.
- I. The Security Contractor will assign action message names and compose messages.
- J. The Security Contractor will set up all new alarms, establish interlocks between the new alarms, and the intrusion detection devices.
- K. The Security Contractor will update the alarm graphic maps.
- L. The Security Contractor will develop and update the new user-defined fields.
- M. The Security Contractor will propose setups for guard tours and key control.
- N. The Security Contractor will complete system diagnostics and operation verification.
- O. The Security Contractor will prepare a specific plan for system testing, startup, and demonstration.
- P. The Security Contractor will develop an acceptance test concept and, on approval, develop the specific test for each set of devices.
- Q. The Security Contractor will develop cable and asset management system details, input data from construction documents. Include system schematics and Visio Technical Drawings.
- R. The Security Contractor will in meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

3.3 ELECTRICAL POWER

- A. The new AC power feeds to the additional ACP's and power supplies shall be installed in conduit separate from the data bus communication and low voltage control cables. The 120 VAC input power shall be furnished and installed by the Electrical Contractor. The Security Contractor shall be responsible for coordinating his requirements with the Electrical Contractor.
- B. The Security Contractor shall furnish and install, in accordance with the manufacturer's instructions, all interconnect wiring, and equipment necessary for the erection of a complete Access Control and Intrusion detection system as described herein and shown on the drawings. All wiring termination, except 120 VAC power inputs and the telecommunications cabling, shall be the responsibility of the Security Contractor.

3.4 TESTING AND SYSTEM ACCEPTANCE

- A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

3.5 DEMONSTRATION

- A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".
- B. The Security Contractor, if necessary, shall engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and

maintain security access system. Refer to Division 01 Section "Demonstration and Training"

- C. The Security Contractor will develop separate training modules for the following:
 - a. Computer system administration personnel to manage the databases and to update and maintain software.
 - b. Operators who prepare and input credentials to man the control station and workstations and to enroll personnel.
 - c. Security personnel.
 - d. Hardware maintenance personnel.
 - e. Corporate management.

END OF SECTION

SECTION 282000

ELECTRONIC SURVEILLANCE

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes the components that shall comprise the Video Surveillance System (VSS) and practices to be used when installing these components. All information herein is intended to present minimum standards of performance, quality, and construction.
- B. The system shall include all hardware and software, closed-circuit cameras, lenses, auto-iris, controls, power supplies, mounts, housings and any conduit, wiring, conductors, raceways, termination cabinet enclosures, mounting hardware, power supplies and any conduit, wiring, conductors, raceways, termination cabinet enclosures, mounting hardware, and all other devices required for a complete and fully functional system, whether specified herein or not.
- C. The system shall provide a video management solution that can simultaneously record and play back video, provide automatic alarm call-ups, and activate events from the software.
- D. Section Includes:
 - 1. Video Surveillance System
 - a. Network Video Recorder
 - b. Cameras
 - 2. Cabling and Power Supplies
 - a. Category 6A 4-UTP cables for IP cameras.
 - 3. Scope not included or specified elsewhere:
 - a. Local Area Network switches provided by Owner.

1.2 RELATED DOCUMENTS

- A. Division 00 "Procurement & Contracting Requirements Group"
- B. Division 01 "General Requirements"
- C. Division 07 Section "Fire and Smoke Protection"
- D. Division 08 Section "Door Hardware"
- E. Division 08 Section "Door Schedule"
- F. Division 26 Section "Cable Trays for Electrical Systems"
- G. Division 26 Section "Identification for Electrical Systems"
- H. Division 26 Section "Grounding and Bonding for Electrical Systems"
- I. Division 26 Section "Hangers and Supports for Electrical Systems"
- J. Division 26 Section "Vibration and Seismic Controls for Electrical Systems"

- K. Division 26 Section "Overcurrent Protective Device Coordination Study"
- L. Division 27 Section "Communications Backbone Cabling"
- M. Division 27 Section "Communications Station Cabling"
- N. Division 27 Section "Communications Equipment Room Fittings"
- O. Division 28 Section "Common Work Results for Electronic Safety and Security"
- P. Division 28 Section "Access Control and Intrusion Detection"

1.3 ABBREVIATIONS AND DEFINITIONS

- A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

1.4 STANDARDS AND CODES

- A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security"

1.5 SUBMITTALS

- A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security"

1.6 SUBSTITUTIONS, DEVIATIONS AND CHANGES

- A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security"

1.7 TRAINING

- A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security"

1.8 QUALITY ASSURANCE

- A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security"

1.9 PROJECT CONDITIONS

- A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security"

1.10 COORDINATION

- A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

PART 2 - PRODUCTS

2.1 VSS DESCRIPTION

- A. This specification outlines the requirements of the Video Surveillance System (VSS). All information herein is intended to present minimum standards of performance, quality, and construction.
- B. The Security Contractor shall provide and install network video recorders, cameras, and power supplies. In addition, the Electrical Contractor will provide any conduit, wiring, conductors, raceways, termination cabinet enclosures, mounting hardware, and all other devices as required for a complete and fully functional system, whether specified herein or not.
- C. The camera power, video and data shall run over the structured cabling system (SCS). The Security Contractor shall provide a point to point communications system from the camera location to the patch panel in the telecom room.
- D. The network switch shall be PoE complaint and provide IEEE 802.11af power to the fixed cameras. The network switch will be provided by the Owner.
- E. The Security Contractor is responsible to coordinate with the Telecommunications Contractor as to the locations for each camera. As the cameras will be IP, the video will be encoded locally at the camera. The camera shall utilize industry standard compression algorithms to reduce the video file size for compression across the data network.
- F. The Video Surveillance System (SMS) Server is located in the main data center and additional storage shall be installed, programed and configured by the Security Contractor.
- G. The Security Contractor will coordinate the installation of the Close Circuit Television (CCTV) System with all other trades and shall provide final termination and testing of all the CAT 6A cabling.
- H. The Security Contractor will coordinate all the requirements of this Section with all other trades.

2.2 VSS FUNCTIONAL REQUIREMENTS

- A. The VSS shall be capable of the following functions:
 - 1. All VSS camera views shall be approved by the Owner or Owner's representative before final acceptance testing.
 - 2. The VSS camera system power, video and data shall run over the structured cabling system (SCS), for communications and power.
 - 3. The SCS shall run from each device to the TR/ER rooms and terminate into a CAT 6A patch panel. The jack in the patch panel will cross connect into the network switch located within the TR/ER room. The Security Contractor will provide Category 6A 4-UTP patch cords for the TR/ER/DTE end and the camera end.
 - 4. The network switch shall be PoE complaint and provide IEEE 802.11af power to the cameras. The network switches will be provided by the Owner.
 - 5. The IP video streams shall be managed by the VSS server. The VSS server will serve as the virtual matrix switch for the routing of video to the various monitors.

6. The video server will provide the storage solution for the video files. The digital video shall be stored for a period of 30 days.

2.3 VSS PARAMENTERS

- A. The RS2 Technologies specified NVR's shall be expanded have a minimum capacity to meet the clients requirements of:
 1. Video compression (IP camera) H.264, MPEG-4, JPEG
 2. Resolution: CIF/2CIF/4CIF/720p
 3. Number of cameras as shown on drawings, expandable to 128
 4. Storage shall support event recording all video at 15 frames per second for 30 days

2.4 SYSTEM PERFORMANCE CRITERIA

- A. Within the context of the overall system performance previously described, the system components shall be designed to operate as described herein.
 1. Modularity: Provide components designed for modular increase or decrease of system capability by installation or removal of plug-in modules. System components shall be designed to facilitate modular subassembly and part replacement.
 2. Reliability: Provide only new, unused components free from flaws or imperfections, which are in current manufacturing production. Components shall be manufactured to meet all the requirements specified herein and shall be free from characteristics or defects which affect the appearance, or which might affect the serviceability or render the equipment unsuitable for the intended purpose. The workmanship shall be of superior quality. The MTBF for any sensor component shall not be less than five thousand (5000) hours. Provide components designed for continuous operation.
 3. Maintainability: The components shall be capable of being maintained using commercially available standard tools and equipment. Components shall be so arranged and assembled that they are readily accessible to maintenance personnel without compromising the defeat resistance of the various security subsystems.
 4. Availability: Provide products and services available within the project schedule established for the Security Contractor's Work. Delays due to a manufacturer's inability to deliver the required products and materials within the established schedule shall be regarded as a default in the Agreement between the Security Contractor and the Owner, subject to the terms and conditions within this Agreement governing default or terms of comparable intent.

2.5 NVR SYSTEM SOFTWARE

- A. Software Functionality
 1. Use the RS2 Technologies Software.
 2. Shall support JPEG, MPEG-4 and H.264 compression simultaneously.
 3. Simultaneously record, playback and display live video without affecting other functions.
 4. Shall be capable to record and store image rates between 7 to 30 fps.
 5. Shall include the ability to schedule the following based on the time of day:

- a. Start recording
 - b. Stop recording
 - c. Cause an alarm on motion detection in camera's field of view
6. Video event detection capabilities. Shall have the ability to use one, several or any non-conflicting combinations of functions on a per camera basis:
 7. Automatically freeze the live video of a camera with no video event in its field of view.
 - a. Stop recording camera images with no video event in it field of view.
 - b. Start recording images up to 3 minutes before video event is detected in the cameras field of view and continue recording for up to five minutes after the video event stopped in the cameras field of view.
 - c. Per camera video event detection masking
 - d. Change frame rate when video event is detected
 8. Shall have the ability record in the following resolutions at minimum 1280 x 800 pixels, alarm condition recording
 9. Shall support the simultaneous display of up to 64 video streams across all connected monitors.
 10. Shall provide the ability to view live and recorded video on the same camera within a single application layout.
 11. Shall provide a completely user-customizable 'Site View': enabling the organization of cameras, recorders, tours, salvos into user-defined, multi-level folders, like Windows Explorer-style file organization.
 12. Shall support the ability to have an Event Priority Window to display Camera Call-Up Actions associated with events in prioritization sequence based on license settings.
 13. Shall support a Bi-Directional interface to enable ability to easily integrate with other 3rd party systems over a serial or TCP/IP connection.
 14. Shall support database management tools which enable ability to setup rules to regulate the archival to provide enhanced support when using a Microsoft SQL Express database.
 - a. Each system workstation shall be capable to:
 - 1) View one or more camera images from different sources
 - 2) Query the history of each recorder and view images saved on disk
 - 3) View, modify, or delete programming parameters of a recorder
 - 4) Control the movement of all motion cameras directly with the workstation mouse (PTZ control)
 - 5) Export camera images to hard disk and video vault (capable of exporting multiple formats, password protected to protect chain of evidence)
 - b. The NVR system shall define the programming parameters for every camera connected. For each camera it shall be possible to:
 - 1) Assign a name
 - 2) Determine the type of camera
 - 3) Assign a representative icon for identification on a graphic screen
 - 4) Determine if the camera image can be visible on a video view
 - 5) Determine the type of recording
 - 6) Determine which events from the recorder should display an alarm message on the screen

- 7) Determine the number of pre-selections desired
 - 8) Determine the number of patterns desired
 - 9) Add comments to record in the video vault
- c. The NVR shall allow for the creation of an unlimited number of video views. For each video view it shall be possible to connect to 16 cameras from various sources.
 - d. The NVR shall be able to incorporate on the same view multiple cameras
 - e. The NVR shall be able to trigger, from one or more specific events, the start of a recording on a recorder with one or more cameras connected to it. The software shall allow for the creation of an unlimited number of video triggers. The software shall allow for the creation of an unlimited number of recording parameters. For each recording parameter it shall be possible to:
 - 1) Define a name
 - 2) Select the digital video recorder to which this recording parameter refers
 - 3) Select the camera to which this recording parameter refers
 - 4) Associate a pre-selection or size
 - 5) Determine the start recording trigger
 - 6) Determine the pre-alarm time
 - 7) Determine the total recording time
 - 8) Determine the stop recording trigger
 - f. The NVR shall allow the playback of all recordings stored on the hard drive of any of the digital video recorders. The operator shall be able to save the video into the video vault.
 - g. The NVR shall provide the operator access to the complete list of normal and abnormal events that required the activation of video recording. The sequence of images can be saved to a hard drive for subsequent consultation and shall be encrypted. The VMS shall allow the operator to access a complete list of alarm recordings in progress including origin of the alarm. The VMS shall be capable of displaying a list of exported videos.
- B. Provide RS2 Technologies video recording equipment to work with the existing RS2 Technologies existing system.

2.6 NETWORK VIDEO RECORDERS (NVR)

- A. Specification Description
 1. Camera Type: Axis
 2. Drive Single: 500 GB
 3. Network Interface: 4 x 1 GigE NICs
 4. RAID Controller: Yes
 5. Video Storage: 36 TB
 6. External Storage: iSCSI
 7. Power Supply: 400W, 100~240VAC
 8. Redundant Power Supply: Yes
 9. Max BTU: 1000
 10. Monitor Interface: 1 VGA, 1 DVI Max. Digital Monitors 1
 11. Video Recording Throughput: 300 Mbps
 12. Dimensions (W x H x D): 48.3 x 8.6 x 53 cm (19 x 3.38 x 21 in)
 13. Regulatory: FCC Part 15, Class A; CE: EN55022, Class A; CE: EN6100-3-2; 3-3; ICES-003/NMB-003, Class A; AS/NZS CISPR22, Class A Immunity CE:

2.7 IP CAMERAS

- A. Shall be fixed high-definition IP fixed dome color cameras with dynamic bandwidth management. Cameras shall be vandal resistant, indoor, and outdoor rated, as required at each location, powered by PoE.
- B. Fixed cameras shall have high resolution (min 4 MP indoor and min. 8 MP outdoor), three codecs (H.264, MPEG-4 and JPEG), dual-streaming capability and intelligent video motion detection. Cameras shall be capable of supporting video analytics.
- C. The cameras shall have multiple mounting options and it shall feature a local monitor output jack for on-site picture and positioning adjustments.
- D. Cameras shall be plenum-rated, ONVIF-compliant and provide a range of options including on-board motion detection, wide dynamic range, and exposure control.
- E. All cameras shall be low light, with light sensitivity of 0,3 lux color/ 0,.06 lux B/W.
- F. Cameras located outside, and areas near windows shall have IR illumination and wide dynamic range capable of handling a wide range of lighting conditions in a scene enabling objects in both bright and dark areas to be visible.
- G. The camera will incorporate a network video server to encode high-quality streaming video at low bit rates for transmission over an IP network, to minimize bandwidth and storage.
- H. Each IP camera shall have a Real Time Clock (RTC). Network Time Protocol (NTP) support shall be available to automatically synchronize the time on the device to the other components of the NTP server.
- I. All IP cameras shall support persistent connections to network video recorders (NVR). In the event of a temporary network or power loss the persistent connection must automatically be re-established with no manual intervention required.
- J. Shall be HD IP cameras with high-definition resolution and dynamic bandwidth management. Low light performance at 0.3 lux color and 0.06 lux B/W.
- K. Shall be intelligent cameras capable of detecting faces in a region of interest and dynamically increase image quality.
- L. Cameras shall be plenum-rated, ONVIF-compliant and provide a range of options including on-board motion detection, wide dynamic range, and exposure control.
- M. The camera shall be suitable for both flush and surface type mounting. It shall feature a local monitor output jack for on-site pictures and positioning adjustments.
- N. Network Requirements:
 - 1. Protocols: Telnet, RTP, HTTP, ARP, TCP, UDP, IP, ICMP, IGMPv2/v3, SNMP
 - 2. Ethernet: 10/100 Base-T, autosensing, half/full duplex, RJ45
 - 3. Overall unit delay:120 ms
 - 4. Power over Ethernet: IEEE 802.3af compliant
- O. Network Security

1. The IP Cameras shall incorporate onboard security to protect them from unauthorized access by supporting the following features:
 - a. All network ports not used for normal functionality will be blocked to prevent network hacking.
 - b. Support password protection to prevent unauthorized administration access.
 - c. A Firewall will be available on each Transmitter and Receiver to allow access to specified IP addresses only. SSL and other non-IP address specific security measures are deemed insufficient.

- P. Provide Axis cameras, models to be specified by Cornell Public Safety.

- Q. Administration
 1. Web page administration should be available for the configuration of all parameters on the device including:
 - a. Name and location
 - b. IP Address
 - c. Ethernet Interface speed
 2. It shall be possible to reset a unit back to Factory Default configuration without losing IP address information.
 3. Administration shall also be possible using the Console serial port.
 4. Diagnostics
 - a. System logging shall be possible to a remote IP address, the console port or the unit itself.
 - b. Dedicated web pages for diagnostic output shall be available including:
 - c. Current Media Connections (by IP address)
 - d. Local System Log
 - e. Registry Information (all settings)
 - f. Boot Log (including boot up self-test)
 - g. System Processes
 - h. Device Information
 - i. Interrupt Information
 - j. ASIC Information
 5. Network Statistics (full network statistics including dropped packets and collisions)
 6. An RS232 Transmitter console port for debug output and serial configuration shall be available.
 7. Telnet access for further diagnostics shall be provided and restricted to administrators with the administrator password who have an IP address specified on the Firewall.

- R. The Simple Network Management Protocol (SNMP) must be supported.

- S. Provide cameras, as shown on drawings:
 1. Final camera location shall be coordinated in the field at the time of installation based on the field of view approved by the Owner's Authorized Representative.
 2. Provide all required mounts and accessories.

Colors, finishes and specific mounting detail shall be coordinated with and approved by Owner Authorized Representative.

3. Provide indoor fixed and PTZ cameras and outdoor fixed and PTZ cameras.
 - a. Operational Video Compression MJPEG H.264.
 - b. Frame Rate H.264: 30ips 1920x1080 MJPEG: 30ips 1920x1080.
 - c. ONVIF-Compliant Yes.
 - d. Video Output 1.0 Vp-p, 75-ohm, composite, RCA service output.
 - e. Resolution: CIF, 4CIF, 720p, 1080P.
 - f. Light Sensitivity: 400 to 900 nm.
 - g. Day/Night: Color only Auto (true day/night).
 - h. IR Illumination Optional: Yes.
 - i. Motion Detection: Yes.
 - j. Face Detection: Yes.
 - k. Privacy Zones: Yes.
 - l. Alarms: Motion, Schedule, Ethernet loss.
 - m. Tamper Detection duplex, half-duplex Bi-directional duplex, half-duplex
 - n. Alarm I/O N/A 2/1 2/1.
 - o. Video Streams 2 simultaneous streams 2 simultaneous streams 2 simultaneous streams.
 - p. Minimum Illumination 0.1 lux at F1.2 color; 0.03 lux b/w and 0.00 lux in IR Illuminator mode Wide angle and telephoto 0.2 lux F1.8 color and 0.05 lux b/w
 - q. Wide Dynamic Range 70 dB.
 - r. IR Corrected Lens Options/ Field of View (FOV) 3-9 mm motorized auto focus; IR corrected Varifocal; IR corrected.
 - s. Network Interface Ethernet 10/100 Base-TX Ethernet 10/100 Base-TX.
 - t. Supported Protocols TCP/IP, DHCP, HTTP, ICMP, UPnP, ARP, DNS, DDNS, PPPoE, SMTP, FTP, RTSP.
4. Provide Cameras from:
 - a. Axis Model cameras, specific models to be identified by Cornell Public Safety.

2.8 CABLES

- A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

2.9 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Insulators shall electrically isolate bus bars from the wall, or other mounting surfaces, thereby controlling the current path.
- C. Provide required stainless-steel hardware to fasten the two-hole ground lugs to the bus bar.
- D. Dis-similar metals will be treated to prevent corrosion and to create a maximum bond.

2.10 LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION PRACTICES

- A. All materials shall be installed as per the manufacturers' instructions, unless noted otherwise.
- B. The Security Contractor shall comply with NECA 1.
- C. The Security Contractor shall bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- D. The Security Contractor shall comply with NECA 1, "Good Workmanship in Electrical Contracting."
- E. All equipment shall be installed according to the manufacturer's instructions.
- F. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

3.2 GENERAL

- A. The Security Contractor shall examine pathway elements intended for cables. They will check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
- B. The Security Contractor shall examine rough-in's for LAN and control cable conduit systems to cameras, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.
- C. The Security Contractor shall review rack elevations for the Security, Video and LAN switches in each TR/ER.
- D. Comply with EIA/TIA-606, "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings."
- E. The Security Contractor shall prepare a specific plan for video system start-up, testing, and demonstration.
- F. The Security Contractor shall develop an acceptance test concept and, on approval, develop specifics of the test sheets.
- G. The Security Contractor shall develop cable and asset management system details; input data from construction documents.
- H. The Security Contractor in meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

3.3 CABLING

- A. Wiring Method: The Security Contractor while installing wiring in conduit and raceway except within consoles, cabinets, desks, and counters. Also, except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method will be used. Use NRTL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal conduit, raceway, and cables except in unfinished spaces wherever possible.
- B. The Security Contractor shall install test and certify the LAN cables using techniques, practices, and methods that are consistent with Category 6A rating of components and that ensure Category 6A performance of completed and linked signal paths, end to end.
- C. The Security Contractor shall install the cables without damaging conductors, shield, or jacket.
- D. All Boxes and enclosures containing CCTV system components or cabling, and which are easily accessible to employees or to the public or have components or cable terminations, shall be provided with a lock and a tamper switch; the tamper switch will be connected to the security system.
- E. All Boxes above ceiling level in occupied areas of the building shall not be accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws and have a tamper switch (where required) installed and connected to the security system.
- F. All wiring where exposed shall be installed in conduit, minimum 3/4" or larger, in accordance with NFPA 70 and local codes.
- G. Comply with EIA/TIA-569, "Commercial Building Standard for Telecommunications Pathways and Spaces."
- H. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.
- I. RS-485 Cabling: Can be install at a maximum distance of 4000 feet if manufacturer's specifications are met.
- J. All Fiber optic cabling shall be in conduit and adhere to the telecommunications standards for installation, termination and testing.

3.4 ELECTRICAL POWER

- A. All AC power feeds to the system shall be installed by the Electrical Contractor, in conduit separate from the video and low voltage control cables. The 120 VAC input power shall be furnished and installed by the Electrical Contractor. The Security Contractor shall be responsible for coordinating all the power requirements for the CCTV system with the Electrical Contractor.
- B. The Security Contractor shall furnish and install, in accordance with the manufacturer's instructions, all interconnect wiring, and equipment necessary for the installation of a complete VSS system as described herein and shown on the drawings.
- C. All wiring termination, except 120 VAC power inputs shall be the responsibility of the Electrical Contractor, camera cabling shall be the responsibility of the

Telecommunications Contractor and above door finish hardware device inputs, shall be the responsibility of the Security Contractor.

3.5 TESTING AND SYSTEM ACCEPTANCE

- A. Refer to Division 28 Section "Common Work Results for Electronic Safety and Security".

END OF SECTION

SECTION 283102

ANALOG ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation of a fully operational analog addressable fire alarm system and related Work as described in the Contract Documents.
- B. Provide system as approved by local Fire Marshal and the Authority Having Jurisdiction (AHJ). System materials and installation shall be in accordance with the manufacturer's recommendations.

1.2 QUALITY ASSURANCE

- A. All methods of construction, details of workmanship that are not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated in their respective sections of the specifications. The equipment specified is based upon the acceptable manufacturers listed. Equipment types, device ratings, dimensions, etc. correspond to the nomenclature dictated by those manufacturers. All equipment shall be tested at the factory. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.
- B. Installation shall be in accordance with NFPA-70 (National Electrical Code), NFPA-72 (National Fire Alarm Code), AHJ, state codes, local codes, requirements of authority having jurisdiction and the contract documents. Installer shall be certified in the State of New York for fire alarm installation.
- C. Equipment shall be designed, manufactured, assembled, and tested in accordance with the latest revisions of applicable published UL, NFPA, ANSI, NEMA and IEEE Standards. All system equipment shall be compatible and of the same manufacturer.
- D. Each item of the fire alarm system shall be listed as a product of a single fire alarm system manufacturer and shall bear the UL Label.
- E. System installation shall be under the supervision of an accredited factory representative. Final connections to the FACP, annunciator panel and any other panels shall be by the factory representative.
- F. The system provider must:
 - 1. Provide equipment from a single manufacturer for which they maintain a contract, distributorship, are an agent, or other formal arrangement for which documentation can be produced showing authority to sell and service the equipment in this territory.

2. Demonstrate that they have successfully installed these systems, utilizing their standard products, for a period of five (5) years minimum.
3. Maintain a service organization to provide both normal and emergency service. Emergency service must be available 24 hours per day, 365 days per year and staff must be adequate to respond within 2 hours of an emergency call.
4. Have a service location not more than 50 miles from the project location.
5. Maintain adequate spare parts inventory to provide both normal and emergency service.
6. Employ service technicians who are trained in accordance with the systems manufacturer's recommendations.
7. Own and demonstrate proficiency in the use of the required test equipment, tools, etc. for the proper installation, set-up, testing and maintenance of the system. If requested, provide a listing of tools and/or equipment and where appropriate, certifications in the proper training and use of the tools and/or equipment
8. Provide all system programming to deliver a customized system to the Owner ready for use.
9. All system programming is to be completed to the satisfaction of the Owner. If after preliminary use of the system, and/or training, the increased understanding of the system's features and capabilities necessitates reprogramming to any extent, it is to be performed at no additional cost.
10. Provide a minimum of two system inspections/tests each year during the warranty period as described in NFPA 72. Needed and requested system programming changes shall be provided at these times.
11. Warranty period shall be as described elsewhere with two years being minimum. Provide a service contract for the Owner review for two years beyond the warranty period. Warranty shall include all parts, materials, labor, transportation, etc.
12. Any system being extended or connected to an existing system shall be tested for full functionality prior to beginning work. System shall be signed off by Owner/Engineer as fully functional prior to any new work.

1.3 SYSTEM DESCRIPTION

- A. The system shall constantly monitor all initiation devices and notification circuits for any abnormalities or alarm conditions. System shall sample/poll each addressable device no less than every 10 seconds.

- B. The system operation subsequent to the alarm activation by any initiating device (manual station, automatic detector, sensor, sprinkler flow switch, etc) shall be as follows:
1. All audible alarm notification appliances within corresponding building or designated area shall provide a common audible fire alarm signal until the System Reset Key or the Signal Silence Key is depressed.
 2. All visual alarm notification appliances shall flash continuously and synchronized until the system is reset or silenced.
 3. The offsite central monitoring station shall be notified automatically until the System Reset Key or the Signal Silence Key is depressed. The municipal box shall be activated notifying the fire department.
 4. Shutdown of the corresponding HVAC system equipment shall occur with a supervisory alarm until the system is reset. All fans over 2000 cfm shall be shut down.
 5. Activation of all programmed outputs assigned to the initiating device shall occur until the system is reset or the silence key is depressed.
 6. The alarm shall be displayed at the local Fire Alarm Control Panel (FACP) and the fire alarm annunciator panel. A printout shall be produced at the FACP.
 7. The system alarm LED shall flash on the control panel and the fire alarm annunciator panel until the alarm has been acknowledged/reset. Once acknowledged, this same LED shall latch on. A subsequent alarm received shall flash the system alarm LED on the control panel and annunciator. The LCD display shall show the new alarm information.
 8. A pulsing audible alarm tone shall occur within the local building control panel and, where applicable, the fire alarm annunciator panel until the event has been acknowledged.
 9. Alarms shall be entered into the system event log history.
- C. Any subsequent alarm shall follow the operation described above.
- D. The activation by any system smoke detector or sensor shall initiate an alarm verification operation whereby the panel will reset the activated detector and wait for a second alarm activation. If, within a preset time after resetting, a second alarm is reported from the same or any other smoke detector, the system shall process the alarm as described previously. If no second alarm occurs within the prescribed time, the system shall resume normal operation. The alarm verification shall operate only on smoke detector alarms. Other activated initiating devices shall be processed immediately. The alarm verification operation shall be selectable by device.
- E. A manual evacuation (drill) switch shall be provided to operate the alarm notification appliances without causing other control circuits to be activated. However, should an actual alarm occur, all alarm functions shall occur as described previously.

- F. The system shall have a password(s) to allow the operator to display all alarms, troubles, and supervisory service conditions log history including the time of each occurrence. This shall be able to be viewed from the front of the control panel, annunciator panel or from a computer connected to the FACP.
- G. The actuation of the " walk test" program at the control panel shall activate the "Walk Test" mode of the system which shall cause the following to occur:
 - 1. The remote central monitoring station connection shall be bypassed.
 - 2. Only audible and visual appliances shall be operated. Other alarm functions (elevator recall, HVAC shutdown, etc.) shall not be affected.
 - 3. Walk test shall be selectable by circuit or circuits.
 - 4. Actual alarms received during a "Walk Test" shall cause the control panel to go into alarm and override the walk test mode.
 - 5. The control panel shall show trouble conditions.
 - 6. The walk test activation of any initiation device shall cause the audible signals to activate for two seconds or a distinguishable audible.
 - 7. The panel shall automatically reset itself after signaling is complete.
 - 8. The control panel shall automatically return to normal condition if there is no activity on a walk test circuit for a period of 30 minutes.
- H. Any momentary opening of an initiating or notification appliance circuit wiring shall cause an audible signal to sound at the Fire Alarm Control Panel and, where applicable, the annunciator panel for four seconds indicating a trouble condition.
- I. Elevator Operation:
 - 1. Provide the following equipment as a minimum and as indicated on the drawings:
 - a. Smoke detection in the elevator equipment room.
 - b. Smoke detection at each elevator lobby.
 - c. Smoke detection in the elevator shaft if a smoke hatch.
 - d. Heat detection in the equipment room and shaft (high and low) if a sprinkler system is in the area. Detectors shall be within 2' of the individual sprinkler heads.

- e. Smoke detection devices located in elevator lobbies, elevator hoistways and elevator machine rooms shall be used for elevator recall. Hoistway and equipment room heat detection shall initiate power shut down prior to water flow. Operation shall be in accordance with ASME A17.1, Safety Code for Elevators and Escalators. Signals shall be provided to the elevator controls for main level lobby alarm, any lobby alarm, elevator equipment room alarm and elevator hoistway alarm as a minimum. Provide addressable control modules for the signals to the elevator controls.
- J. Alarm initiation of a detector associated with a smoke hatch or fire barrier shall initiate a system alarm. Also, provide connections between the auxiliary contacts on the detectors or addressable control module and the associated smoke hatches and fire barriers such that the smoke hatch or fire barriers will be operated upon its respective detector activation. Provide power supplies, wiring and accessories for fire alarm system and all supervisory functions required for proper smoke hatch [and fire barriers operation.
- K. Duct mounted smoke detectors associated with duct dampers shall have an addressable control module to operate the duct damper. In the event of an alarm initiation by the duct mounted smoke detector or the associated air handling unit/fan shut down the duct damper shall be closed. Control wiring shall be provided to shut the damper(s) when the associated air handling unit is not operational. Provide power supplies, wiring and accessories as needed for this operation.
- L. Provide wiring and equipment such that alarm initiation of a heat detector located in the elevator machine room and/or the elevator shaft shall provide suitable voltage from the fire alarm control panel to be applied to the shunt trip coil of the elevator's supply circuit breaker. Heat detectors used for this purpose shall be thermally coordinated with adjacent sprinkler heads to ensure that the heat detector is activated prior to sprinkler waterflow. No fire alarm devices except the heat detectors in the elevator machine rooms and shaft shall cause this. Also, alarm initiation of these heat detectors shall initiate the system alarm functions described above. Provide an addressable control module with a Form C contact at the elevator controllers, which shall be normally closed and shall open upon alarm initiation of any of these heat detectors; this contact shall be used to disconnect the battery-powered emergency return unit if so equipped with the use of a relay suitable for the emergency power circuit. Also, provide an auxiliary contact on the main line disconnect switch (four pole unit) and two (2) #12 in conduit to the elevator controller from this contact for the same purpose.
- M. Provide a minimum of two Form C contacts at the building's fire alarm control panel. This contact shall activate upon activation of any fire alarm initiating device.

1.4 SUPERVISION

- A. The system shall utilize independently supervised initiation device circuits. The alarm activation of any initiation device shall not prevent the subsequent alarm operation of any other initiation device.
- B. Notification appliance circuits shall be supervised to indicate an open or short circuit condition.

- C. The incoming power to the system shall be supervised so that any power failure must be audible and visually indicated at the control panel and the remote annunciator. A green "power on" LED shall be displayed continuously while incoming power is present. This shall be a trouble alarm.
- D. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the control panel and the remote annunciator. This shall be a trouble alarm.
- E. The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.

1.5 SUBMITTALS

- A. Provide a complete system submittal prior to ordering of equipment and installation including but not limited to:
 - 1. Complete equipment list, including quantities.
 - 2. Catalog descriptive literature for all equipment. This shall include a description of the unit, ratings, functions, capability, materials and compatibility with other components.
 - 3. Riser Wiring Diagram showing all equipment, devices, device addresses, connections, control connections, remote notification connection(s), wire quantities and sizes.
 - 4. Floor plan indicating equipment and device locations, addresses, power circuit information with power panel location, notification circuiting, initiation circuiting, control circuiting and any system applicable building characteristics (ceiling heights, structural members impeding detection, etc). Contact the Engineer for an electronic copy of the project floor plans. Engineer logo shall be included in final drawing.
 - 5. Typical Terminal Wiring Diagram for each type of device.
 - 6. Terminal wiring Diagram for all Fire Alarm equipment.
 - 7. Calculations including:
 - a. Battery sizing calculations indicating total number of power devices, load associated with each type device, backup period and recommended battery capacity (AH).
 - b. Voltage drop calculations with actual equipment loads used to derive battery back-up ampere-hour rating and individual circuit voltage drop (indicate the wire size to be used and the associated voltage drop with the allowed voltage drop) for each circuit.
 - 8. Complete console enclosure and equipment configuration.

9. Contractor shall submit copies of the installation firms license for approval and post a copy of license on the premises where the work is being performed.
 - a. Work involving installation of Fire Alarm system components shall be performed by firms currently licensed by the NYS department of State Division of Licensing Services. The supervising personnel shall be NICET level 2 certified.
 10. Test reports as called for.
 11. Copies of the firm alarm installation firm's current license. The contractor shall also post a copy of the license on the premises where work is being performed.
- B. If required by the Authority Having Jurisdiction (AHJ) provide a submission of all requested information for review and comment by the AHJ. All AHJ comments shall be incorporated and resubmitted until approved.
- C. Test reports at the completion of the project. Testing shall be of all system devices, equipment, circuits, features and functions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. The project fire alarm system shall comply with and be in accordance with the drawings and specifications. All system equipment and materials shall be of the same manufacturer unless otherwise indicated. System and component acceptable manufacturers include the following unless otherwise indicated:
1. Existing Fire Alarm Control Panel (FACP) is a Simplex panel. All associated fire alarm devices and wiring shall be compatible with the existing FACP.

2.2 FIRE ALARM SYSTEM

- A. The fire alarm system shall be comprised of the components specified as a minimum and also include components not indicated but required for a complete and operable system as described herein.
- B. The system and all its components shall be UL listed and in accordance with NFPA 72, local and state codes.
- C. The system shall have 25 % spare capacity. This shall include all individual notification circuits, initiation circuits, initiating modules, alarm modules, power supplies, batteries, central processing unit memory and printed circuit card space. System initiation device and control device capacity shall be a minimum of the indicated percentage over the shown quantity or 250 whichever is greater.
- D. Each initiating device shall have an individual address for system communication. The system addresses shall not exceed seven digits. Each address, initiation circuit, notification circuit and control point shall have an individual identification description.

2.3 FIRE ALARM CONTROL PANEL (FACP)

- A. Provide all required modifications and additions to the existing Simplex FACP to accommodate the work of this project.
- B. Any event initiated by the FACP due to an alarm input shall be retained in nonvolatile EPROM memory.
- C. The FACP shall be equipped with a minimum of 4 hours of battery standby. The FACP shall be equipped with battery charging circuits sufficient to recharge fully depleted batteries to within 70% of the maximum capacity within 12 hours. When the system is operating on the battery supply, a trouble condition shall be generated. When utility power is restored, the system shall revert back to 120 VAC supply without any operator intervention.
- D. Existing FACP: Simplex

2.4 REMOTE TRANSPONDER UNIT (RTU)

- A. Provide RTU as may be required. The RTU shall function as a subpanel to the FACP, and shall have all the initiation, notification, control, battery, display functions, etc. as the FACP. In the event of failure of the FACP the RTU shall continue to function as a standalone system. All remote notification shall be through the FACP. Provide power circuits to the RTU similar to the FACP. The spare capacity indicated for the FACP shall also be provided in the RTU's. All trouble and alarm conditions at the RTU shall be transmitted to the FACP for suitable operation.
- B. RTU's shall contain their own processors and memory and function independently of the FACP but utilize the same base programming. Programming functions in the RTU shall be accessible through the FACP and RTU.
- C. The RTU shall be capable of communication with addressable devices that are uniquely identified by an address. Wiring shall be shielded twisted pair cable. The system must allow up to 2,500 feet wire length to the furthest addressable device. T-tapping of the communications channel or multiple loop channels shall be supported.
- D. Enclosures shall be of modular size to allow **surface** mounting of multiple boxes adjacent to each other, shall have hinged solid metal doors and contain a lock with a key common to all system devices.
- E. The FACP shall communicate with RTU's through dual supervised data lines. Data lines shall be standard #18 AWG twisted shielded pair minimum or as recommended by the manufacturer. In normal operation, each line shall be used alternately on intervals to maintain line integrity. Should either data line fail, system shall automatically revert to alternate data line and data line trouble shall be reported to operator. The FACP shall automatically "re-boot" after data line is restored. Minimum allowable distance between the FACP and RTU shall be 2500'.
- F. Design Make: Simplex FACP.

2.5 VENTILATION FAN SHUTDOWN CONTROL

- A. Provide supervised normally closed relays and contactors for connection into the fan motor control circuits ahead of all automatic devices.
- B. Sequence fan shutdown for every air distribution system. Provide duct detectors in return of systems over 2,000 cfm and in both supply and return at each floor of systems over 15,000 cfm.
- C. Provide drill bypass feature, locate switch on Fire Alarm Control Panel and label "DRILL-FAN SHUTDOWN BYPASS". Buzzer shall sound continuously while in bypass mode.
- D. Provide fan reset feature, locate switch on Fire Alarm Control Panel and label "FAN RESET".

2.6 INITIATION DEVICES

- A. General:
 - 1. Provide analog addressable smoke and thermal sensors as shown. All detectors, control modules, monitor modules and all other initiation devices shall communicate with twisted pair cable and have an individual address. Peripheral devices shall be of the same manufacturer as the FACP.
 - 2. Spot type detectors shall utilize the same interchangeable bases.
 - 3. If a device is removed or taken out of service a trouble signal shall be initiated.
- B. Photo-Obscuration Type Smoke Detector:
 - 1. The photo-obscuration detector shall operate on the photo electronic principle and provide an analog signal to the system indicating the amount of smoke. Detector shall be an analog addressable type.
 - 2. The detector shall incorporate a built in type identification so the system can identify the type of detector. The sensor shall be continually monitored to measure any change in their sensitivity because of the environment (dirt, smoke, temperature, humidity, etc.). Unit shall not be affected by exterior light or EMF.
 - 3. The detector shall be designed and arranged to prevent interference from exterior electromagnetic fields and light.
 - 4. The detector shall provide advance indication of the analog value of the products of combustion to the FACP indicating that maintenance is required in order to insure normal operation. The detector sensitivity shall be adjustable per device (within UL limits) and be set at the FACP for continuous or variable based on time of day. There shall be a minimum of six selectable sensitivity levels. The individual detector sensitivity setting shall be adjusted to meet the building/space characteristics and operation.

5. Detectors shall be designed for twistlock mounting to a separate base assembly. Provide manufacturer's recommended back box suitable for surface mounting where required.
6. The detector base shall have terminals for making all connections; no soldering shall be required. It shall be possible to secure the detector to the base with a concealed socket headscrew to prevent unauthorized tampering.
7. Smoke detectors shall be UL 268 listed and FM approved.
8. All smoke detectors shall be field checked and set to meet the prevailing conditions of the premise and any Owner requests. All such work shall be performed by an authorized representative of the manufacturer trained in such procedures.
9. Photo-obscuration type smoke detection shall be used for smoke detection unless indicated otherwise indicated.

C. Heat Detector:

1. The heat detector shall be a thermal sensor and shall constantly monitor the space temperature and constantly report this to the system. The unit shall be analog addressable. Heat detectors utilized for shunt trip of elevator feeder shall be thermally (temperature and thermal mass) coordinated with adjacent sprinkler heads to ensure that the heat detector is activated prior to sprinkler waterflow.
2. The sensor shall use dual solid state thermistors and shall monitor the ambient temperature from 32 degrees F, to 155 degrees F and provide a fast response to rapid increase in temperature. The sensor shall send data to the FACP representing the analog value of the ambient temperature. The FACP shall be suitable to monitor for set temperature (selectable by detector for 135 or 155 degrees F) and rate of rise (selectable by detector for 15 or 20 degrees F per minute). Individual detector thermal settings shall be adjusted for the building/space characteristics and operation but shall initially be set to 135 degrees F set temperature and 15 degrees F per minute rate of rise. Shall only be provided to areas prone to physical damage.
3. Detectors shall be designed for twistlock mounting to a separate base assembly. Provide back box suitable for surface mounting where required.
4. The detector base shall have terminals for making all connections; no soldering shall be required. It shall be possible to secure the detector in the base with a concealed socket headscrew to prevent unauthorized tampering.
5. Smoke detectors shall be UL 268 listed and FM approved.
6. All thermal sensors shall be field checked and set to meet the prevailing conditions of the premise. All such work shall be performed by an authorized representative of the manufacturer trained in such procedures.

D. Addressable Initiation Module:

1. The addressable initiation module shall be used to connect supervised conventional initiating device or zone of supervised conventional initiating devices (water flow switches, tamper switches, manual pull stations, (4) wire smoke detectors, conventional (4) wire duct detectors, fire pump alarms, dry chemical fire extinguisher control panels, etc.) to one of the system's addressable circuits.
2. The module shall provide address setting means using rotary decimal switches and also store an internal identifying code which the control panel shall use to identify the type of device.
3. The module shall contain an integral LED that flashes each time the unit is polled.

E. Manual Pull Stations:

1. Non-coded pull-down type, double action (push then pull down) manual addressable units with front keyed test/reset. Units shall be semi-flush where installed in construction with hollow or block walls. Where construction does not allow semi-flush mounting then unit shall be surface mounted utilizing the manufacturers back box. Each unit shall have a distinct address. Units shall be key reset.
2. Units installed outdoors or in potentially wet locations shall be rated for such conditions.
3. Bright red finish with white lettering "FIRE ALARM".
4. Provide tamperproof clear lexan protective shield with speaker and batteries to produce 85 Db minimum sound pressure level at 10 ft. when shield is raised. Shield shall have activation/deactivation switch with lockout screw, and 400 lb. breaking strength retaining cable.
5. Unless directly connected to a central station alarm service, municipal alarm system or local manned fire alarm dispatch station, a clearly legible sign shall be posted above each manual station stating: "LOCAL ALARM ONLY - NOT CONNECTED TO FIRE DEPARTMENT - CALL FIRE DEPARTMENT BY TELEPHONE".

F. Duct-Type Smoke Detector:

1. Detector shall be a photoelectric type that shall be activated by the presence of combustion products.
2. The detector head shall be a plug-in unit. The unit shall contain no moving parts. One chamber shall be for fire detection and the second chamber shall function as a reference, to stabilize the detector for changes in environmental temperature, humidity and pressure.

It shall be possible to electrically check detectors sensitivity, using a sensitivity test set, or equivalent, and readjust the detectors sensitivity as required.

3. The detector base shall have terminals for making all connections; no soldering shall be required. It shall be possible to secure the detector in the base with a concealed socket-head screw to prevent unauthorized tampering.
4. Smoke detectors shall be listed by Underwriter's Laboratories, Inc. and approved by Factory Mutual Insurance Company.
5. Provide complete with sampling tubes. Size sampling tubes for 80% of the width of the duct. Locate in ductwork for the indicated system and in accordance with the manufacturer's recommendations.
6. Provide auxiliary contacts and separate 24 VDC power to relay required for smoke damper operation.
7. Provide a remote indicating light/key test switch for each duct detector and mount in nearest corridor ceiling and labeled as to the damper is controlling.
8. Provide addressable base.
9. Duct detector shall report as a supervisory alarm at FACP.
10. Acceptable Manufacturer
 - a. Simplex.

G. Projected Beam Photo Electric Smoke Detectors:

1. Microprocessor based beam type smoke detector consisting of two units with projected light beam with measurement of smoke obscuration. Units shall have individual system addresses and a sensing range suitable for the intended location with minimum capability up to 60 ft. x 330 ft. of detection area. Where an analog signal is not available provide an addressable initiation module for system interface.
2. System shall have an adjustable time delay (up to 30 seconds) for momentary beam blockage. Alarm sensitivity shall be adjustable.
3. System lensing shall be selected based on the intended location.
4. Shall initiate trouble alarm when dust obscures beam by 50%. Unit shall compensate for a gradual buildup of dust.
5. Installation with convenient beam alignment adjustments.
6. Provide with manufacturer surface mounting backbox for surface mounted locations.

7. Housing color to match the surrounding colors.
8. Operating voltage 18-32 VDC. Provide a 24 VDC power circuit from the FACP. Connect unit to the system addressable circuit with separate power connection.
9. Provide with remote indicator and testing station for each unit. Station shall indicate system condition (alarm, normal, trouble), have the ability to remotely test the system and have time delay/sensitivity adjustments. Mount station in local utility space and label for the specific unit.
10. Acceptable Manufacturer:
 - a. Cornell University Standard UL listed for use with specified fire alarm control panel.

2.7 NOTIFICATION APPLIANCES

A. Horn:

1. 24 volts DC.
2. Basic grille type with powder coated red finish paint.
3. Horn shall be rated 94 dBA (anechoic chamber) at 10 feet. Output shall be selectable steady tone or coded. Provide dampening devices to reduce unit output by 5dBA for a minimum of 40% of the system speakers units and install as needed to meet the Owners needs.
4. Units shall be semi-flush where installed in construction with hollow or block walls. Where construction does not allow semi-flush mounting then unit shall be surface mounted utilizing the manufacturers back box.
5. Units installed outdoors or in potentially wet locations shall be rated for such conditions.
6. Provide directional projector where noted on the Drawings.
7. Provide backbox and grille for fully recessed installations; 4 in. deep box maximum.

B. Strobe Unit:

1. 24 volts DC with built-in Xenon Flasher; two watts maximum. Pulse duration shall be 0.2 seconds with maximum duty cycle of 40%. Illumination intensity shall be field selectable for 15, 30, 75 or 110 candela. Output setting shall be 15 candela in corridors, 75 candela in general areas, 110 candela in sleeping areas or as indicated. Flash rate minimum 1 Hz, maximum 2 Hz. Units within building shall flash in synchronization.

2. Protruding pyramid shaped lexan lens with reflector and the word "FIRE" imprinted on the lens.
 3. Rated life shall be a minimum of 500 hours of continuous operation.
 4. Units installed outdoors or in potentially wet locations shall be rated for such conditions.
 5. Units shall be semi-flush where installed in construction with hollow or block walls. Where construction does not allow semi-flush mounting then unit shall be surface mounted utilizing the manufacturers back box. Wall or ceiling mounted as noted on the Drawings.
 6. Provide surface backbox for surface installation; 4 in. deep maximum.
- C. Combination Horn-Strobe Units:
1. Unit shall be a combination of the Horn and strobe units specified above in a single manufactured unit.
- D. Addressable Notification Appliances:
1. Notification appliances specified herein shall be addressable and individually programmed for use as dictated by the Owner. Notification shall be programmed by floor, office space, common space, specialty use space and others as directed. Appliances shall only annunciate upon the directed conditions and order.

2.8 ADDRESSABLE CONTROL MODULE

- A. The addressable control module shall have an individual system address, be supervised and control an output dry contact from indication from the FACP. This can be used to control or have an input to elevator controls, notification appliances, door holder circuits, fans systems, etc. as indicated. Modules shall be connected to the addressable loop(s).
- B. The unit shall control an output relay (dry contact form C). The module shall mount in a 4 in. square, 2-1/8 in. deep electrical box.
- C. The module shall contain an integral LED that shall flash each time the module is polled.
- D. The module shall provide address setting means using rotary decimal switches and also store an internal identifying code which the control panel shall use to identify the type of device. Each unit shall have a separate address and be connected to the system addressable signaling circuit.

2.9 REMOTE ANNUNCIATOR (FAAP):

- A. Wall mount within a flush box. Maximum depth of 4 in., stainless steel trim. Nominal dimensions of 4" x 12".

- B. Annunciation shall be by two line by 40 character LCD display to provide system information and alarm/trouble description.
- C. Unit power and control shall be from the FACP. Unit circuiting shall be supervised.
- D. Provide trouble signal with audible buzzer, silencing switch and system reset. All pushbuttons shall be inoperable without keyswitch activated. Pushbuttons for alarm acknowledge, silence and alarm reset shall be standard on the front with a description. Shall include a minimum of four auxiliary switches/pushbuttons to be programmed as coordinated with the owner (possible options are door holder release override, manual alarm initiation, elevator capture bypass, etc.).
- E. Tamper-resistant front panel screws.
- F. Provide a framed directory showing the building outline of each floor and referencing device descriptions. All lettering shall be minimum 1/2 in. high. Mount next to remote annunciator.

2.10 BATTERY AND CHARGER

- A. Standby power shall be provided through 24 volt DC battery and automatic charger.
- B. Provide additional sealed lead-calcium batteries as may be required to accommodate the devices being added by this project, with sufficient ampere-hour capacity which will allow system to operate 24 hours under supervisory condition and at the end of this period to operate all alarm signals for ten consecutive minutes.
- C. Provide cell reversal protection.
- D. Life expectancy shall be ten years minimum.
- E. Charger shall be self-regulating, solid state, type, automatic with capability to fully charge the discharged battery within five hours.
- F. Locate charger within the FACP enclosure. Locate batteries in a separate vented enclosure directly adjacent to the FACP.

2.11 PULL STATION ALARM COVER

- A. Provide a protective alarm cover over manual pull stations where prone to physical damage. Unit shall allow easy access to the manual pull station and also provide an audible alarm when operated.
- B. Unit shall provide a 95dB alarm at 1 foot and be powered from a 9VDC battery.
- C. Unit shall be suitable for use in the intended location and pull station.
- D. Acceptable manufacturer:
 - 1. System manufacturer.

2. STI Stopper II

2.12 CENTRAL STATION

- A. Required points are as follows, but not limited to, (water flow, manual pull, smoke detection, heat detection, special extinguishing systems, and supervisory signals). Provide all necessary programming.

PART 3 - EXECUTION

3.1 INSTALLATION, EQUIPMENT

- A. All installations shall be accomplished in a professional manner by qualified personnel regularly engaged in and experienced in this type of Work. Fire alarm installation shall be directed by a person who possesses a state license for installation of fire alarm systems. All equipment and components shall be installed in accordance with the manufacturer's recommendations.
- B. System junction boxes and surface mounted device boxes shall be painted red.
- C. Provide all wiring and monitor modules for all sprinkler flow switches, pressure switches, and alarm check valves, installed by others. Maintain supervisory circuitry to the switches. Use liquidtight conduit for the last 2 ft. - 0 in. of raceway at the switch.
- D. Provide all wiring and monitor modules for post indicator valves, OS&Y valves and dry pipe sprinkler system maintenance air pressure switches, provided by others. Wire into the supervisory alarm portion of the fire alarm system.
- E. Provide all wiring and control modules for each of the smoke dampers installed by others. Wire to the damper junction box with flexible conduit and wire; provide box or boxes as required. Install according to NEC. Smoke dampers shall close when its associated smoke duct detector is in alarm, upon direction from the FACP or if the associated fan unit is not operating, including manual shutoff of power.
- F. Provide all power supplies and wiring to smoke relief hatches and fire barriers provided by others. Smoke relief hatch or fire barrier shall operate only when its associated smoke detector is in alarm.
- G. Provide all wiring to duct smoke detectors. Duct smoke detectors shall be mounted on the ventilating ductwork by others. All mounting arrangements, holes cut into ductwork, sealing of openings along with ceiling and access doors for the duct type detectors shall be provided by others. Provide duct detectors along with sampling tubes with end caps. Sequence smoke damper operation thirty seconds after its associated fan has been shut down. Duct detector shall report as supervisory alarm at FACP.
- H. Provide all wiring required for fan shutdown. Wire from the addressable control module for each fan to be shut down and provide wiring from the module to the fan control unit (starter, adjustable speed drive, etc). Dry contact shall be wired ahead of all control functions for starters. Provide intermediate relay for control circuits beyond the rating of the control module.

- I. Provide all wiring for remote test station and status annunciation for a smoke damper.
- J. Install all door holders in accordance with installation detail on the drawings and coordinate with the General Construction trade. Connect door holders to nearest 120 volt corridor receptacle circuit. Provide control modules as may be required.
- K. Provide all elevator capture control wiring and control modules. Installation shall be in accordance with manufacturer's recommendations.
- L. Elevator machine room and shaft heat detectors shall be mounted within two feet of the sprinkler head where applicable, and shall be thermally coordinated with the sprinkler heads to ensure the heat detector is activated prior to sprinkler waterflow.
- M. Detection and initiating equipment shall be listed by NRTL and approved by FM.
- N. All surface mounted devices shall be mounted on a special box furnished by fire alarm equipment manufacturer. Total assembly shall be secure, smooth contour and have no protrusions.
- O. Where detectors are installed on wood or masonry surfaces, attach brackets directly to the surface with tamperproof fasteners. Where detectors are installed on suspended ceilings, provide additional supports in the ceiling, such as channel support system, angle iron or additional runner bars. Fasten the additional supports rigidly to the ceiling runner bar system. Attach bracket to the supports with tamperproof fasteners. Install metal spacers between the bracket and supports so that the ceiling tiles will not be a part of the support system.
- P. Install wall mounted audio/visual signal devices at 80 in. AFF to bottom. Where ceiling types are called for, verify ceiling type and mounting height in the field. Provide pendant-mounted devices as required for specified mounting height.
- Q. An auxiliary fire alarm relay used to control an emergency control device that provides control functions described in this specification shall be located within 3 ft. of the emergency control device and all wiring shall be supervised.
- R. All smoke detectors shall be field checked and set to meet the prevailing conditions of the premise. All such Work shall be performed by an authorized representative of the manufacturer trained in such procedures.
- S. Provide all wiring at the EP switch. Wire to the EP switch with flexible conduit and wire; provide box or boxes if required. Install according to NEC. Smoke dampers shall operate only when its associated duct smoke detector is in alarm.
- T. Provide all power supplies and wiring to smoke relief hatched and fire barriers. Smoke relief hatch or fire barrier shall operate only when its associated smoke detector is in alarm.
- U. All wiring shall conform to N.E.C. Articles 725 and 760, and to NFPA-72, "National Fire Alarm Code".

- V. Label all fire alarm devices and system components (major equipment, conduit, junction boxes and cabling) according to the Cornell Standard 16710 and 283100.

3.2 SYSTEM CIRCUITING

- A. Contractor shall attempt to reuse as much existing wiring as possible throughout the facility. Only replace or provide new when necessary.
- B. All wiring shall conform to the NEC, and to NFPA-72, National Fire Alarm Code.
- C. Install all wiring in accordance with manufacturer's recommendations taking into account loading, intended location, circuit length, spare capacity and voltage drop.
- D. All wiring shall be copper and installed in a dedicated/segregated red EMT conduit system.
- E. Power circuits:
 - 1. Provide the required quantity of 20 ampere, 120 volt circuits to the system with a minimum of one for the FACP.
- F. Provide minimum #18 AWG twisted shielded pair for addressable signal line circuits. Notification appliance circuits shall be #14 AWG minimum.
- G. Addressable signal line circuits shall be NFPA 72 2010 Class A (redundant, single open operation).
- H. Notification appliance circuits shall be NFPA 72 - 2010 Class A (redundant, single open operation).
- I. Provide a 24VDC power circuit, #16 twisted pair minimum, with each initiation addressable circuit for the entire length.
- J. Notification circuits shall be segregated as indicated on the drawings and by individual floors as a minimum. Circuits shall also be dedicated to audible or visual appliances but not both.

3.3 PROGRAMMING

- A. Include in bid the cost to cover all system programming, including items particular to this project (such as custom zone descriptions, time delay settings, sensitivity settings, etc.) such that entire system is 100% complete and operating to the Owner's satisfaction. Coordinate all system programming with the Owner. Also, provide programming of the system a minimum of once during the warranty period to provide changes requested by the Owner.

3.4 SPARE EQUIPMENT

- A. Provide the following spare equipment to the Owner. Deliver the equipment to the Owner designated location on the project site in original packaging.

- B. Equipment to include:
 - 1. Smoke detectors: 5% of each type used with a minimum of five.
 - 2. Heat detectors: 5% of each type used with a minimum of five.
 - 3. Addressable control modules: 2% of each type used with a minimum of two.

3.5 TESTING AND INSTRUCTION

- A. The complete fire alarm system shall be fully tested after the installation is complete. Testing shall include all devices, FACP, annunciator panel, other panels, features and functions. Testing shall be witnessed by the owners representative and be in accordance with the NFPA and herein. Provide a testing report to the authority having jurisdiction and the Engineer as a submittal.
- B. Provide a minimum of 2 hours of instruction to the operating personnel designated by the Owner's Representative with regard to use and operation of the system. Provide up to three programming modifications.
- C. Provide three sets of keys to all panels, manual stations, etc., to the Owner's Representative.
- D. Provide a copy of the system programming to the Owner on a CD/DVD disk or flash drive.
- E. Provide to the Owner system Operation Manuals as specified that shall include as a minimum.
 - 1. Bill of Material.
 - 2. Catalog descriptive literature for all equipment. This shall include a description of the unit, ratings, functions, capability, materials and compatibility with other components.
 - 3. Riser Wiring Diagram showing all equipment, devices, device addresses, connections, control connections, remote notification connection(s), wire quantities and sizes.
 - 4. Floor plan indicating equipment and device locations, addresses, power circuit information with power panel location, notification circuiting, initiation circuiting and control circuiting. Contact the Engineer for a copy of the project floor plans.
 - 5. Typical Terminal Wiring Diagram for each type of device.
 - 6. Terminal wiring Diagram for all Fire Alarm equipment.

7. Calculations including:
 - a. Battery sizing calculations indicating total number of power devices, load associated with each type device and recommended battery capacity (AH).
 - b. Voltage drop calculations with actual equipment loads used to derive battery back-up ampere-hour rating and individual circuit voltage drop (indicate the wire size to be used and the associated voltage drop with the allowed voltage drop) for each circuit.
8. Instruction report starting when instruction was given and who was in attendance, signed by Owner's Representative.
9. A written test report from an authorized representative of the equipment manufacturer that each device and overall system operation has been 100% tested and approved.
10. Certificate of Completion as described in NFPA-72.
11. A two year warranty in accordance with the Basic Requirements of these Specifications shall be provided for this system.
12. All devices shall be pre-tested by the contractor and distributor prior to scheduling final acceptance test with AHJ and EH&S.
13. Final test to be done with AHJ and EH&S present.

3.6 FIRE / SMOKE DAMPER OPERATION

A. Installed Smoke Detection Devices and Smoke Dampers

1. Smoke dampers are installed at each duct/smoke barrier penetration.
2. Every smoke damper has a local duct smoke detector.
3. Every smoke damper has a local remote test station and status annunciation.
4. Every duct smoke detector is addressable and is connected to the building fire alarm system.
5. The building project area is provided with addressable area smoke detectors.

B. Fire Alarm Activation of Smoke Dampers

1. Duct Smoke Detectors:
 - a. Upon activation of any duct smoke detector, an addressable signal is sent to the building fire alarm system and the smoke damper associated with duct smoke detector is closed.

- b. Upon receipt of the addressable duct smoke detector signal, the building fire alarm system shuts down both the supply and return fans or the exhaust fan, associated with the duct system that experienced the detector activation.
 - c. Upon receipt of the associated fan system drives being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
 - C. Non-Fire Alarm System Activation of Smoke Dampers (These activations do not cause for a building fire condition to be annunciated)
 - 1. Safety Device Activation
 - a. Upon activation of either the low-limit switch (freeze-stat) or the supply duct high static pressure switch, both the supply and return fans are de-energized via hardwiring of the low limit switch in the fan starter circuits.
 - b. The building fire alarm system point addressable module that is installed at the variable frequency drive of the supply and return fans then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - c. Upon receipt of the associated fan system drives being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
 - 2. BMS (Building Management System) Component Fault
 - a. Upon activation of any of the following BMS component faults, the supply and return fans, or exhaust fan are de-energized via BMS.
 - 1) Supply fan VFD fault
 - 2) Return fan VFD fault
 - 3) Exhaust fan VFD fault
 - 4) Exhaust fan current sensor fault
 - 5) Outside air damper end switch fault
 - 6) Return air damper end switch fault
 - 7) Exhaust air damper end switch fault

- b. The building fire alarm system point addressable module that is installed at the variable frequency drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - c. Upon receipt of the associated fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
3. EMCS Operator Activation:
- a. When the EMCS system operator overrides the operational status of the air handling system and shuts down the supply, return, or exhaust fans.
 - b. The shutdown of the supply, return or exhaust fans shall be interlocked through DDC programming. If the supply fan is shutdown, the return fan shall also be shut down automatically. If the return fan is shutdown, the supply fan shall be shut down automatically.
 - c. The building fire alarm system point addressable module that is installed at the variable frequency drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - d. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
4. Maintenance Operator Activation:
- a. When a building maintenance staff member manually shuts off the supply, return or exhaust fan at the starter disconnect switch, the supply, return or exhaust fans are shutdown.
 - b. The shutdown of the supply, return or exhaust fans shall be interlocked through DDC programming. If the supply fan is shutdown, the return fan shall also be shut down automatically. If the return fan is shutdown, the supply fan shall be shut down automatically.
 - c. The building fire alarm system point addressable module that is installed at the variable frequency drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.

- d. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
- D. Smoke Damper Testing - M/E Engineering offers the following suggestions for a smoke damper testing protocol. The actual final protocol needs to be authored and approved by all Cornell parties and agencies of interest.
1. Duct Smoke Detector (Fire Alarm Condition):
 - a. Under controlled conditions and with proper notification to the Building Manager and Cornell Fire and Safety, apply smoke to any duct smoke detector in the ductwork of any air handling systems which serve the project area.
 - b. Upon receipt of the addressable duct smoke detector signal, the building fire alarm system shuts down both the supply and return, or exhaust fans associated with the duct system that experienced the detector activation.
 - c. The building fire alarm system point addressable module that is installed at the variable frequency drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - d. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
 - e. Confirm damper closure at the local smoke damper access door.
 2. Safety Device Activation (Non-Fire Alarm Condition)
 - a. Under controlled conditions and with proper notification to the Building Manager, manually trip the low limit switch (freeze-stat) associated with any air handling system in the project area.
 - b. The building fire alarm system point addressable module that is installed at the variable frequency drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - c. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.

- d. Confirm damper closure at the local smoke damper access door.
3. BMS Component Interlock or Fault:
- a. Under controlled conditions and with proper notification to the Building Manager, manually cause for a fault condition to occur in any of the following BMS components:
 - 1) Supply fan VFD fault
 - 2) Return fan VFD fault
 - 3) Exhaust fan VFD fault
 - 4) Exhaust fan current sensor fault
 - 5) Outside air damper end switch fault
 - 6) Return air damper end switch fault
 - 7) Exhaust air damper end switch fault
 - b. The building fire alarm system point addressable module that is installed at the variable frequency drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - c. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
 - d. Confirm damper closure at the local smoke damper access door
4. EMCS Operator Activation (Non-Fire Alarm Condition):
- a. Under controlled conditions and with proper notification to the Building Manager, manually override the operational status of any air handling system via laptop, PC or remote access to EMCS Webcontrol and shutdown the associated air handling system.
 - b. The shutdown of the supply, return or exhaust fans shall be interlocked through DDC programming. If the supply fan is shutdown, the return fan shall also be shut down automatically. If return fan is shutdown, the supply fan shall be shut down automatically.

- c. The building fire alarm system point addressable module that is installed at the variable frequency drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - d. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
 - e. Confirm damper closure at the local smoke damper access door.
5. Maintenance Operator Activation (Non-Fire Alarm Condition):
- a. Under controlled conditions and with proper notification to the Building Manager, manually shut off any air handling system within the project area.
 - b. The shutdown of the supply, return or exhaust fans shall be interlocked through DDC programming. If the supply fan is shutdown, the return fan shall also be shut down automatically. If the return fan is shutdown, the supply fan shall be shut down automatically.
 - c. The building fire alarm system point addressable module that is installed at the variable frequency drive, or motor starter current sensor, of both the supply and return fans or exhaust fan, then sends an addressable signal to the building fire alarm system indicating that the air handling system has been shut down.
 - d. Upon receipt of the associated supply, return or exhaust fan system drive/starter being shut down, the building fire alarm system shall close all smoke dampers associated with that duct system on a 30 second delay.
 - e. Confirm damper closure at the local smoke damper access door.

END OF SECTION 28 31 02

APPENDIX A
FIRE ALARM SYSTEM OPERATION/SEQUENCE MATRIX

System Outputs

System Inputs	Actuate Common Alarm Signal Indicator	Actuate Audible Alarm Signal	Actuate Common Supervisory Signal Indicator	Actuate Audible Supervisory Signal	Actuate Common Trouble Signal Indicator	Actuate Audible Trouble Signal	Indicate Zone or Device Description	Activate Notification Appliances	Display Change of Status on All Annunciators/Printers	Transmit Alarm Signal to Central Station	Transmit Supervisory Signal to Central Station	Transmit Trouble Signal to Central Station	Release Magnetically Held Doors	Recall Elevator to Recall Floor	Actuate Warning to Elevator Controls	Actuate Warning to Elevator Cabs	Activate Elevators Shunt Trip	Close All Related Smoke Dampers	Unlock All Exits and Control Doors	Shutdown Respective Air Handling Units (SA and RA)	Activate Floor Pressurization (High Rise Only)	Activate Stairwell Pressurization (High Rise Only)	Active Smoke Exhaust (High Rise Only)	Open Associated Smoke Hatch	Local Notification
Fire Alarm System AC Power Failure					X	X						X													
Fire Alarm System Low Battery					X	X						X													
Open Circuit					X	X						X													
Ground Fault					X	X						X													
Circuit Short					X	X						X													
Manual Pull Station Actuation	X	X					X	X	X	X			X						X						
Area Smoke Detectors	X	X					X	X	X	X			X	X				X	X		X	X	X		
HVAC Air Duct Smoke Detector	X	X	X	X			X		X										X						
Area Heat Detectors	X	X					X	X	X	X			X	X				X	X		X	X	X		
Fire Suppression System Alarm	X	X					X	X	X	X			X	X				X	X						
Sprinkler Tamper Switch			X	X			X				X														
Sprinkler Water Flow in Building	X	X					X	X	X	X			X	X				X	X						
Sprinkler Water Flow in Elevator Equipment Room or Shaft	X	X					X	X	X	X					X	X		X							
Elevator Shaft Smoke Detector	X	X					X	X	X	X				X										X	
Elevator Equipment Room Area Smoke Detector	X	X					X	X	X	X			X	X		X		X	X						

APPENDIX A
FIRE ALARM SYSTEM OPERATION/SEQUENCE MATRIX

Elevator Shaft and Equipment Room Heat Detectors	X	X					X	X	X	X			X			X	X	X	X						
Elevator Pit Sprinkler Flow	X	X					X			X				X	X	X	X								
Elevator Pit Heat Detector	X	X					X	X	X	X				X	X	X	X								
Elevator Lobby Smoke Detectors	X	X					X	X	X	X				X	X			X	X			X	X	X	
Elevator Lobby Recall Floor	X	X					X	X	X	X				X	X			X	X			X	X	X	
Fire Pump Power Failure/Phase Reversal			X	X			X		X	X	X														
Fire Pump Low Fuel			X	X			X		X		X			X											
Fire Pump Running			X	X			X		X		X			X											
Jockey Pump Running			X	X			X		X		X														
Fire Pump not in Automatic Mode			X	X			X				X														
Area of Refuge Two-Way Communication Status		X		X	X		X			X															
Smoke Detector Adjacent to Smoke Hatch	X	X					X	X	X	X				X	X										
AHU Off, Any Reason																	X								
CO Detection			X	X			X		X		X														X
Sprinkler Bell Activation	X	X					X			X				X	X	X	X								

APPENDIX A

FOODSERVICE EQUIPMENT

IF PRINTING THIS DOCUMENT:

SELECT "REDUCE TO MARGINS" IN YOUR PRINT SETTINGS TO ENSURE THE ITEM NUMBERS DO NOT GET CUT OFF

RENOVATE 2ND-5TH FLOOR AT KING-SHAW HALL ITHACA, NY

FOODSERVICE EQUIPMENT SUMMARY
FEBRUARY 05, 2025

JACOBS | DOLAND | BEER

192 LEXINGTON AVENUE, SUITE 804

NEW YORK, NY

212.206.0736

Equipment Summary

02/05/2025

Project:
Cornell King Shaw

From:
Jacobs Doland Beer, LLC
Robert Rice
192 Lexington Avenue
Suite 804
New York, NY 10016-
(212)206-0736 101

Job Reference Number: 2855

Item	Qty	Description
1.00		***BACK OF HOUSE*** *** Model No. ***
1.01	1 ea	FREEZER, REACH-IN Turbo Air Model No. PRO-26F-N(-L) PRO Series Freezer, reach-in, one-section, 25.35 cu. ft., 28-3/4"W x 34-1/8"D x 78"H, top mount self-contained refrigeration, self-cleaning condenser device, digital temperature controller, self-diagnostic monitoring system, hot gas condensate system, automatic fan motor delays, (1) solid door with lock, lifetime guaranteed heavy duty hinges & handles, LED interior lighting, (3) stainless steel wire shelves, stainless steel interior & exterior (galvanized top & bottom), R290 Hydrocarbon refrigerant, 1/2 HP, 115v/60/1-ph, 7.0 amps, NEMA 5-15P, cETLus, ETL-Sanitation, Made in USA (contact sales for lead time)
	1 ea	Note: Contact factory representative for parts & accessories discounts
	1 ea	5 year parts & labor warranty, standard
	1 ea	7 year compressor warranty (self-contained only), (updated warranty & spec sheets pending from Turbo Air)
	1 ea	PRO-26F-N-L: Left hinged
	1 st	Caster Set, swivel, locking front wheels, standard



Item	Qty	Description
1.02	1 ea	<p>REFRIGERATOR, ROLL-IN</p> <p>Turbo Air Model No. PRO-50R-RI-N PRO Series Refrigerator, roll-in, two-section, 81.87 cu. ft. capacity, 66-7/8"W x 37-3/4"D x 84-1/4"H, top mount self-contained refrigeration, self-cleaning condenser device, digital temperature controller, self-diagnostic monitoring system, hot gas condensate system, automatic fan motor delays, (2) solid doors with locks, lifetime guaranteed heavy duty hinges & handles, LED interior lighting, accepts (2) racks, stainless steel interior & exterior (galvanized top & bottom), heavy duty stainless steel ramp, R290 Hydrocarbon refrigerant, 1 HP, 115v/60/1-ph, 8.0 amps, NEMA 5-15P, cETLus, ETL-Sanitation, Made in USA (contact sales for lead time)</p> <p>1 ea Note: Contact factory representative for parts & accessories discounts</p> <p>1 ea 5 year parts & labor warranty, standard</p> <p>1 ea 7 year compressor warranty (self-contained only), (updated warranty & spec sheets pending from Turbo Air)</p>
1.03	2 ea	<p>UNIVERSAL PAN RACK</p> <p>New Age Model No. 1655 Pan Rack, mobile, (13) universal adjustable aluminum guides, bottom pan slides are welded in place, 4 1/2" OC for 12 x 20 to 18 x 26 pans, 1-1/2" centers, end loading, 5" platform swivel casters, NSF, Made in USA, (standard factory lead time)</p> <p>2 ea Lifetime warranty against rust & corrosion, 5 year workmanship and material defects warranty, standard</p> <p>2 pr CL-B Caster Lock, for 5" platform caster (pair)</p>

Item	Qty	Description
1.04	2 ea	<p>REFRIGERATOR, REACH-IN</p> <p>Turbo Air Model No. PRO-50R-N PRO Series Refrigerator, reach-in, two-section, 47.73 cu. ft., 51-3/4"W x 34-1/8"D x 78"H, top mount self-contained refrigeration, self-cleaning condenser device, digital temperature controller, self-diagnostic monitoring system, hot gas condensate system, automatic fan motor delays, (2) solid doors with locks, lifetime guaranteed heavy duty hinges & handles, LED interior lighting, (6) stainless steel wire shelves, stainless steel interior & exterior (galvanized top & bottom), R290 Hydrocarbon refrigerant, 1/2 HP, 115v/60/1-ph, 8.0 amps, NEMA 5-15P, cETLus, ETL-Sanitation, Made in USA (contact sales for lead time)</p> <p>2 ea Note: Contact factory representative for parts & accessories discounts</p> <p>2 ea 5 year parts & labor warranty, standard</p> <p>2 ea 7 year compressor warranty (self-contained only), (updated warranty & spec sheets pending from Turbo Air)</p> <p>2 kt TS23-UNLR HALF (4) pairs universal slides and pilasters for PRO-50 & PRO-77 left or right section</p> <p>2 st Caster Set, swivel, locking front wheels, standard</p>
1.05	1 ea	<p>WORKTABLE WITH SINKS</p> <p>Custom Model No. DETAIL 1-3 Worktable per Detail 1-3. Refer to Section 2.05B for approved manufacturer(s).</p> <p>1 ea DETAIL 1-2B Splash, angled-top, 2" wide, per Detail 1-2B</p> <p>1 ea DETAIL 1-1A Square edge per Detail 1-1A</p> <p>1 ea DETAIL 3-1 SINK Integral sink per Detail 3-1</p> <p>1 ea DETAIL 3-3 Stainless steel sink cover and holder per Detail 3-3</p> <p>1 ea DETAIL 3-5 HAND SINK Recessed hand sink per Detail 3-5</p> <p>DETAIL 1-3 H Undershelf per Detail 1-3 Note H</p> <p>DETAIL 1-3 G Side and/or rear crossbracing per Detail 1-3 Note G</p>

Item	Qty	Description
1.06	1 ea	<p>COFFEE BREWER FETCO Model No. CBS-52H-15 (C52036) Handle Operated Series Coffee Brewer, twin, 1.5 gallon capacity, automatic, on/off switch, two-portion standard, gravity flow dispense tube system, programmable recipes, gourmet coffee brew basket locks during brew cycle, hot water service, tank drain, 3 x 3.0kW heaters, 120/208-240v, 3-ph, 4+G wires, 19.5 - 22.4 max amp draw, 7.0 - 9.1kW, terminal block, 16.5 - 22.5 gallons per hour, UL, cUL, NSF (Use with FETCO D449, D452, or D009 - sold separately)</p> <p>1 ea NOTE: Pricing and specifications subject to change with or without notice - Please call 1.800.FETCO.99 for confirmation</p> <p>1 ea Circuit board: 3 year parts & 1 year labor warranty, standard</p> <p>1 ea Electro-mechanical parts: 2 year parts & 1 year labor warranty, standard</p> <p>1 ea All other parts: 1 year parts & 1 year labor warranty, standard</p>
		
1.06A	2 ea	<p>COFFEE DISPENSER FETCO Model No. D449 L4D-15 LUXUS® Thermal Dispenser, 1.5 gallon, Freshness Timer®, Volume Indicator™, vacuum insulated, flip & hide fill-through lid, base with built-in handles and drip tray</p> <p>2 ea NOTE: Pricing and specifications subject to change with or without notice - Please call 1.800.FETCO.99 for confirmation</p> <p>2 ea 1 year parts warranty, standard</p> <p>2 ea Black dispenser faucet, standard</p>
		
1.07	1 ea	<p>WALL SHELF Custom Model No. DETAIL 2-1 Wall shelf per Detail 2-1. Refer to Section 2.05B for approved manufacturer(s).</p>
1.08	1 ea	<p>WATER FILTRATION SYSTEM Everpure Model No. QC7I SINGLE 4FC5-S QC7I Water Filtration System, QC7I Single 4FC5-S, (1) 4FC5-S Fibredyne® carbon block cartridge, reduces sediment, chlorine, taste & odor, inhibits scale, 15,000 gallons capacity, 2.5 gpm flow rate, 5 micron, inlet water shut-off valve, outlet pressure gauge, flush valve, 3/8" inlet/outlet connections, NSF 42, (EV920261)</p> <p>1 ea EV969331 Replacement Cartridge: 4FC5-S Water Filter Cartridge, 4FC5-S, (1) 4FC5-S Fibredyne® II carbon block cartridge, reduces chlorine, taste & odors, inhibits bacterial growth & scale, 15,000 gallons, 2.5 gpm, 5 micron, NSF 42 (EV969331)</p> <p>1 ea Provide (1) complete set of replacement cartridges</p>
		

Item	Qty	Description
1.09	1 ea	<p>TRASH CONTAINER</p> <p>Rubbermaid Commercial Products Model No. FG354060GRAY Packed 4 ea</p> <p>Slim Jim® Container, 23 gallon, 22"W x 11"D x 30"H, with venting channels, molded-in handles, general purpose waste, open type without lid, high-impact plastic construction, gray, Made in USA</p> <p>1 ea FG267360GRAY Slim Jim® Swing Lid, for Slim Jim® Container, gray</p>
1.10	1 ea	<p>FIRE SUPPRESSION SYSTEM</p> <p>Ansul Fire Protection Model No. R102</p> <p>Fire suppression system to be a fully operational system with wet chemical suppressant. System to be U.L. 300 listed, and installed in full accordance with the manufacturer's recommendations and all required applicable NFPA, state, and local codes. Wherever possible, piping to be unexposed. Any exposed piping, conduit, and nozzles to be chrome-plated or stainless steel. Fusible link assemblies to be unexposed. Ship complete with tanks, automan release, and remote manual release. Mount cylinders and controls on the wall or the side of the exhaust hood where shown on plan at an accessible height that will not conflict with equipment below. Mount tight to underside of finished ceiling. For projects with mechanical pollution control device(s) (PCUs), provide Ansul coverage for the PCU(s). Refer to the mechanical drawings for all requirements, quantities, specifications, and location(s).</p>
1.11	1 ea	<p>COMBI OVEN, VENTLESS</p> <p>Alto-Shaam Model No. 6-10E PRO</p> <p>Prodigy™ Pro Combi Oven/Steamer, electric, boiler-free, countertop, capacity (6) 18" x 13" half size sheet or (7) 12" x 20" full size hotel (GN 1/1) pan capacity, Wi-Fi enabled control with steam/convection/combi cooking modes, removable "T" style temperature probe, (2) power levels, programmable cool-down, SafeVent™ steam venting, (5) cleaning levels, triple-pane door, high efficiency LED lighting, (2) side racks with (7) non-tilt support rails, door hinged right, stainless steel construction, adjustable stainless steel legs, EcoSmart®, cULus, UL EPH Classified, CE, IPX5, EAC, city-wide COA for New York City</p> <p>1 ea NOTE: Subject to Manufacturer's Terms & Conditions. See Documents Section</p> <p>1 ea One year parts and labor warranty, standard</p> <p>1 ea It is the sole responsibility of the owner/operator/purchaser of this equipment to verify that the incoming water supply is comprehensively tested and, if required, provide a means of water treatment that would meet the compliance requirements with the manufacturers water quality standards published on the product spec sheet. Non-compliance with these minimum standards will potentially damage this equipment and/or</p>



Item	Qty	Description
		components and VOID the original equipment manufacturers warranty
	1 ea	Alto-Shaam Prodigy Factory Authorized Installation Program (First unit only) ((NET) NO FURTHER DISCOUNTS APPLY)
	1 ea	<p>Installation Program includes:</p> <ol style="list-style-type: none"> 1. Travel within 60 miles (120 miles round-trip) of installer 2. Pre-installation site survey 3. Professionally reviewed and managed installation process 4. Assembly of purchased equipment 5. Assembly of any accessories 6. Placement and leveling of unit 7. Connection to existing utilities within three feet of unit 8. Mechanical to ensure proper function <p>(Note: Installation of units outside of the 60 mile radius will require additional travel charges payable by the customer)</p> <p>Installation Program does not include:</p> <ol style="list-style-type: none"> 1. Delivery to end user location 2. Unit must be within five feet of and have a clear and unobstructed path to final destination 3. Special licensing or permits 4. Overtime travel or labor 5. Removal of packing material 6. Removal and scrapping of old unit 7. Installation kit
	1 ea	XP-SVC START-UP Installation start-up check ((NET) NO FURTHER DISCOUNTS APPLY) (NOTE: Includes travel within 60 miles (120 miles round-trip) of installer. Additional trip charges may apply outside the 60-mile limit. Contact your local factory-authorized service agent for details)
	1 ea	ECO
	1 ea	208-240v/50/60/3-ph, 21.9-25.3 amps, 7.9-10.5kW, 8 AWG, NO cord or plug
	1 kt	5021519 Installation Kit, for electric combi ovens, CPVC, rated up to 30.0 amps, includes quick disconnect kit, per oven ((NET) NO FURTHER DISCOUNTS APPLY)
	1 ea	Note: Please refer to Installation Program brochure for kit contents
	1 ea	6-10EVH Ventech Type 1 Hood with Condensation, for 6-10E, self-contained, two-speed high-powered fan, 775-880 CFM, includes: (2) easy clean grease filters, (2) odor filters, stainless steel construction, 1.63 amps, 0.34 kW, cULus, UL EPA, ANSI/NSF 4, CE, EAC (Not available with smoking feature, or units with recessed door) (All utilities are run through the oven, no additional hookups required)

Item	Qty	Description
	1 ea	Hood Field install ((NET) NO FURTHER DISCOUNTS APPLY)
	1 ea	FI-24113 Ventech Type 1 Hood Washable Grease Filter with metal housing
	1 ea	Wifi, standard
	1 ea	Removable "T" style temperature probe, standard
	1 ea	5016091 Combi Oven Stand, mobile, 28-15/16" x 30-11/16" x 36-1/4" (734mm x 779mm x 920mm), with pan slides and shelf, spacing 2-11/16" (68mm), stainless steel, for 6-10 or 10-10
	1 ea	Dormont WATER DISCONNECT Dormont Water Connector, 36" long, Dormont Water Connector, with quick-disconnect with a two-way shut-off valve; KEC to properly size the diameter based on the equipment it serves.
1.12	1 ea	WATER FILTRATION SYSTEM Everpure Model No. EV979721 KleenSteam II Single System, 10,000 gallon capacity, 2.5 gpm flow rate, total system for steamers prevents limescale formation, (1) 7CB5 carbon filters, (1) SS-10 scale inhibitor Cartridge, dip tube, (2) 2.2 lbs. canisters ScaleKleen® (EV979721)
	1 ea	Provide (1) complete set of replacement cartridges
1.13	1 ea	WORKTABLE Custom Model No. DETAIL 1-3 Worktable per Detail 1-3. Refer to Section 2.05B for approved manufacturer(s). DETAIL 1-3 G Side and/or rear crossbracing per Detail 1-3 Note G
1.14	1 ea	UTILITY CHASE Custom Model No. DETAIL 7-6 Utility chase per Detail 7-6. Refer to Section 2.05B for approved manufacturer(s).
1.15	1 ea	OVERSHELF, TABLE-MOUNTED Custom Model No. DETAIL 2-5 Table-mounted overshelf per Detail 2-5. Refer to Section 2.05B for approved manufacturer(s).
1.16	2 ea	POS PRINTER NIC Model No. BY OWNER This item is not in the Kitchen Equipment Contract KEC to coordinate the size and utility requirements of this item

Item	Qty	Description
1.17	2 ea	HEATED CABINET, MOBILE Alto-Shaam Model No. 750-S Halo Heat® Low Temp Holding Cabinet, on/off simple controller with adjustable thermostat, indicator light, capacity (10) 12" x 20" pans, (2) chrome plated side racks, (3) wire shelves, stainless steel exterior, 2-1/2" casters; 2 rigid, 2 swivel with brakes, EcoSmart®, cULus, UL EPH ANSI/NSF 4, CE, IPX3, TUV-NORD, EAC, N11942
	2 ea	NOTE: Subject to Manufacturer's Terms & Conditions. See Documents Section
	2 ea	120v/60/1-ph, 9.0 amps, 1.1kW, 5 ft. cord, NEMA 5-15P, standard
	2 ea	Solid door, hinged on right, standard
	2 st	5008017 Casters, 3-1/2" (89mm), plate, (2) rigid, (2) swivel with brakes
1.18	1 ea	REFRIGERATOR, UNDERCOUNTER Turbo Air Model No. PUR-60-FB-N PRO Series Undercounter Refrigerator, front breathing airflow, two-section, 14.8 cu. ft., 60-1/4"W x 30"D x 30-1/2"H, (2) solid hinged swing doors with locks, stainless steel interior & exterior (galvanized steel bottom), (2) stainless steel wire shelves, self-cleaning condenser, R290 Hydrocarbon refrigerant, 1/6 HP, 115v/60/1-ph, 8.9 amps, NEMA 5-15P, cETLus, ETL-Sanitation, Made in USA (contact sales for lead time)
	1 ea	Note: Contact factory representative for parts & accessories discounts
	1 ea	5 year parts & labor warranty, standard
	1 ea	7 year compressor warranty (self-contained only)
	1 ea	Non-Standard mounting options below:
	4 ea	30265H0200 2-1/2" Caster with brake, 1/2" diameter & 13 TPI (sold by each)
1.19	1 ea	THREE (3) COMPARTMENT SINK WITH SCRAP BASKET Custom Model No. DETAIL 4-5 Three-compartment sink with scrap basket per Detail 4-5. Refer to Section 2.05B for approved manufacturer(s).
1.20	1 ea	POT RACK WALL SHELF Custom Model No. DETAIL 2-14 Pot rack with wall shelf per Detail 2-14. Refer to Section 2.05B for approved manufacturer(s).

Item	Qty	Description
1.21	1 ea	DISHWASHER, DOOR TYPE Champion Model No. DH-2000 (40-70) Versa-Clean Dishwasher, door type, high temperature with built-in 40° & 70° F rise electric booster, self-draining pump, 55 racks/hour capacity, auto-fill, stainless steel construction, electric tank heat, NSF, cULus, 1hp
	1 ea	1 year limited warranty, standard
	1 ea	Single-point electrical connection, standard
	1 ea	208v/60/3-p
	1 ea	Straight-through design application
	1 ea	117084 Drain water tempering kit, (unmounted)
	1 ea	418953 Shock Arrestor (unmounted)
	2 ea	101273 Flat Bottom Dishrack, 20" x 20", additional
	2 ea	101285 Peg Dishrack, 20" x 20", additional
1.22	1 ea	CONDENSATE HOOD Halton Model No. DETAIL 7-1 Condensate hood per Detail 7-1. Refer to Section 2.05B for approved manufacturer(s).
1.23	1 ea	CLEAN DISHTABLE Custom Model No. DETAIL 4-1 Clean dishtable per Detail 4-1. Refer to Section 2.05B for approved manufacturer(s).
1.24	1 ea	POT RACK, WALL-MOUNTED Custom Model No. DETAIL 2-3 Wall-mounted pot rack per Detail 2-3. Refer to Section 2.05B for approved manufacturer(s).
1.25	1 ea	COMPOST CONTAINER Rubbermaid Commercial Products Model No. FG354007GRN Packed 4 ea Slim Jim® Station Recycling Container, 23 gallon, 22"W x 11"D x 30"H, with "We Recycle" symbol, durable, easy-to-clean, green, Made in USA
	1 ea	FG267360BLA Slim Jim® Swing Lid, for Slim Jim® Container, black, S.O.S.
1.26	1 ea	ICE MAKER WITH BIN Existing Model No. RELOCATED KEC to coordinate the size and utility requirements of this item

Item	Qty	Description
1.27	1 ea	<p>WATER FILTRATION SYSTEM Everpure Model No. EV933042 High Flow CSR Twin-MC2 System, for combination coffee brewers, fountain, ice & steam, 18,000 gallon capacity, 3.34 gpm flow rate, 0.2 micron rating, (2) MC 0.2 micron precoat Cartridges (1) SRX scale reduction feeder (1) EC210 pre-filter, water shut-off, pressure gauges, flushing valve (EV933042)</p>  <p>1 ea This system requires (2) cartridges, (1) pre-filter & (1) scale reduction feeder. 1 ea Provide (1) complete set of replacement cartridges</p>
1.28	1 ea	<p>HAND SINK Eagle Group Model No. HSA-10-FWLDP-LRS Hand Sink, wall mount, 14" wide x 10" front-to-back x 5" deep bowl, 304 stainless steel construction, factory installed side splashes, wrist handle faucet, towel & soap dispensers, lever drain with overflow, inverted "V" edge, NSF</p>
1.29	6 ea	<p>SHELVING, MOBILE Metro Model No. MQ.MBL-SIZE PER PLAN MetroMax Q Shelving Unit, open grid polymer with Microban antimicrobial protection, epoxy coat steel frame, wedge connectors. Size and quantity per the plan with five (5) tiers of shelving. Posts to be 63" high with four (4) casters, two (2) brakes.</p>
1.30	1 ea	<p>DESK NIC Model No. BY GC This item is not in the Kitchen Equipment Contract KEC to coordinate the size and utility requirements of this item</p>
1.31	1 ea	<p>WALL SHELVING NIC Model No. BY GC This item is not in the Kitchen Equipment Contract KEC to coordinate the size and utility requirements of this item</p>
1.32	2 ea	<p>CORNER GUARD Custom Model No. DETAIL 7-5 Corner guard per Detail 7-5. Refer to Section 2.05B for approved manufacturer(s).</p>
2.00		<p>***FRONT OF HOUSE*** *** Model No. ***</p>

Item	Qty	Description
2.01	1 ea	<p>REFRIGERATED MERCHANDISER</p> <p>Turbo Air Model No. TSR-49GSD-N Super Deluxe Glass Door Refrigerator, two-section, 54-3/8"W x 31-7/8"D x 83-1/4"H, 44.14 cu. ft., self-contained, self-cleaning condenser device, front aluminum door frame, stainless steel top, sides & bottom grille, stainless steel interior, (2) hinged double pane glass doors with Low-E glass, LED interior lighting, (6) PE coated wire shelves, LED digital thermometer, door open beep, self-diagnostic monitoring system, turbo cooling, automatic fan motor delays, door locks, bottom mount compressor, R290 Hydrocarbon refrigerant, 1/3 HP, 115v/60/1-ph, 3.1 amps, NEMA 5-15P, cETLus, ETL-Sanitation, ENERGY STAR®</p> <p>1 ea Note: Contact factory representative for parts & accessories discounts</p> <p>1 ea 5 year parts & labor warranty, standard</p> <p>1 ea 7 year compressor warranty (self-contained only)</p> <p>1 ea Self-cleaning condenser device equipped, standard</p> <p>1 st Caster Set, swivel, locking front wheels, standard</p>
2.02	1 ea	<p>MILLWORK COUNTER</p> <p>Custom Model No. CUSTOM Millwork counter to be fabricated and installed by the KEC. Refer to the drawings for size and details. Refer to the architectural drawings for finishes and additional details. KEC to coordinate any cutouts in the countertop for foodservice equipment. Refer to Section 2.05B for approved manufacturer(s). FAB-MW-TOP KEC to provide a solid surface / stone top. Refer to the architectural drawings for finishes and details.</p>
2.03	1 ea	<p>MILLWORK COUNTER WITH SINKS</p> <p>Custom Model No. CUSTOM Millwork counter to be fabricated and installed by the KEC. Refer to the drawings for size and details. Refer to the architectural drawings for finishes and additional details. KEC to coordinate any cutouts in the countertop for foodservice equipment. Refer to Section 2.05B for approved manufacturer(s). FAB-MW-CLADDING KEC to clad the front of the counter. Refer to the architectural drawings for finishes and details. FAB-MW-TOP KEC to provide a solid surface / stone top. Refer to the architectural drawings for finishes and details.</p> <p>1 ea DETAIL 3-1 SINK Integral sink per Detail 3-1</p> <p>1 ea DETAIL 3-5 HAND SINK Recessed hand sink per Detail 3-5</p>

Item	Qty	Description
2.04	1 ea	SOUP WELL, DROP-IN Hatco Model No. RHW-1B Round Food Warmer/Cooker, electric, built-in, (1) 11 qt. round pan capacity, dry operation, thermostatic controls, 122° - 212°F, includes pan, lid & remote control, stainless steel construction, 1.3kW, 10.4 amps, 120v/60/1-ph, NEMA 5-15P, cULus, UL EPH Classified
	1 ea	NOTE: Sale of this product must comply with Hatco's Minimum Resale Price Policy; consult order acknowledgement for details
	1 ea	NOTE: Includes 24/7 parts & service assistance, call 414-671-6350
	1 ea	RHW-11QT-POT Food Pan, round, 11 qt. capacity, for RHW
	1 ea	RHW-11QT-LID-HG Lid, hinged, for RHW 11 qt. round pan

Item	Qty	Description
2.05	1 ea	<p>DISPLAY CASE, NON-REFRIGERATED</p> <p>Structural Concepts Model No. NR3647DSV Reveal® Service Non-Refrigerated Display Case, freestanding, 35-3/4"W x 33"D x 47-1/8"H, (2) removable & adjustable clear glass shelving, LED top & shelf lights, vertical, fixed front & side uv frameless glass, full end panels, clear glass rear sliding doors, one piece formed ABS plastic tub, black exterior & interior, adjustable locking casters, cETLus, ETL-Sanitation</p> <p>1 ea NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle</p> <p>1 ea NESHIPNOTE Must ship prepaid/add SCC will ship via air ride truck using a carrier that will not transfer the freight Glass warranty only applicable to first point of delivery</p> <p>1 ea Warranty: 1 year parts & labor warranty, standard</p> <p>1 ea Electrical: 110-120v/60/1-ph, 0.70 amps, 11.0 watts, standard</p> <p>1 ea Electrical Connection: 6' Straight blade power cord with NEMA 5-15P, standard</p> <p>1 ea Interior Color: Powder coated SCC Standard Silversan Black (FDA compliant)</p> <p>1 ea Frame Exterior: Powder coated SCC Standard Silversan Black (FDA compliant), standard</p> <p>1 ea Panel Exterior Color: Laminate standard color 909-58 Black</p> <p>1 ea GRAIN DIRECTION Standard laminate grain directions (when applicable): - Front Panels (Upper Header and Lower Panels): Horizontal grain direction - End Panels: Vertical grain direction - Blend & Reveal Cases Only: Horizontal grain direction on front and end panels</p> <p>1 ea End Panel Left: Full end panel</p> <p>1 ea End Panel Right: Full end panel</p> <p>1 ea Lower Front Panel Color: Powder coated SCC Standard Silversan Black (FDA compliant), standard</p> <p>1 ea Lower Rear Panel Color: Powder coated SCC Standard Silversan Black (FDA compliant), standard</p> <p>1 ea Rear Doors: Clear glass rear sliding doors, standard</p> <p>1 ea Lights: LED 3500K with frost lens, standard</p> <p>1 ea Base Support: Adjustable, locking casters (self-cont.), standard</p> <p>1 ea Base Support: Adjustable, locking casters (self-cont.), standard</p> <p>1 ea Architect to verify color</p> <p>1 ea Provide shop drawing for review</p>

Item	Qty	Description
2.06	1 ea	<p>DISPLAY CASE, REFRIGERATED</p> <p>Structural Concepts Model No. NR3647RSV Reveal® Service Refrigerated Case, freestanding, 35-3/4"W, 47-1/4"H, Breeze-E (Type II) with EnergyWise self-contained refrigeration, (2) removable & adjustable clear glass shelving, LED top & shelf lights, vertical, fixed front & side uv frameless glass, full end panel, clear glass rear sliding doors, coated coil, condensate pan, cETLus, ETL-Sanitation</p> <p>1 ea Note: See design guide for cutout dimensions</p> <p>1 ea NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle</p> <p>1 ea NESHIPNOTE Must ship prepaid/add SCC will ship via air ride truck using a carrier that will not transfer the freight Glass warranty only applicable to first point of delivery</p> <p>1 ea 1 yr. parts & labor warranty, 5 yr. compressor warranty, standard</p> <p>1 ea Refrigeration: Breeze-E (Type II) self-contained refrigeration, rear access (R290) standard</p> <p>1 ea Electrical Connection: 10' NEMA 5-15P, 110-120v/60/1-ph straight blade power cord, standard</p> <p>1 ea Clean Sweep: None, standard</p> <p>1 ea Base Support: Adjustable, locking casters (self-cont.), standard</p> <p>1 ea Interior Color: Powder coated SCC Standard Silversan Black (FDA compliant)</p> <p>1 ea Frame Exterior: Powder coated SCC Standard Silversan Black (FDA compliant), standard</p> <p>1 ea Panel Exterior Color: Laminate standard color 909-58 Black</p> <p>1 ea GRAIN DIRECTION Standard laminate grain directions (when applicable): - Front Panels (Upper Header and Lower Panels): Horizontal grain direction - End Panels: Vertical grain direction - Blend & Reveal Cases Only: Horizontal grain direction on front and end panels</p> <p>1 ea End Panel Left: Full end panel</p> <p>1 ea End Panel Right: Full end panel</p> <p>1 ea Lower Front Panel Color: Powder coated SCC Standard Silversan Black (FDA compliant), standard</p> <p>1 ea Rear Doors: Clear glass rear sliding doors, standard</p> <p>1 ea Lower Rear Panel Color: Powder coated SCC Standard Silversan Black (FDA compliant), standard</p> <p>1 ea Lights: LED 3500K with frost lens, standard</p> <p>1 ea Architect to verify color</p> <p>1 ea Provide shop drawing for review</p>

Item	Qty	Description
2.07	2 ea	<p>KIOSK ORDERING SYSTEM NIC Model No. BY OWNER This item is not in the Kitchen Equipment Contract KEC to coordinate the size and utility requirements of this item</p>
2.08	3 ea	<p>TRASH CONTAINER Rubbermaid Commercial Products Model No. FG354060GRAY Packed 4 ea Slim Jim® Container, 23 gallon, 22"W x 11"D x 30"H, with venting channels, molded-in handles, general purpose waste, open type without lid, high-impact plastic construction, gray, Made in USA</p>  <p>3 ea FG267360GRAY Slim Jim® Swing Lid, for Slim Jim® Container, gray</p>
2.09	1 ea	<p>COMPOST CONTAINER Rubbermaid Commercial Products Model No. FG354007GRN Packed 4 ea Slim Jim® Station Recycling Container, 23 gallon, 22"W x 11"D x 30"H, with "We Recycle" symbol, durable, easy-to-clean, green, Made in USA</p>  <p>1 ea FG267360BLA Slim Jim® Swing Lid, for Slim Jim® Container, black, S.O.S.</p>
2.10	1 ea	<p>FOOD GUARD NIC Model No. BY MILLWORK This item is not in the Kitchen Equipment Contract KEC to coordinate any built-in and/or drop-in foodservice equipment</p>
2.11	1 ea	<p>COLD BREW COFFEE DISPENSER Espresso Parts Model No. BRODRNXDUO BROOD DRNX SLM DUO Nitro & Still Beverage Dispenser, two taps, flash chills each serving to 36°C, plug & play, Keg-free, pulls nitrogen from the atmosphere, compact design, 120v</p> 
2.12	1 ea	<p>DRIP TROUGH Glastender, Inc. Model No. DI-RF12 Drop-In Rinsers Faucet Drain Tray, 12"W, 1/2" tray flange, 1/2" drain, stainless steel, installation kit includes: 10 ft. clear vinyl tubing, (5) 4" Ty-wraps, (2) 1/2" plastic elbows, ETL-Sanitation</p>  <p>1 ea 1 year parts & labor warranty 1 ea NOTE: Must install backflow prevention device conforming to ANSI/ASSE 1022 or ANSI/ASSE 1024 to meet plumbing code (not included)</p>
2.13		SPARE NO.

Item	Qty	Description
2.14	1 ea	<p>ESPRESSO CAPPUCCINO MACHINE</p> <p>Eversys Inc. Model No. ENIGMA ST E'4M Enigma E'4M Automated Espresso Coffee Machine, 2 group, super automatic, up to 350 espresso per hour production capacity, (2) 10" touch screen controls, electronic e'Foam Micro Air Dosing (MAD) system, electronic milk texturing system, includes: (2) Everfoam steam arms, (2) ceramic burr grinders, (2) 3.3 lb coffee bean hoppers, (1) 1.5 lb grounds drawer, (1) hot water spout, (1) 5.4 liter steam boiler, (2) 1.5 liter coffee boilers, black exterior</p> <p>1 ea 1 year labor & service, 2 year parts, standard</p> <p>1 ea Pricing also includes installation, unless specifically noted otherwise.</p> <p>1 ea ENIGMA DUAL MILK OPTION Dual Milk Upgrade</p> <p>1 ea VITRIFRIGO FG14 STAINLESS STEEL Milk Refrigerator, holds (2) one gallon containers, internal thermometer, (6) tube holes, stainless steel construction, 110-120v/50/60/1-ph, NSF, UL</p> <p>1 ea ENIGMA 1.5 STEP OPTION 1.5 Step Option, automated milk steaming wand, for Enigma E'4m machines</p>
2.15	2 ea	<p>BLENDER</p> <p>Vitamix Model No. 36019 Best-In-Class Quiet Blending Technology The ultimate blender with unparalleled sound reduction, exceptional beverage blends, and improved speed of service.</p>
2.16	1 ea	<p>ICE CADDY, MOBILE</p> <p>BK Resources Model No. BK-MIB-2422 Mobile Ice Bin, with sliding lid, 22"W x 24"D x 29"H, stainless steel, 117lb. capacity, removable bottom tray, drain valve in rear of unit, 3" casters with brake</p>

Item	Qty	Description
2.17	1 ea	<p>CONVECTION OVEN, VENTLESS</p> <p>TurboChef (Middleby) Model No. DOUBLE BATCH, 3P (QUICK SHIP) HHD-9500-814-DL Double Batch™ Oven, electric, 3-phase ventless, countertop, stackable, (2) independent decks, store up to 800 recipes (400 per cavity), smart voltage sensor technology (North America only), internal catalytic converters, 16" pizza capacity per deck, (1) oven cleaner, (1) oven guard, (1) aluminum paddle, (2) trigger sprayers, (2) standard racks, (2) top & bottom jetplates, stainless steel front, top & sides, rubber seal for surface mounting, cULus, UL EPH Classified, TÜV, CE (Max qty - 5 per order, ships within 4 days)</p> <p>1 ea MDD-1001 Open Kitchen bundle, includes - 1 x ConnectWare module, 1 x Secure Access Point (SAP), 3 year subscription for Open Kitchen (NET price displays when item is added to quote)</p> <p>1 ea All items FOB: Carrollton, Texas: Consumable/accessory orders less than \$5,000 will incur a handling fee. Orders shipping standard ground will incur a \$15.00 handling fee. Orders shipping other than standard ground will incur \$25.00 handling fee</p> <p>1 ea One year parts and labor warranty</p> <p>1 ea (DOUBLE BATCH, 1P-14-DL) 208/240v/60/3-ph, 30.0 amps, 8.32/9.6 kW, 6 ft. cord & plug (nominal), NEMA 15-30P</p>

Item	Qty	Description
2.18	1 ea	<p>RAPID COOK OVEN TurboChef (Middleby) Model No. EL BANDIDO (I1 SOTA W/ PANINI PRESS) i1-9500-938 El Bandido Panini Press Oven, Rapid Cook, electric, countertop, externally actuated panini press mechanism, top-launched microwave system, external air filtration, LED timer, smart menu system, One Touch Controls, single or dual-temperature, built-in self diagnostics, smart voltage sensor technology (US only), includes: TurboChef Cleaner and Guard Starter Kit, includes (1) cleaner packet, (1) 24 oz bottle, (1) foam trigger sprayer, (1) oven guard, (1) aluminum paddle (I1-9716), (2) solid PTFE baskets (105696), rear air filter, die-cast aluminum front panel, 4" adjustable legs, 6.2kW, cULus, CE, UL EPH Classified, TUV</p> <p>1 ea MDD-1001 Open Kitchen bundle, includes - 1 x ConnectWare module, 1 x Secure Access Point (SAP), 3 year subscription for Open Kitchen (NET price displays when item is added to quote)</p> <p>1 ea All items FOB: Carrollton, Texas: Consumable/accessory orders less than \$5,000 will incur a handling fee. Orders shipping standard ground will incur a \$15.00 handling fee. Orders shipping other than standard ground will incur \$25.00 handling fee</p> <p>1 ea One year parts and labor warranty</p> <p>1 ea 208/240v/60/1-ph, 30.0 amps, 6 foot cord (nominal), NEMA 6-30P, standard</p> <p>1 ea I1-9500-921 Custom color red</p> <p>1 ea Architect to verify color</p>
2.19	2 ea	<p>POS PRINTER NIC Model No. BY OWNER This item is not in the Kitchen Equipment Contract KEC to coordinate the size and utility requirements of this item</p>
2.20	1 ea	<p>REFRIGERATOR, UNDERCOUNTER Existing Model No. RELOCATED KEC to coordinate the size and utility requirements of this item</p>
2.21	2 ea	<p>MOBILE COUNTER NIC Model No. BY MILLWORK This item is not in the Kitchen Equipment Contract KEC to coordinate any built-in and/or drop-in foodservice equipment</p>

Item	Qty	Description
2.22	2 ea	COFFEE DISPENSER FETCO Model No. D449 L4D-15 LUXUS® Thermal Dispenser, 1.5 gallon, Freshness Timer®, Volume Indicator™, vacuum insulated, flip & hide fill-through lid, base with built-in handles and drip tray
		
	2 ea	NOTE: Pricing and specifications subject to change with or without notice - Please call 1.800.FETCO.99 for confirmation
	2 ea	1 year parts warranty, standard
	2 ea	Black dispenser faucet, standard
2.23	1 ea	POP-UP TOASTER Waring Model No. WCT850 Commercial Switchable Bagel/Bread Toaster, heavy-duty, (4) 1-1/2" slots, (4) slice capacity (up to 360 slices/hr), (2) rotary dial to adjust browning controls, removable crumb tray, carriage control levers, replaceable industrial heating plates, brushed stainless steel finish, NEMA 6-20P, 208v/50/60/1-ph, 13.5 amps, 2800 watts, cETLus, NSF
		
	1 ea	1 year limited warranty, standard
		For Customer Care & Product Service, please contact: (800) 269-6640 waring_service@conair.com
		Waring Customer Care 314 Ella T. Grasso Ave Torrington, CT 06790
2.24	1 ea	MICROWAVE OVEN Panasonic Model No. NE-1054F PRO Commercial Microwave Oven, 1000 watts, 0.8 cu. ft. capacity, (6) power levels, 2- & 3-stage cooking, 20 program memory capacity, touch control pad with Braille, 99-minute timer, programmable and manual operation, program list/cycle counter, self diagnostics, tone control, bottom energy feed, interior light, see-through door with "grab & go" handle, stainless steel front, 120v/60/1-ph, 13.4 amps, cord, NEMA 5-15P, cULus, NSF
		
	1 ea	1 year parts & labor warranty (or 18,000 cycles) which ever comes first and 3 year magnetron warranty (or 54,000 cycles) which ever comes first
2.25		SPARE NO.

Item	Qty	Description
2.26	1 ea	TRASH COUNTER NIC Model No. BY MILLWORK This item is not in the Kitchen Equipment Contract KEC to coordinate any built-in and/or drop-in foodservice equipment
2.27	2 ea	COMPOST CONTAINER Rubbermaid Commercial Products Model No. 1955960 Packed 4 ea  Slim Jim® Container, 16 gallon, 22"L x 11"W x 25"H, with venting channels, molded-in handles, general purpose waste, open type without lid, high-impact plastic construction, green, Made in USA
2.28	2 ea	RECYCLING CONTAINER Rubbermaid Commercial Products Model No. 1971257 Packed 4 ea  Slim Jim® Container, 16 gallon, 22"L x 11"W x 25"H, with venting channels, molded-in handles, general purpose waste, open type without lid, high-impact plastic construction, blue, Made in USA
2.29	2 ea	TRASH CONTAINER Rubbermaid Commercial Products Model No. 1971258 Packed 4 ea  Slim Jim® Container, 16 gallon, 22"L x 11"W x 25"H, with venting channels, molded-in handles, general purpose waste, open type without lid, high-impact plastic construction, gray, Made in USA
X1	8 ea	CONVENIENCE RECEPTACLE - 120/1 NIC Model No. BY GC This item is not in the Kitchen Equipment Contract
X2	1 ea	CONVENIENCE RECEPTACLE - 208/1 NIC Model No. BY GC This item is not in the Kitchen Equipment Contract

Acceptance: _____ Date: _____

Printed Name: _____

Project Grand Total:

IF PRINTING THIS DOCUMENT:

SELECT "REDUCE TO MARGINS" IN YOUR PRINT SETTINGS TO ENSURE THE ITEM NUMBERS DO NOT GET CUT OFF

RENOVATE 2ND-5TH FLOOR AT KING-SHAW HALL ITHACA, NY

FOODSERVICE EQUIPMENT CUTS
FEBRUARY 05, 2025

JACOBS | DOLAND | BEER

192 LEXINGTON AVENUE, SUITE 804

NEW YORK, NY

212.206.0736

Description: ***Back of House***

Notes:

 REFRIGERATOR MANUFACTURER Turbo air more durable, efficient, beautiful	4184 E. Conant St. Long Beach, CA 90808 Tel. 310-900-1000 Fax. 310-900-1077 www.turboairinc.com		Project:	
			Model #:	
			Item #:	
			Available W/H:	Qty:
			Approval:	
			AIA #:	SIS #:
			CSI Section 11400	

Solid Door Freezer

Reach-In Top Mount
PRO Series

FEATURES & BENEFITS

**Model : PRO-26F-N
PRO-26F-N-L**

Self-Cleaning Condenser

The accumulation of dust in the condenser can cause the failure or breakdown of refrigerators. Refrigerators run normally until they reach a certain level of accumulation. At some point, when they are over the limit, their performance drops quickly resulting in damage to, or disposal of the stored products inside. The Self-Cleaning Condenser device keeps the condenser clean and prevents system failure by automatically brushing daily.

Digital temperature control & monitor system

- Keeps food products safe by maintaining constant temperatures
- Alarms that sound when doors are not sealed shut; protect against food spoilage that originates from cold air leaks
- Early warning alarm program detects issues before malfunction occurs
- Digital display allows for easy monitoring
- Programs interpret the condition of refrigeration systems by self-diagnosis
- Rapid cool-down function (Turbo Freeze)
- Automatic evaporator fan motor delays

Hydrocarbon refrigerants (R-290)

With innovative and eco-friendly technology, Turbo Air brings you hydrocarbon refrigerators designed to meet DOE's Energy Conservation Standards in 2017 and to use EPA's SNAP Program approved HC refrigerants. Hydrocarbon refrigerants do not deplete the ozone layer and have very low contribution to global warming (ODP-0, GWP-3).

Cold air distribution system

Provides uniformly maintained temperature within the food zone.

Hot gas condensate system

Through Turbo Air's creative innovation, the condensate system surfaces have been specially treated to resist corrosion. This not only increases efficiency without the risk of refrigerant leakage from corrosion, but also prevents the overflow of condensate water.

All stainless steel cabinet construction

The PRO series model boasts a stainless steel interior and a **22 gauge** stainless steel exterior (galvanized steel top, bottom). It guarantees the utmost in cleanliness and long product life. The PRO series model adds a touch of style to the most refined setting.

Sturdy, clean stainless steel shelving

Shelves are the most important part of cleanliness as they come in direct contact with food. After a while, PVC coated wire shelves may peel, rust and lead to unsanitary conditions. Only the Turbo Air PRO series uniquely provides stainless steel shelving.

Lifetime guaranteed heavy duty hinges and handles

High-density polyurethane insulation

The entire cabinet structure and solid doors are foamed-in-place using high density, CFC free polyurethane insulation.

USB temperature data storage

Plug in a USB flash drive into the built-in USB port to store raw temperature data while the unit is operating. Raw data can be processed via Turbo Air's website, which plots it on a convenient date and time versus temperature graph. Owners can analyze their unit's performance to ensure stable temperatures during peak usage and detect any temperature anomalies.



Patented Self-Cleaning Condenser



This product is equipped with a fine mesh filter to the front of the condenser to catch dust, and a rotating brush that moves up and down daily to remove excess buildup outward and away.

- **Thermostatic expansion valve**
- **LED interior lighting**
- **Freezer holds -10°F ~ 0°F for the best in frozen food preservation**
- **Built to maintain NSF standard temperatures in 100°F ambient**

- **PRO-26F-N: Right hinged**
- **PRO-26F-N-L: Left hinged**



Model	Swing Door	CU./FT.	#of Shelves	HP	AMPS	Crated Weight (lbs.)	L x D x H [†] (inches)
PRO-26F-N(-L)	1	25.35	3	1/2	7.0	358	28³/₄ X 34¹/₈ X 78

Solid Door Freezer

Reach-In Top Mount
PRO Series

Model : PRO-26F-N(-L)

ELECTRICAL DATA	
Voltage	115/60/1
Plug Type	 NEMA 5-15P
Full Load Amperes	7.0
Compressor HP	1/2
Cord Length (ft.)	9
Refrigerant	R-290
DIMENSIONAL DATA	
# of Doors	1
# of Racks Accepted	1
Net Capacity (cu. ft.)	25.35
Ext. Length Overall (in.)	28 ³ / ₄ (730mm)
Ext. Depth Overall (in.)*	34 ¹ / ₈ (866mm)
Ext. Height Overall (in.) †	78 (1982mm)
Int. Length Overall (in.)	23 ⁷ / ₈ (605mm)
Int. Depth Overall (in.)	27 ⁵ / ₈ (700mm)
Int. Height Overall (in.)	58 ³ / ₄ (1493mm)
# of Shelves	3
Shelf Size (L x D) (in.)	23 ¹ / ₂ x 26 ³ / ₈
Net Weight (lbs.)	315
Gross Weight (lbs.)	358

Design and specifications subject to change without notice.

Actual shipping weight may differ due to extra packing materials for product protection.

* Depth does not include 1-1/4" for door handles.

† Height does not include 5" for caster height.

■ WARRANTY : 5 Year Parts and Labor Warranty 7 Year Compressor Warranty

■ STANDARD FEATURES

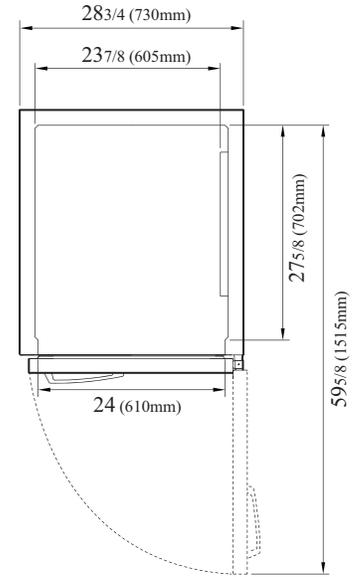
- Anti-corrosion coated evaporator
- Door locks
- Self-contained system
- 4" dia. swivel casters with locks on the front set
- Easy replaceable one piece magnetic door gaskets
- Solid and sturdy grille design
- Top mount compressor

■ OPTIONAL ACCESSORIES

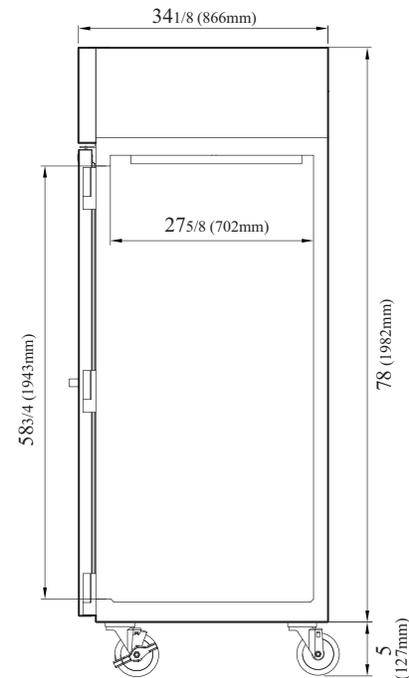
- 5" caster, 1/2" diameter & 13 TPI:
M726500100 (non-brake), M726500200 (w/ brake)
- 4.7" leveling seismic leg (1/2", 13 TPI): 30221M0500
- 6" stainless steel leg: 30221M0600
- Additional stainless steel shelf: H26R901680
- Tray slides kits: TS1-N1(#1), TS1-N4(#4), TS1-UN(Universal), TS1-N1 HALF,
TS1-N4 HALF, TS1-UN HALF

PLAN VIEW

(unit : inch)



TOP VIEW



SIDE VIEW

Ver.20241108



- Turbo Air: 800-627-0032
- Radiance: 800-500-3519
- Warranty: 800-381-7770
- AC: 888-900-1002



Continued product development may necessitate specification changes without notice.

 REFRIGERATOR MANUFACTURER Turbo air more durable, efficient, beautiful	4184 E. Conant St. Long Beach, CA 90808 Tel. 310-900-1000 Fax. 310-900-1077 www.turboairinc.com	Project:	
		Model #:	
		Item #:	
		Available W/H:	Qty:
		Approval:	
		AIA #:	SIS #:
		CSI Section 11400	

Roll-In Solid Door Refrigerator

Reach-In Top Mount
PRO Series

≡ FEATURES & BENEFITS ≡

Model : PRO-50R-RI-N

■ Self-Cleaning Condenser

The accumulation of dust in the condenser can cause the failure or breakdown of refrigerators. Refrigerators run normally until they reach a certain level of accumulation. At some point, when they are over the limit, their performance drops quickly resulting in damage to, or disposal of the stored products inside. The Self-Cleaning Condenser device keeps the condenser clean and prevents system failure by automatically brushing daily.

■ Digital temperature control & monitor system

- Keeps food products safe by maintaining constant temperatures
- Alarms that sound when doors are not sealed shut; protect against food spoilage that originates from cold air leaks
- Early warning alarm program detects issues before malfunction occurs
- Digital display allows for easy monitoring
- Programs interpret the condition of refrigeration systems by self-diagnosis
- Rapid cool-down function (Turbo cooling)
- Automatic evaporator fan motor delays
- Sensitive touch display

■ Hydrocarbon refrigerants (R-290)

With innovative and eco-friendly technology, Turbo Air brings you hydrocarbon refrigerators designed to meet DOE's Energy Conservation Standards in 2017 and to use EPA's SNAP Program approved HC refrigerants. Hydrocarbon refrigerants do not deplete the ozone layer and have very low contribution to global warming (ODP-0, GWP-3).

■ Cold air distribution system

Provides uniformly maintained temperature within the food zone.

■ Hot gas condensate system

Through Turbo Air's creative innovation, the condensate system surfaces have been specially treated to resist corrosion. This not only increases efficiency without the risk of refrigerant leakage from corrosion, but also prevents the overflow of condensate water.

■ All stainless steel cabinet construction

The PRO series model boasts a stainless steel interior and a 22 gauge stainless steel exterior (galvanized steel top, bottom). It guarantees the utmost in cleanliness and long product life. The PRO series model adds a touch of style to the most refined setting.

■ High-density polyurethane insulation

The entire cabinet structure and solid doors are foamed-in-place using high density, CFC free polyurethane insulation.

■ USB temperature data storage

Plug in a USB flash drive into the built-in USB port to store raw temperature data while the unit is operating. Raw data can be processed via Turbo Air's website, which plots it on a convenient date and time versus temperature graph. Owners can analyze their unit's performance to ensure stable temperatures during peak usage and detect any temperature anomalies.

■ Thermostatic expansion valve

■ Built to maintain NSF standard temperatures in 100°F ambient



Patented Self-Cleaning Condenser



This product is equipped with a fine mesh filter to the front of the condenser to catch dust, and a rotating brush that moves up and down daily to remove excess buildup outward and away.

■ Refrigerator holds 33°F ~ 38°F for the best in food preservation

■ Lifetime guaranteed heavy duty hinges and handles

■ LED interior lighting



Model	Swing Door	CU./FT.	#of Rack Accepted	HP	AMPS	Crated Weight (lbs.)	L x D x H [†] (inches)
PRO-50R-RI-N	2	81.87	2	1	8	820	667/8 x 373/4 x 841/4

Roll-In Solid Door Refrigerator

Reach-In Top Mount
PRO Series

Model : PRO-50R-RI-N

ELECTRICAL DATA	
Voltage	115/60/1
Plug Type	 NEMA 5-15P
Full Load Amperes	8.0
Compressor HP	1
Feed Wires with Ground	3
Cord Length (ft.)	9
Refrigerant	R-290
DIMENSIONAL DATA	
# of Doors	2
# of Racks Accepted	2
Net Capacity (cu. ft.)	81.87
Ext. Length Overall (in.)	66 ⁷ / ₈ (1700mm)
Ext. Depth Overall (in.)*	37 ³ / ₄ (960mm)
Ext. Height Overall (in.)	84 ¹ / ₄ (2140mm)
Int. Length Overall (in.)	62 (1575mm)
Int. Depth Overall (in.)	31 ¹ / ₂ (800mm)
Int. Height Overall (in.)	66 ⁷ / ₈ (1699mm)
Rack Size (L x D x H) (in.)	27 x 29 x 66
Net Weight (lbs.)	726
Gross Weight (lbs.)	820

Design and specifications subject to change without notice.

Actual shipping weight may differ due to extra packing materials for product protection.

* Depth does not include 1-1/4" for door handles. Depth does not include 3-1/2" for ramps.

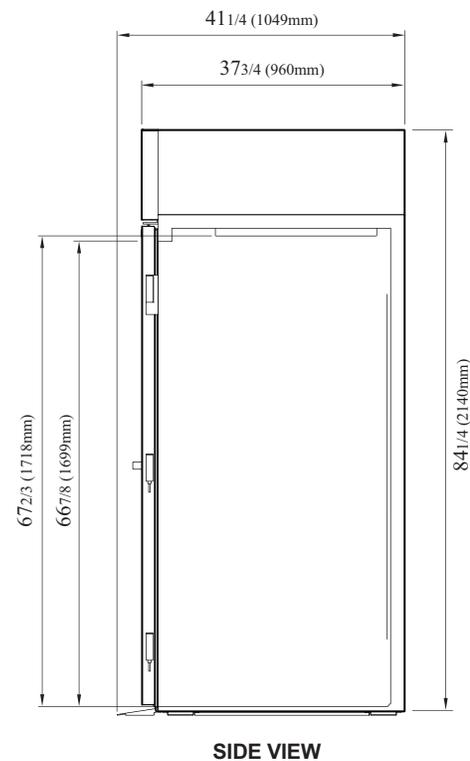
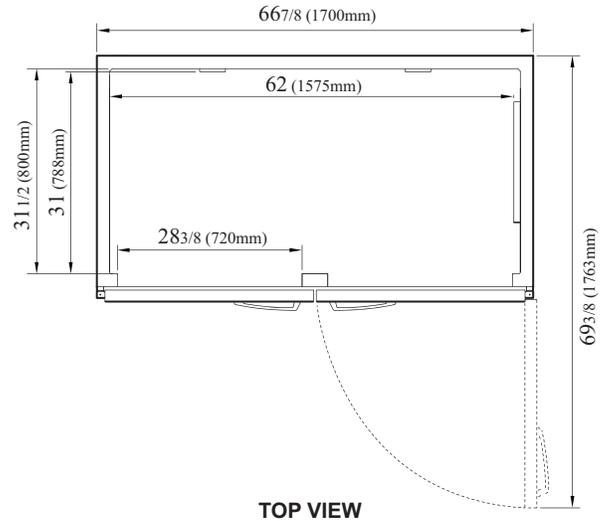
- **WARRANTY : 5 Year Parts and Labor Warranty
7 Year Compressor Warranty**

STANDARD FEATURES

- *Anti-corrosion coated evaporator*
- *Door locks*
- *Self-contained system*
- *Solid and sturdy grille design*
- *Heavy duty stainless steel ramp*
- *Top mount compressor*

PLAN VIEW

(unit : inch)



Ver.20241108

NATURAL
Refrigerant



MADE IN
U. S. A.



- Turbo Air: 800-627-0032
- Radiance: 800-500-3519
- Warranty: 800-381-7770
- AC: 888-900-1002

Turbo air REFRIGERATOR MANUFACTURER **RADIANCE** REFRIGERATION SYSTEM **Turbo air** **TEXAKING**

Continued product development may necessitate specification changes without notice.

Project: _____

Item: _____

Quantity: _____

Universal Adjustable Stepped-Angle Rack



1650

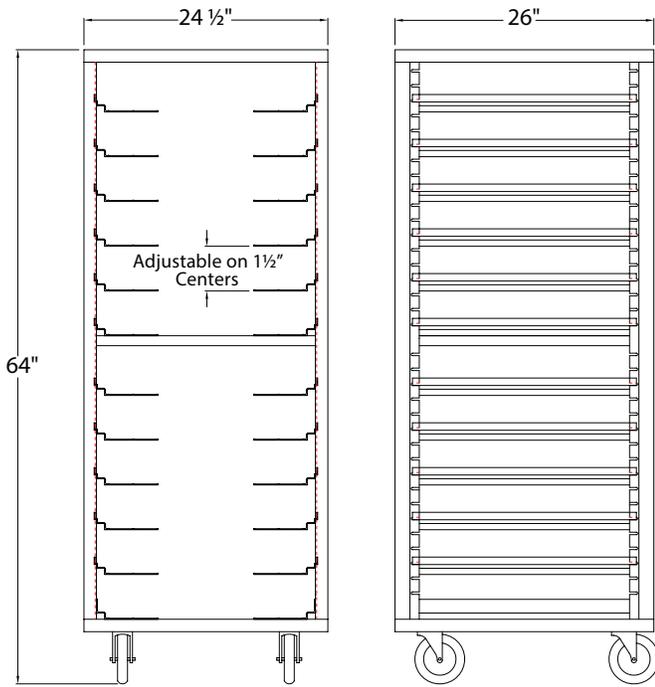


PAN SIZES:

- 18" x 13" & 18" x 26" Bun Pans
- 20" x 20" Cup & Glass Racks
- 20 3/4" x 25 1/2" European Std. Gastro-Norm Pans
- 10" x 20" & 20" x 22" Roast & Bake Pans
- 14" x 18" & 15" x 20" Service Trays
- 12" x 20" Steamtable Pans

These versatile racks feature extra wide, stepped-angle runners that accommodate a wide variety of pan styles and sizes; coupled with the ability to adjust runner spacing, this rack takes practicality to a whole new level.

- Frame constructed of 1 1/4" x 1 1/2" x .070" wall tubing that incorporates a .125" thick, 1 5/16" leg
 - Leg is notched on 1 1/2" centers to accept universal stepped-angle runners.
- Stepped-type angles are 2" x 6" x .100" thick and feature ribs that allow pans to slide on and off with ease; minimizing the galling or flaking that can occur with heavy usage.
- Equipped with four 5" plate type swivel casters that are inset completely under the rack.
- Lifetime-Guarantee against rust and corrosion.
- Five-year Guarantee against material defects and workmanship.
- NSF Certified.



1650

► Universal Adjustable Stepped Angle Rack

Model No.	Size W-H-D	Number Of Runners	Minimum Spacing	Ship Lbs.
Roll-In Unit				
1650	24 1/2" x 64" x 26"	12 pair	1 1/2"	82
Standard Unit				
1655	24 1/2" x 70" x 26"	13 pair	1 1/2"	89
Additional Angle Runner (2)				
42068	25 1/2"D			2

Bottom pan slides are welded in place.
Four 5" plate type swivel casters.

OPTIONS: Options may not be NSF Certified. Contact the factory.

- Caster Locks (2)** - Add "CL" suffix to model #.
- Corner Bumpers (4)** - Add "B" suffix to model #.
- Solid Base** - Add "E" suffix to model #.
- Perimeter Bumper** - Add "PB" suffix to model #.
- Pan Stop** - Add "PS" suffix to model #.
- Vertical Bumpers (4)** - Add "VB" suffix to model #.



New Age Industrial Corp., Inc. || NewAgeIndustrial.com || Made in the USA

PO Box 520 • 16788 US Hwy 36 • Norton, Kansas 67654 || Phone: (800) 255-0104 • (785) 877-5121 || Fax: (877)-877-7687 • (785) 877-2616

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		Model #:	
		Item #:	
		Available W/H:	Qty:
		Approval:	
		AIA #:	SIS #:
		CSI Section 11400	

Solid Door Refrigerator

Reach-In Top Mount
PRO Series

FEATURES & BENEFITS

Model : PRO-50R-N

Self-Cleaning Condenser

The accumulation of dust in the condenser can cause the failure or breakdown of refrigerators. Refrigerators run normally until they reach a certain level of accumulation. At some point, when they are over the limit, their performance drops quickly resulting in damage to, or disposal of the stored products inside. The Self-Cleaning Condenser device keeps the condenser clean and prevents system failure by automatically brushing daily.

Digital temperature control & monitor system

- Keeps food products safe by maintaining constant temperatures
- Alarms that sound when doors are not sealed shut; protect against food spoilage that originates from cold air leaks
- Early warning alarm program detects issues before malfunction occurs
- Digital display allows for easy monitoring
- Programs interpret the condition of refrigeration systems by self-diagnosis
- Rapid cool-down function (Turbo Cooling)
- Automatic evaporator fan motor delays

Hydrocarbon refrigerants (R-290)

With innovative and eco-friendly technology, Turbo Air brings you hydrocarbon refrigerators designed to meet DOE's Energy Conservation Standards in 2017 and to use EPA's SNAP Program approved HC refrigerants. Hydrocarbon refrigerants do not deplete the ozone layer and have very low contribution to global warming (ODP-0, GWP-3).

Cold air distribution system

Provides uniformly maintained temperature within the food zone.

Hot gas condensate system

Through Turbo Air's creative innovation, the condensate system surfaces have been specially treated to resist corrosion. This not only increases efficiency without the risk of refrigerant leakage from corrosion, but also prevents the overflow of condensate water.

All stainless steel cabinet construction

The PRO series model boasts a stainless steel interior and a **22 gauge** stainless steel exterior (galvanized steel top, bottom). It guarantees the utmost in cleanliness and long product life. The PRO series model adds a touch of style to the most refined setting.

Sturdy, clean stainless steel shelving

Shelves are the most important part of cleanliness as they come in direct contact with food. After a while, PVC coated wire shelves may peel, rust and lead to unsanitary conditions. Only the Turbo Air PRO series uniquely provides stainless steel shelving.

Lifetime guaranteed heavy duty hinges and handles

High-density polyurethane insulation

The entire cabinet structure and solid doors are foamed-in-place using high density, CFC free polyurethane insulation.

USB temperature data storage

Plug in a USB flash drive into the built-in USB port to store raw temperature data while the unit is operating. Raw data can be processed via Turbo Air's website, which plots it on a convenient date and time versus temperature graph. Owners can analyze their unit's performance to ensure stable temperatures during peak usage and detect any temperature anomalies.



Patented Self-Cleaning Condenser



This product is equipped with a fine mesh filter to the front of the condenser to catch dust, and a rotating brush that moves up and down daily to remove excess buildup outward and away.

Thermostatic expansion valve

LED interior lighting

Refrigerator holds 33°F ~ 38°F for the best in food preservation

Built to maintain NSF standard temperatures in 100°F ambient



Model	Swing Door	CU./FT.	#of Shelves	HP	AMPS	Crated Weight (lbs.)	L x D x H [†] (inches)
PRO-50R-N	2	47.73	6	1/2	8.0	538	51 ³ / ₄ x 34 ¹ / ₈ x 78

Solid Door Refrigerator

Reach-In Top Mount
PRO Series

Model : PRO-50R-N

ELECTRICAL DATA	
Voltage	115/60/1
Plug Type	 NEMA-5-15P
Full Load Amperes	8.0
Compressor HP	1/2
Cord Length (ft.)	9
Refrigerant	R-290
DIMENSIONAL DATA	
# of Doors	2
# of Racks Accepted	2
Net Capacity (cu. ft.)	47.73
Ext. Length Overall (in.)	51 3/4 (1314mm)
Ext. Depth Overall (in.)*	34 1/8 (866mm)
Ext. Height Overall (in.) †	78 (1982mm)
Int. Length Overall (in.)	46 3/4 (1189mm)
Int. Depth Overall (in.)	27 5/8 (702mm)
Int. Height Overall (in.)	58 3/4 (1493mm)
# of Shelves	6
Shelf Size (L x D) (in.)	22 3/4 x 26 3/8 (L/R)
Net Weight (lbs.)	485
Gross Weight (lbs.)	538

Design and specifications subject to change without notice.

Actual shipping weight may differ due to extra packing materials for product protection.

* Depth does not include 1-1/4" for door handles. † Height does not include 5" for caster height.

■ WARRANTY : 5 Year Parts and Labor Warranty 7 Year Compressor Warranty

■ STANDARD FEATURES

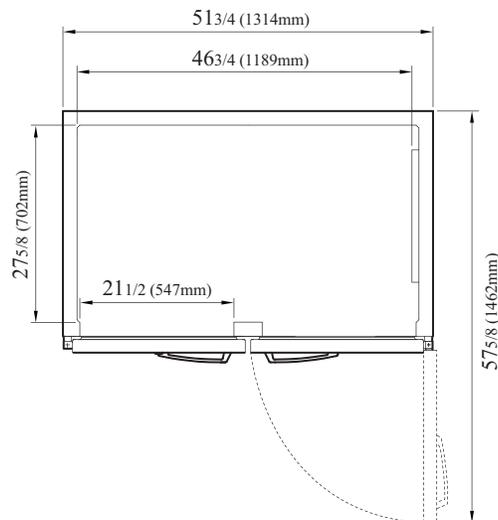
- Anti-corrosion coated evaporator
- Door locks
- Self-contained system
- 4" dia. swivel casters with locks on the front set
- Easy replaceable one piece magnetic door gaskets
- Solid and sturdy grille design
- Top mount compressor

■ OPTIONAL ACCESSORIES

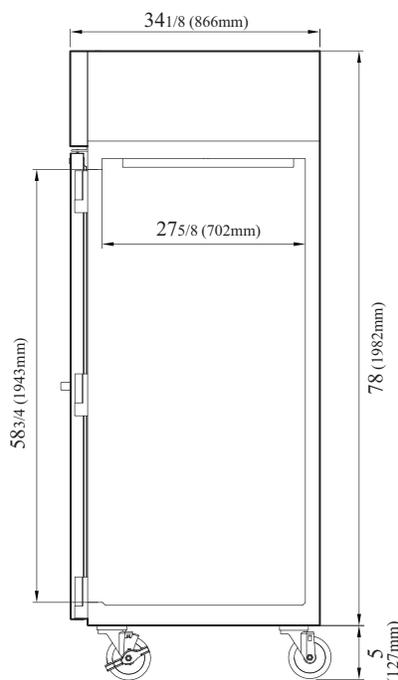
- 5" caster, 1/2" diameter & 13 TPI:
M726500100 (non-brake), M726500200 (w/ brake)
- 4.7" leveling seismic leg (1/2", 13 TPI): 30221M0500
- 6" stainless steel leg: 30221M0600
- Additional stainless steel shelf: (L) H50R901690, (R) H50R901700
- Tray slides kits: TS23-N1LR(#1), TS23-N1LR HALF, TS23-N4LR(#4),
TS23-N4LR HALF, TS23-UNLR(Universal), TS23-UNLR HALF

PLAN VIEW

(unit : inch)



TOP VIEW



SIDE VIEW

Ver.20241108



- Turbo Air: 800-627-0032
- Radiance: 800-500-3519
- Warranty: 800-381-7770
- AC: 888-900-1002



Continued product development may necessitate specification changes without notice.

<p>REFRIGERATOR MANUFACTURER Turbo air</p> <p>more durable, efficient, beautiful</p>	Project:
	Model #:
	Item #:
	Available W/H: Qty:
	Approval:
	AIA #: SIS #:
	CSI Section 11400

Tray Slides Kits for PRO Series Reach-in



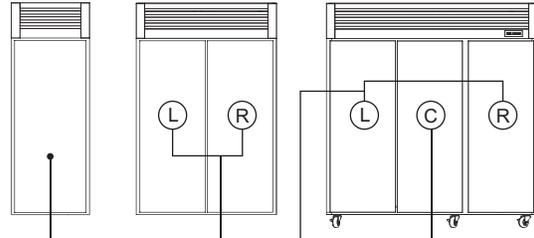
Universal Tray Slides



#1 Tray Slides

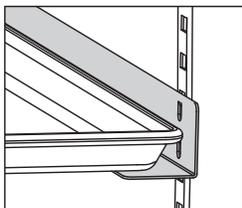


#4 Tray Slides

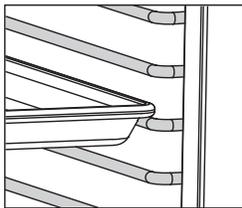


TS1-N1(#1) TS1-N1(#1) HALF TS1-N4(#4) TS1-N4(#4) HALF TS1-UN(Universal) TS1-UN HALF	TS23-N1LR(#1) TS23-N1LR HALF TS23-N4LR(#4) TS23-N4LR HALF TS23-UNLR(Universal) TS23-UNLR HALF TS23-UNLR-H(Universal) TS23-UNLR-H HALF	TS3-N1C(#1) TS3-N1C HALF TS3-N4C(#4) TS3-N4C HALF TS3-UNC(Universal) TS3-UNC HALF TS3-UNC-H(Universal) TS3-UNC-H HALF
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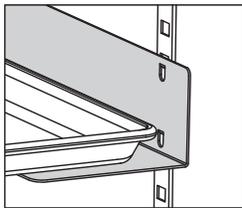
Part Code	Description
TS1-N1(#1)	(9) pairs #1 tray slides and pilasters for PRO-26
TS1-N1 HALF	(5) pairs #1 tray slides and pilasters for PRO-26
TS1-N4(#4)	(2) pairs #4 tray slides and pilasters for PRO-26
TS1-N4 HALF	(1) pair #4 tray slides and pilasters for PRO-26
TS1-UN(Universal)	(7) pairs universal tray slides and pilasters for PRO-26 & PRO-26R-R1
TS1-UN HALF	(4) pairs universal tray slides and pilasters for PRO-26
TS23-N1LR(#1)	(9) pairs #1 tray slides and pilasters for PRO-50 & PRO-77 left or right section
TS23-N1LR HALF	(5) pairs #1 tray slides and pilasters for PRO-50 & PRO-77 left or right section
TS23-N4LR(#4)	(2) pairs #4 tray slides and pilasters for PRO-50 & PRO-77 left or right section
TS23-N4LR HALF	(1) pair #4 tray slides and pilasters for PRO-50 & PRO-77 left or right section
TS23-UNLR(Universal)	(7) pairs universal slides and pilasters for PRO-50 & PRO-77 left or right section
TS23-UNLR HALF	(4) pairs universal slides and pilasters for PRO-50 & PRO-77 left or right section
TS23-UNLR-H(Universal)	(7) pairs universal tray slides and pilasters for PRO-50 & PRO-77 left or right section (Heated Cabinet only)
TS23-UNLR-H HALF	(4) pairs universal tray slides and pilasters for PRO-50 & PRO-77 left or right section (Heated Cabinet only)
TS3-N1C(#1)	(9) pairs #1 tray slides and pilasters for PRO-77 middle section
TS3-N1C HALF	(5) pairs #1 tray slides and pilasters for PRO-77 middle section
TS3-N4C(#4)	(2) pairs #4 tray slides and pilasters for PRO-77 middle section
TS3-N4C HALF	(1) pair #4 tray slides and pilasters for PRO-77 middle section
TS3-UNC(Universal)	(7) pairs universal tray slides and pilasters for PRO-77 middle section
TS3-UNC HALF	(4) pairs universal tray slides and pilasters for PRO-77 middle section
TS3-UNC-H(Universal)	(7) pairs universal tray slides and pilasters for PRO-77 middle section (Heated Cabinet only)
TS3-UNC-H HALF	(4) pairs universal tray slides and pilasters for PRO-77 middle section (Heated Cabinet only)
H26R104460	(1) #1 Tray Slide
H26R104470	(1) Universal Tray Slide



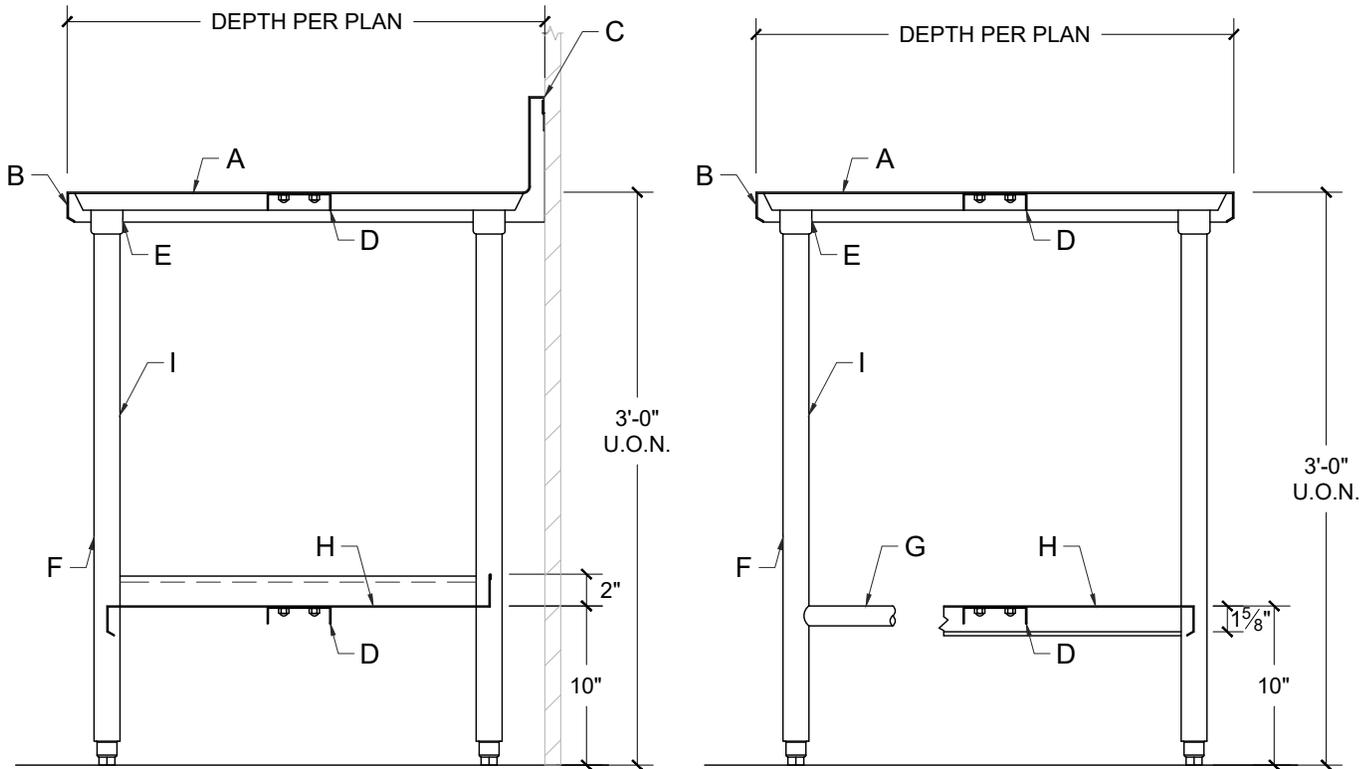
#1 Tray Slides
 16 ga. stainless steel angle type for bottom support of;
 (1) 18"x26" Pan or (2) 14"x18" Pans



#4 Tray Slides
 Stainless steel rod type for rim support of;
 (1) 18"x26" Pan



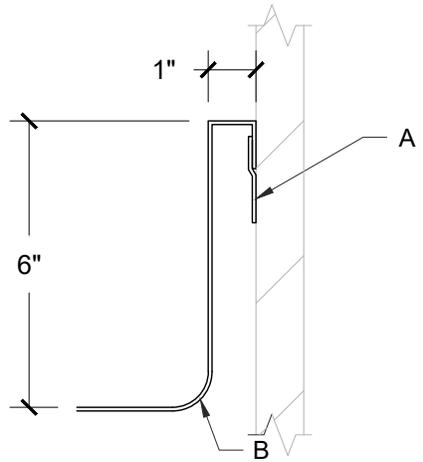
Universal Tray Slides
 16 ga. stainless steel angle type for bottom support of;
 (1) 18"x26" Pan or
 (2) 14"x18" Pans or



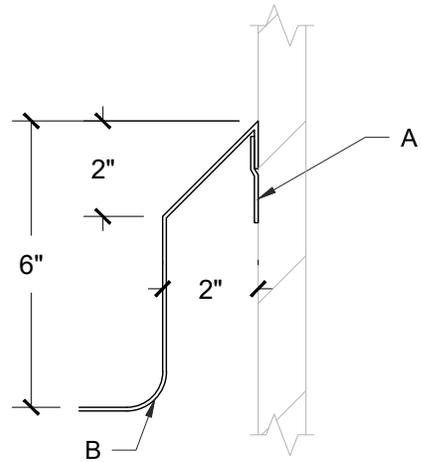
SECTIONS

1" = 1'-0"

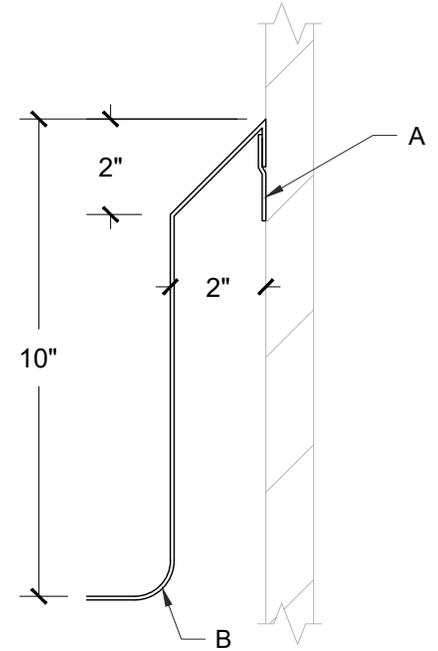
- A. 14GA. TYPE 304 S/S TOP WITH SOUND DEADENING
- B. EDGE PER DETAIL 1-1; EDGE TYPE PER SPECIFICATION
- C. BACK AND/OR SIDE SPLASHES PER THE PLAN AND DETAIL 1-2; SPLASH TYPE PER SPECIFICATIONS
- D. 4"X1" 14 GA. S/S HAT CHANNEL; CAP WITH S/S ACORN NUTS
- E. S/S GUSSETS FULLY WELDED TO 14 GA. S/S HAT CHANNELS
- F. 1-5/8" O.D. 16 GA. S/S LEGS WITH ADJUSTABLE S/S BULLET FEET
- G. WHERE CROSSBRACING IS SPECIFIED, PROVIDE 16 GA. 1-1/4" O.D. S/S CROSSRAIL FULLY WELDED, GROUND & POLISHED AT JUNCTURES, SIDES AND REAR
- H. WHERE UNDERSHELF IS SPECIFIED, PROVIDE 16 GA. S/S SHELF WITH EDGE PER DETAIL 1-1 TYPE A
- I. 5'-0" MAXIMUM O.C. BETWEEN LEGS U.O.N



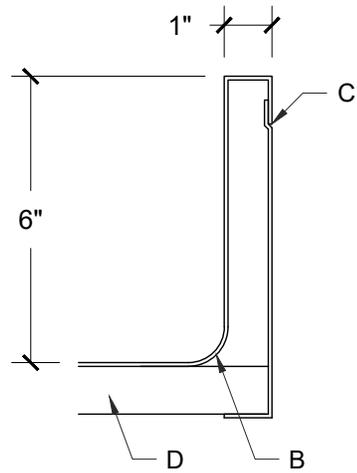
(A) 1" SPLASH



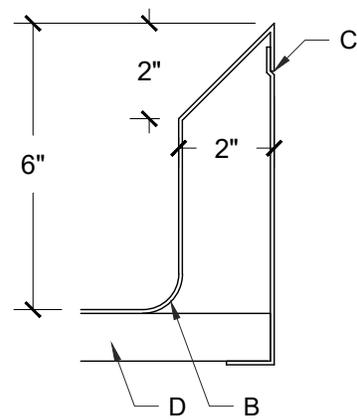
(B) 2" SPLASH



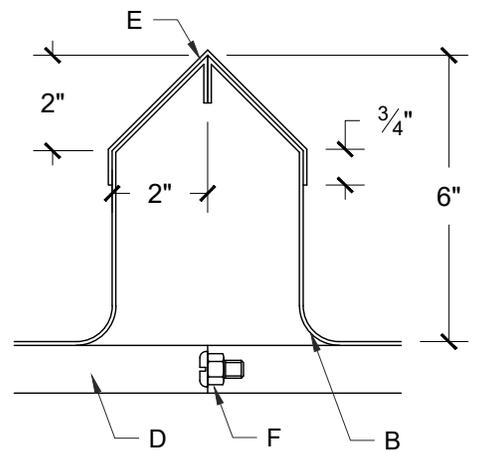
(C) DISHTABLE SPLASH



(D) ENCLOSED 1" SPLASH



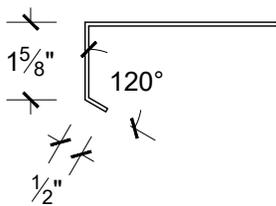
(E) ENCLOSED 2" SPLASH



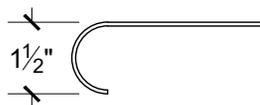
(F) CAPPED SPLASHES

SECTIONS
3" = 1'-0"

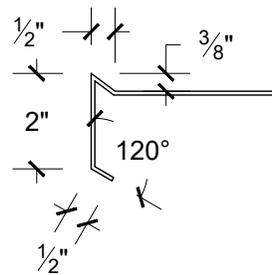
- A. Z CLIP 2" WIDE, 42" O.C. MAX
- B. 3/8" RADIUS
- C. TACK WELD AND SEAL
- D. CHANNEL OR ANGLE
- E. 16 GA S/S CAP PIECE TACK WELDED AND POLISHED
- F. BOLT CHANNELS OR ANGLES TOGETHER



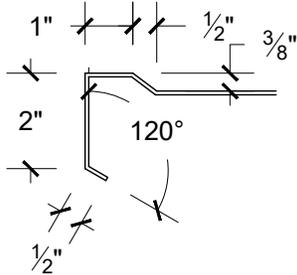
(A) SQUARE EDGE



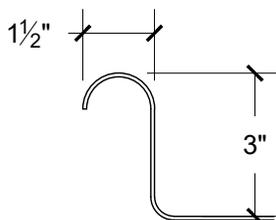
(B) ROLLED EDGE



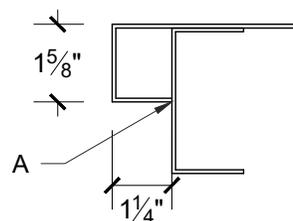
(C) INVERTED "V" EDGE



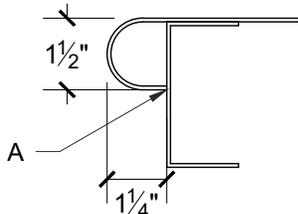
(D) MARINE EDGE



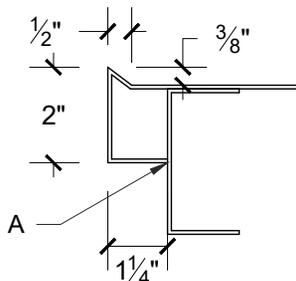
(E) RAISED ROLLED EDGE



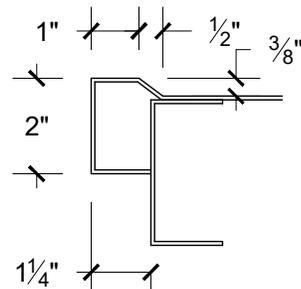
(F) COUNTER CHANNEL EDGE



(G) COUNTER ROLLED EDGE



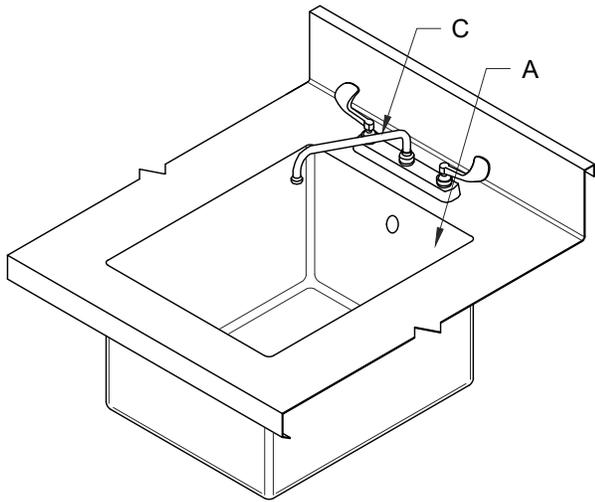
(H) COUNTER INVERTED "V" EDGE



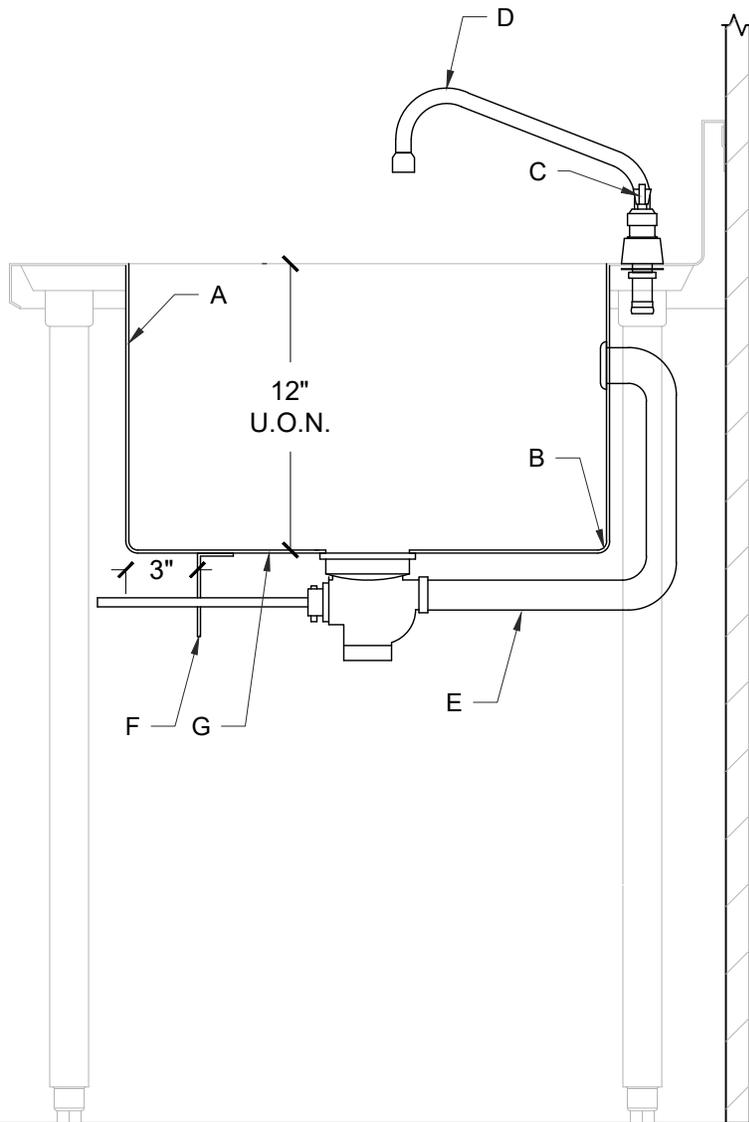
(I) COUNTER MARINE EDGE

SECTIONS
3" = 1'-0"

A. EDGE TO BE TIGHT TO COUNTER AND SEALED

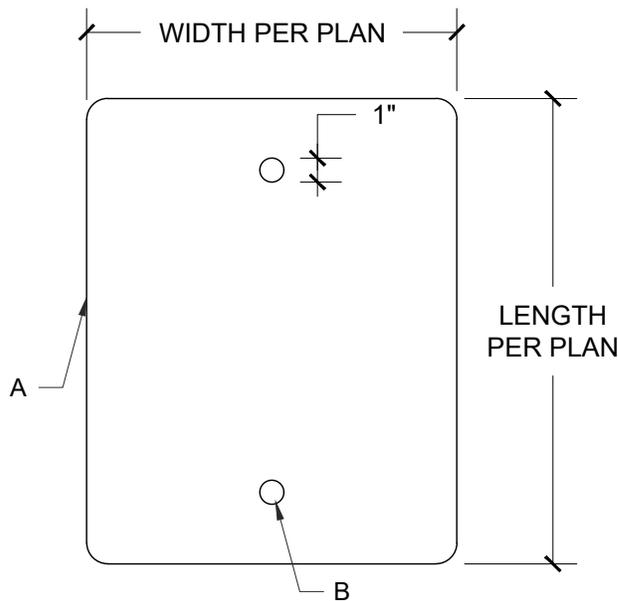


ISOMETRIC
3/4" = 1'-0"

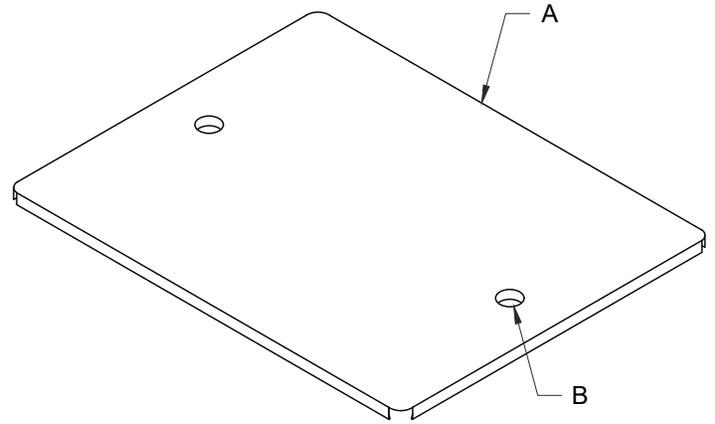


SECTION
1-1/2" = 1'-0"

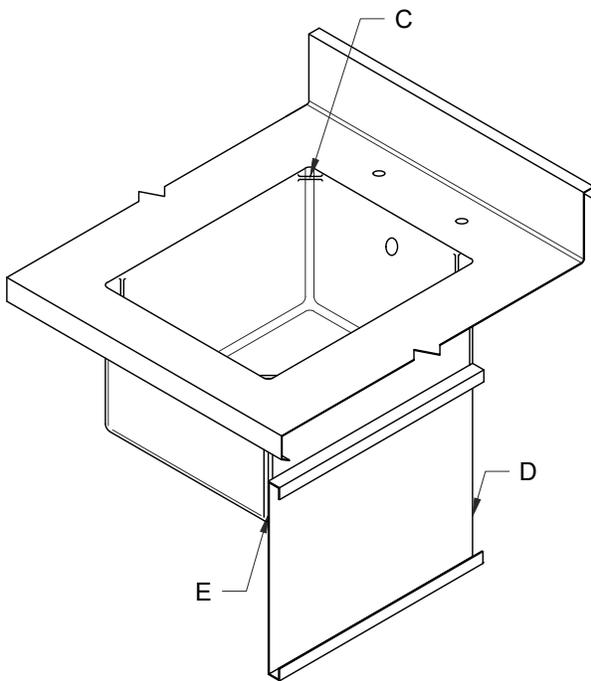
- A. 14 GA. S/S SINK, SIZED PER PLAN
- B. 3/8" RADIUS COVED CORNER CONSTRUCTION
- C. WRIST HANDLES ON FAUCET
- D. SIZE FAUCET TO ALIGN OVER THE DRAIN. PROVIDE A DECK-MOUNTED FAUCET U.O.N.
 - 8": FISHER MODEL 3511 OR T&S BRASS MODEL B-1111
 - 10": FISHER MODEL 3312 OR T&S BRASS MODEL B-1122
 - 12": FISHER MODEL 3313 OR T&S BRASS MODEL B-1123
- WHERE SPLASH-MOUNTED FAUCETS ARE SPECIFIED, PROVIDE:
 - 8": FISHER MODEL 3611 OR T&S BRASS MODEL B-1116
 - 10": FISHER MODEL 3252 OR T&S BRASS MODEL B-1127
 - 12": FISHER MODEL 13269 OR T&S BRASS MODEL B-0231
- E. DRAIN VALVE WITH OVERFLOW ASSEMBLY: FISHER MODEL 2232 OR T&S BRASS MODEL B-3992-01
- F. 14 GA S/S VALVE BRACKET
- G. SOUND DEADEN UNDER SINK



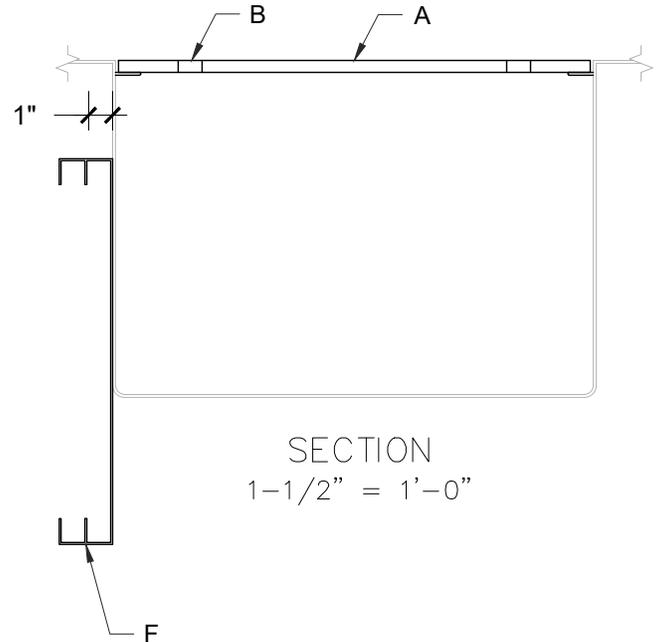
COVER PLAN
1-1/2" = 1'-0"



COVER ISOMETRIC
1-1/2" = 1'-0"

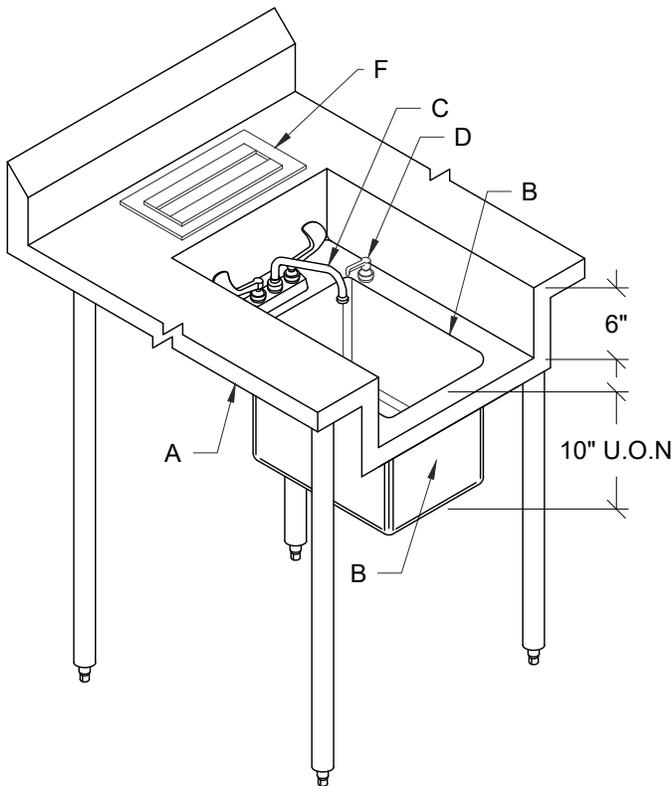


COVER HOLDER ISOMETRIC
3/4" = 1'-0"

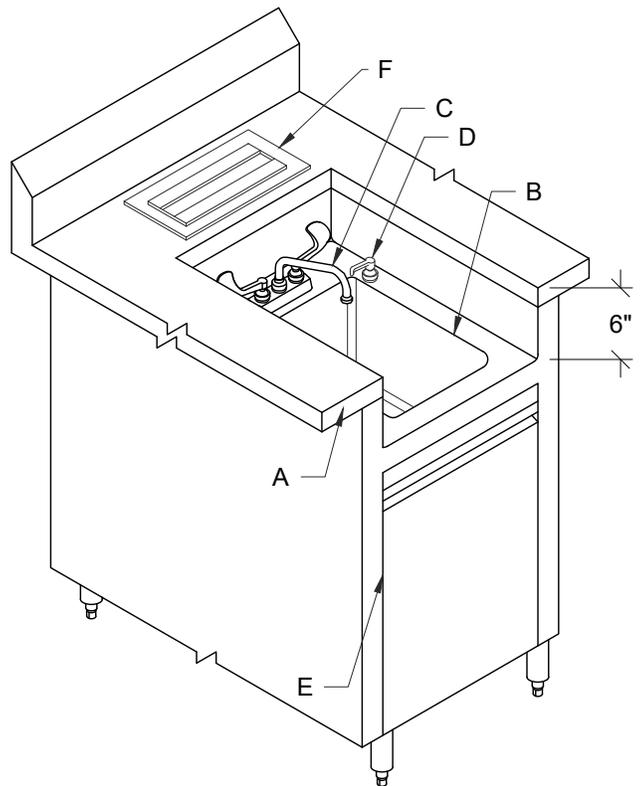


SECTION
1-1/2" = 1'-0"

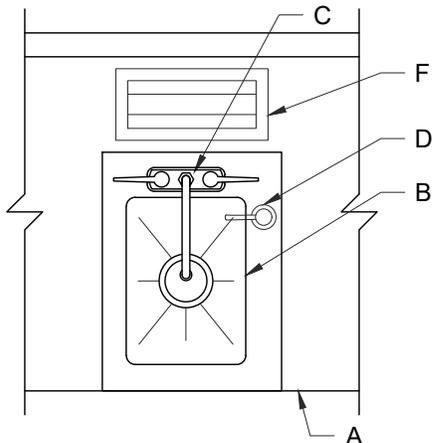
- A. POLYETHYLENE CUTTING BOARD OR 14 GA TYPE 304 SINK COVER WITH TURNED DOWN EDGES TO SIT FLUSH WITH WORK SURFACE
- B. 1" FINGER HOLE
- C. S/S ROD SUPPORTS 1/2" BELOW TOP SURFACE; FULLY WELDED TO SINKS
- D. S/S SINK COVER HOLDER
- E. TO BE WELDED FLUSH ALONG SIDE OF SINK
- F. DIVIDE HOLDER FOR MULTIPLE SINKS



ISOMETRIC: SINK IN WORKTABLE
3/4"=1'-0"



ISOMETRIC: SINK IN COUNTER
3/4"=1'-0"



PLAN
3/4"=1'-0"

- A. COUNTER OR WORKTABLE, AS SPECIFIED
- B. HAND SINK PER DETAIL 3-1, WITHOUT ROTARY WASTE OR OVERFLOW ASSEMBLY ON HAND SINKS
- C. FAUCET WITH WRIST HANDLES AND 0.5 GPM AERATOR
 - 1. DECK-MOUNTED, 8" SWING NOZZLE
 - a. FISHER MODEL 3511
 - b. T&S BRASS MODEL B-1111
- D. PROVIDE SOAP DISPENSER BOBRICK MODEL B-822 OR EQUAL. LOCATE SOAP DISPENSER SO THAT IT DOES NOT CONFLICT WITH WRIST HANDLES
- E. HINGED DOOR PER DETAIL 5-3
- F. PROVIDE PAPER TOWEL DISPENSER BOBRICK MODEL B-526 OR EQUAL

HANDLE OPERATED COFFEE BREWER

CBS-5000 Series

CBS-52H-15

Twin 1.5 Gallon Brewer



Shown with 1.5 Gallon LUXUS® Thermal Dispensers (L40-15)

The CBS-5000 Series was designed for simplicity. The Handle Operated Series brewers save the operator time and effort by delivering quick and consistent results from your pre-programmed coffee recipe. It is the reliable choice for serving high-volumes of single batch coffee all day long.



Handle operation — a quick start!

Simply twist the handle to begin the brew cycle and in minutes your perfectly brewed coffee is ready to serve.



Manual water faucet.

Safely dispense hot water away from steam and brew basket.



Set it and forget it.

Program your recipe once and this brewer delivers consistent and repeatable results.

FETCO®
TRUSTED | RELIABLE | QUALITY

Water Specification

Water Inlet
¾" male flare fitting

Minimum Flow Rate
1¼ gpm [4.71 lpm]

Water Pressure
20-75 psig [138-517 kPa]

Electrical Configuration

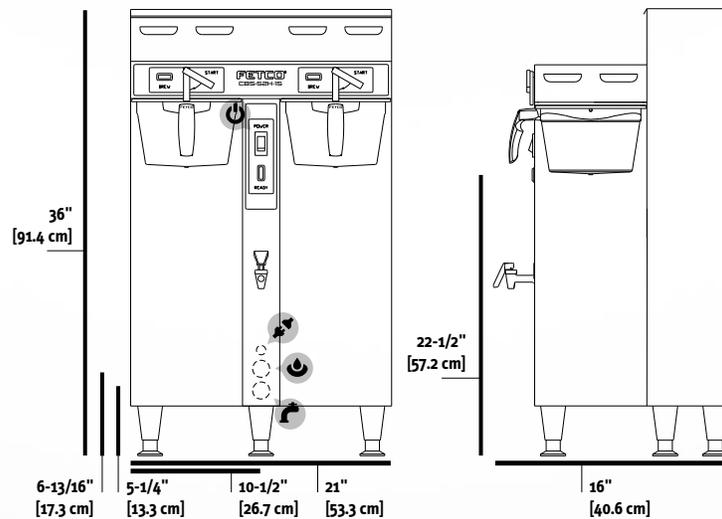
Configuration Code	Heater Configuration	Voltage	Phase	Wires	KW	Electrical Connection	Max Amp Draw	Gallon [Liter] /Hour
US & CANADA								
C52016	2 x 3.0 kW	120/208-240	1	3+G	4.6-6.1	Terminal Block	22.0-25.4	10.5-15.0 [39.7-56.8] ⁽¹⁾
C52026	2 x 4.0 kW	120/208-240	1	3+G	6.1-8.1	Terminal Block	29.3-33.8	15.0-19.5 [56.8-73.8] ⁽¹⁾
C52036 ⁽²⁾	3 x 3.0 kW	120/208-240	3	4+G	7.0-9.1	Terminal Block	19.5-22.4	16.5-22.5 [62.5-85.2] ⁽¹⁾
C52046 ⁽²⁾	3 x 4.0 kW	120/208-240	3	4+G	9.1-12.1	Terminal Block	25.6-29.6	22.5-30.0 [85.2-113.6] ⁽¹⁾
C52186 ⁽²⁾	3 x 4.0 kW	440-480	3	3+G	10.3-12.1	Terminal Block	13.6-14.8	22.5-30.0 [85.2-113.6] ⁽¹⁾
INTERNATIONAL								
C52076 ⁽²⁾	3 x 3.0 kW	220-240/380-415	3	4+G	7.8-9.1	Terminal Block	11.8-12.9	19.5-22.5 [73.8-85.2] ⁽¹⁾
C52086 ⁽²⁾	3 x 4.0 kW	220-240/380-415	3	4+G	10.3-12.1	Terminal Block	15.7-17.1	25.5-30.0 [96.5-113.6] ⁽¹⁾
C52096	2 x 3.0 kW	220-240	1	2+G	5.1-6.1	Terminal Block	23.3-24.4	13.5-15.0 [51.1-56.8] ⁽¹⁾
C52106	2 x 4.0 kW	220-240	1	2+G	6.8-8.1	Terminal Block	30.9-33.8	18.0-19.5 [68.1-73.8] ⁽¹⁾

(1) Based on standard factory settings: 4.0 minute brew time; 0% prewet; 200°F water.

(2) Requires 3 phase Electrical Power System (Z056).

Measurements

Height 36" [91.4 cm]	Width 21" [53.3 cm]	Depth 16" [40.6 cm]	Empty Weight 82 lbs [37.2 kg]	Filled Weight 145 lbs [65.8 kg]	Shipping Weight 100 lbs [45.4 kg]	Shipping Dimensions: 35" x 23" x 23" [88.9 x 58.4 x 58.4 cm]
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Compatible Dispensers

1.5 Gallon LUXUS® Thermal Server (L4S-15)

Must be used with S4S Serving Stations.

1.5 Gallon LUXUS® Thermal Dispenser (L4D-15)

1.5 Gallon LUXUS® Portable Thermal Dispenser (TPD-15)

D452

D449

D009

Customize Your Brewer

Single Serving Station for L4S-15/20 Server

Twin Serving Station for L4S-15/20 Server

Triple Serving Station for L4S-15/20 Server

Identifier Plates, Acrylic

Hot Tea Infuser (1.5 Gallon Size)

Drip Tray - Square

A150

A151

A152

A069

A113

A137

Cups per Hour*

8oz. **475** 12oz. **317** 16oz. **238** 20oz. **190**

* Approximate based on maximum power setting.

Paper Coffee Filters

15" x 5.5" (500/Case)

F001

Information

🖱️ fetco.com

✉️ info@fetco.com

📞 847.719.3000
1.800.338.2699 USA

📠 847.719.3001

🏠 Food Equipment Technologies Co.
600 Rose Road
Lake Zurich, IL 60047
USA

LUXUS[®]

1.0 / 1.5 / 2.0 GALLON THERMAL DISPENSERS AND SERVERS

L4 SERIES



2.0 Gallon

1.5 Gallon

1.0 Gallon

L4D Thermal
Dispensers



2.0 Gallon

1.5 Gallon

1.0 Gallon

L4S Thermal
Servers

The L4 Series Thermal Dispenser and Servers are designed to keep your coffee service hot, fresh and portable. With the legendary thermal retention properties you'd expect from FETCO, the L4 is equipped with enhanced features that now make it even easier for operators to manage their daily coffee service. Digital liquid-level monitoring and rugged stainless construction make the L4 the perfect self-serve choice for any foodservice segment - Hotels, OCS, C-Stores, Restaurants, Coffee Shops, Cafes, etc.

* Shown with #A147
Server Stand
(sold separately)

FETCO[®]
TRUSTED | RELIABLE | QUALITY

L4D Series LUXUS® Thermal Dispensers & Servers

The LUXUS® L4D Thermal Dispensers and Servers are designed to retain all the heat generated during the brewing process with very little dissipation. In fact, FETCO thermal dispensers maintain the suggested 180-185°F holding temperature for at least 4 hours and meet or exceed industry standards. This patented technology eliminates the need for an additional heat source, thus saving energy and equipment costs.



L4D Dispenser

With integrated stand and removable drip tray.



L4S Server

Shown with Serving Station with removable drip tray (sold separately).

Key Features and Benefits

Integrated Lid Design with Improved Functionality

The integrated lid design features a removable funnel system, pivoting brew cap and front-positioned handle.

- ▶ Precision Fit Funnel Assembly keeps moisture and heat from escaping to lock in freshness and aroma
- ▶ Brew Cap mounted on lid exterior for easy access
- ▶ Forward positioned handle for better maneuverability

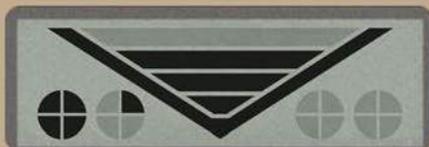


Digital Freshness Timer

Four pie-shaped visual indicators that represent how much time (in 15 minute increments) has elapsed since filling.



- ▶ Example #1
1 hour 15 mins. elapsed / 80% liquid remaining (represented by 4 filled bars)



*NOTE: Time is reset when dispenser is emptied, removing funnel or when enough liquid is added to increase volume by one level.

Digital Volume Indicator

Digital visual indicator shows how much liquid remains with a series of "V" shape bars representing 20% increments.



- ▶ Example #2
2 hours 30 mins. elapsed / 20% liquid remaining (represented by 1 filled bar)



*NOTE: Time is reset when dispenser is emptied, removing funnel or when enough liquid is added to increase volume by one level.

Funnel Construction

Funnel enclosure helps provide additional protection to circuit board, internal battery and display window. Features built-in handle for quick cleaning and maintenance.



Traditional Pull Faucet

Precise control of beverage container filling. Transparent polycarbonate faucet guard keeps containers and cups away from the spout to help prevent cross contamination.



Wrap Stabilizer

Pronounced ledge in molded plastic cover helps prevent graphic "wraps" from sliding up the dispenser body during handling.



Multi-Face Serving Stations (L4 Servers)

Modular multi-station design in 1, 2 or 3 increments can create a permanent or temporary beverage service on any countertop, meeting room, lobby or food line.



L4D Dispenser / L4S Server

Technical Specifications

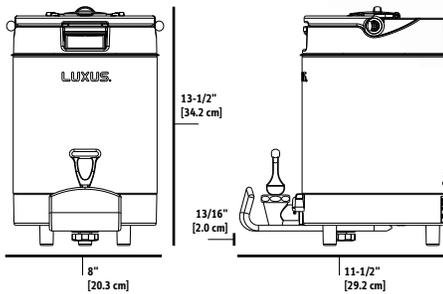
Measurements

D448	L4D-10 1.0 Gallon LUXUS® Thermal Dispenser				
Product	Height 21 3/4" [55.2 cm]	Width 8" [20.3 cm]	Depth 12 1/2" [31.7 cm]	Empty Weight 8.0 lbs [3.6 kg]	Filled Weight 15.9 lbs [7.2 kg]
Shipping	23"	16"	13"	12.0 lbs	–
D449	L4D-15 1.5 Gallon LUXUS® Thermal Dispenser				
Product	Height 23" [58.4 cm]	Width 9" [22.9 cm]	Depth 13 1/4" [33.6 cm]	Empty Weight 10.5 lbs [4.8 kg]	Filled Weight 22.4 lbs [10.2 kg]
Shipping	25"	17"	13"	14.0 lbs	–
D450	L4D-20 2.0 Gallon LUXUS® Thermal Dispenser				
Product	Height 24 1/2" [62.2 cm]	Width 9" [22.9 cm]	Depth 13 1/4" [33.6 cm]	Empty Weight 11.5 lbs [4.8 kg]	Filled Weight 27.5 lbs [10.2 kg]
Shipping	27"	17"	13"	16.0 lbs	–

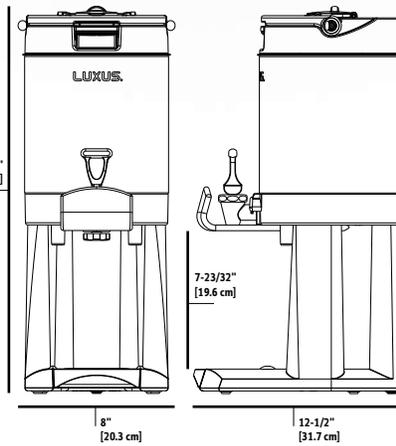
D451	L4S-10 1.0 Gallon LUXUS® Thermal Server*				
Product	Height 13 1/2" [34.2 cm]	Width 8" [20.3 cm]	Depth 11 1/2" [29.2 cm]	Empty Weight 5.6 lbs [2.5 kg]	Filled Weight 12.4 lbs [5.6 kg]
Shipping	15"	16"	12"	9.0 lbs	–
D452	L4S-15 1.5 Gallon LUXUS® Thermal Server*				
Product	Height 14 3/4" [37.4 cm]	Width 9" [22.9 cm]	Depth 12 1/2" [31.7 cm]	Empty Weight 7.2 lbs [3.3 kg]	Filled Weight 17.6 lbs [8.0 kg]
Shipping	16"	17"	13"	10.0 lbs	–
D453	L4S-20 2.0 Gallon LUXUS® Thermal Server*				
Product	Height 16 1/16" [40.8 cm]	Width 9" [22.9 cm]	Depth 12 1/2" [31.7 cm]	Empty Weight 8.3 lbs [3.3 kg]	Filled Weight 25.0 lbs [8.0 kg]
Shipping	21"	17"	13"	12.0 lbs	–

* Must be used with with "A" series Serving Stations.

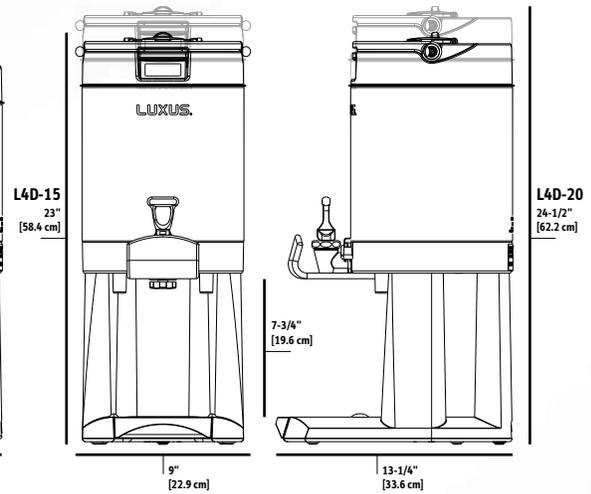
L4S-10



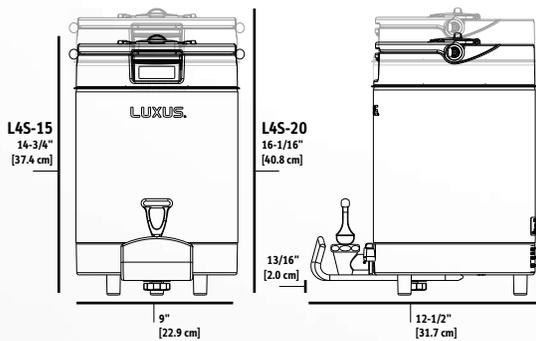
L4D-10



L4D-15/20



L4S-15/20



Customize Your Dispenser

- #1071.00030.00 Orange Dispenser Faucet Replacement Handle*
- #1071.00031.00 Green Dispenser Faucet Replacement Handle*
- #1071.00032.00 Blue Dispenser Faucet Replacement Handle*
- #1071.00040.00 Red Dispenser Faucet Replacement Handle*
- #Z053 Rear Facing Positioned Digital Display

* Color choice must be specified at time of purchase for no charge

Serving Stations

Serving Stations for L4S-10 Server

- #A147 Single Face
- #A148 Double Facing
- #A149 Triple Facing

Serving Stations for L4S-15/L4S-20 Servers

- #A150 Single Face
- #A151 Double Facing
- #A152 Triple Facing



NOTE: Serving stations work for both L3 and L4 series servers.

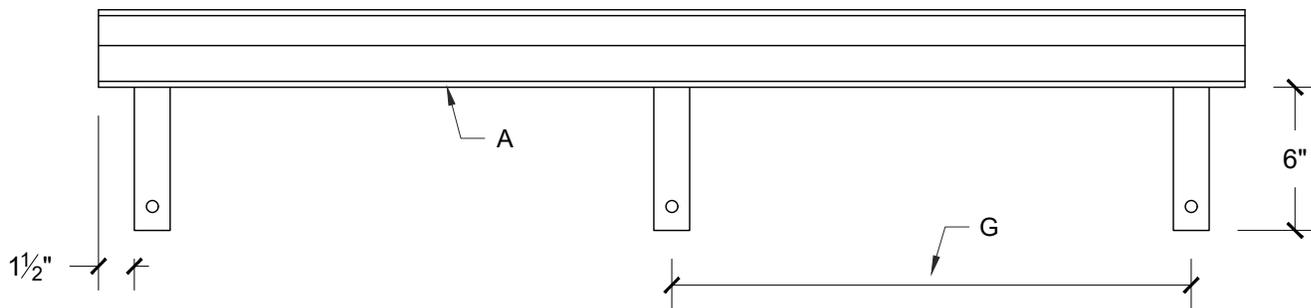
Information

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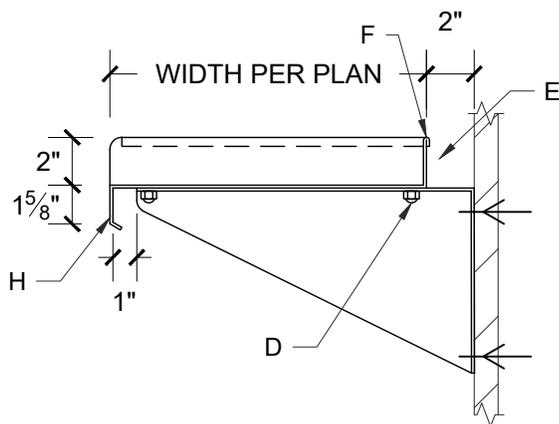
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847.719.3001

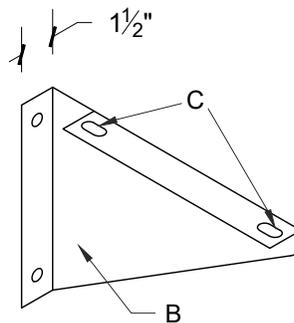
Food Equipment Technologies Co.
600 Rose Road
Lake Zurich, IL 60047
USA



ELEVATION
1-1/2" = 1'-0"

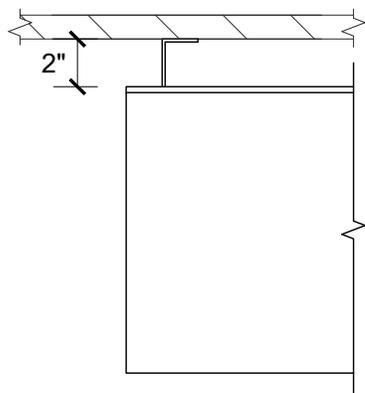


SECTION
1-1/2" = 1'-0"

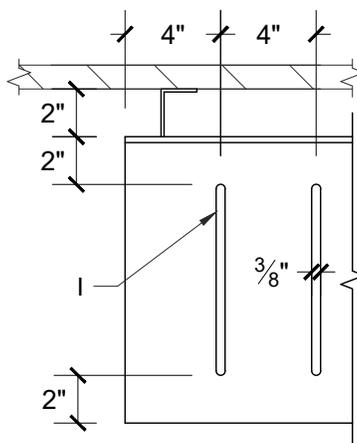


BRACKET DETAIL
1-1/2" = 1'-0"

- A. 16 GA S/S SHELF
- B. 14 GA S/S BRACKET
- C. ELONGATED STUD HOLES FOR FIELD ADJUSTMENTS
- D. WELD STUDS TO UNDERSIDE OF SHELF; CAP WITH S/S ACORN NUTS
- E. 2" STAND OFF FROM WALL
- F. TURN UP AND HEM
- G. BRACKETS SPACED NO MORE THAN 5'-0" APART O.C.
- H. SQUARE EDGE PER DETAIL 1-1 TYPE A
- I. WHERE SLOTTED SHELF SPECIFIED, PROVIDE CUTOUTS 4" APART O.C.



PLAN
1-1/2" = 1'-0"



PLAN: SLOTTED SHELF
1-1/2" = 1'-0"



QC7I SINGLE 4FC5-S

System Part Number: EV9202-61



SYSTEM DESCRIPTION

The **QC7I Single 4FC5-S** water filtration system features exclusive Fibredyne™ II bacteriostatic media that filters sediment down to 5 microns and provides chlorine taste & odor reduction at a flow rate of 2.5 gpm for 15,000 gallons. The 5 micron mechanical filtration supports lasting, balanced performance with high turbidity water supplies. Integrated scale inhibitor media helps protect against the formation of scale* on equipment surfaces. This system is certified under NSF/ANSI Standard 42.

FEATURES • BENEFITS

- ◆ Integrated scale inhibitor minimizes the potential for scale formation* to ensure reliable, efficient equipment operation
- ◆ Proprietary Fibredyne II media reduces chlorine taste & odor while providing particulate reduction down to 5 microns
- ◆ Fibredyne II media inhibits the growth of bacteria within the filter to guard against media fouling and optimize performance
- ◆ Inlet shutoff valve, flush valve, and pressure gauges simplify service and monitor operating performance
- ◆ Quick-change (QC) cartridges make changing cartridges simple and sanitary
- ◆ Reduces a range of contaminants to help ensure clearer, fresher water for consistently great-tasting beverages
- ◆ Helps protect equipment to help ensure reliable and efficient operation resulting in reduced maintenance and downtime
- ◆ NSF/ANSI Standard 42 certified for Bacteriostatic Effects and the reduction of Chlorine Taste & Odor, and Particulate Class III

APPLICATIONS

- ◆ Ice machines
- ◆ Coffee brewers

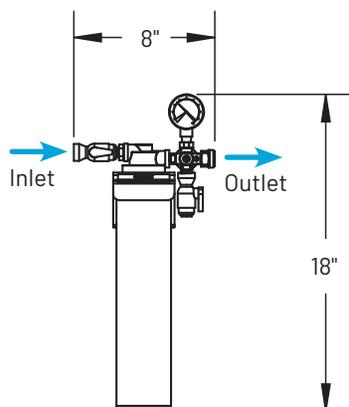
INSTALLATION TIPS

- ◆ Choose a mounting location suitable to support the weight of the system while operating.
- ◆ Install vertically and allow 2½" (6.35 cm) clearance below the cartridge for easy removal and replacement.
- ◆ Feed water temperature must not exceed 100°F (38°C).
- ◆ Do not install where the system could be exposed to freezing temperatures.
- ◆ Feed water supply pressure must not exceed 125 psi (non-shock). When pressure exceeds 85 psi, a pressure reducing valve is recommended.
- ◆ Flush cartridges by running water through the system for five (5) minutes.
- ◆ For more details, see the installation, operation, and maintenance guide included with the system.

*As tested by Pentair.
EPA Est. 002623-IL-002

QC71 SINGLE 4FC5-S

EV9202-61



SPECIFICATIONS

System	Performance
Overall Dimensions 18" H x 8" W x 5.25" D (45.7 cm x 20.4 cm x 13.4 cm)	Service Flow Rate 2.5 gpm (9.46 lpm)
Connections Inlet Connection: 3/8" FNPT Outlet Connection: 3/8" FNPT	Rated Capacity 15,000 gallons (56,781 L)
Operating Pressure 10 - 125 psi (0.7 - 8.6 bar)	Chlorine Taste & Odor Reduction Yes
Water Temperature 35 - 100°F (2 - 38°C)	Particulate Reduction Yes
Operating Weight 8 lbs (3.7 kgs)	Bacteriostatic Effects Yes
Shipping Weight 5 lbs (2.3 kgs)	
Electrical Connection None required	

REPLACEMENT CARTRIDGE(S)

Model	Qty	Description	Part No
4FC5-S	1	Primary filter	EV9693-31

For Pentair Everpure Product Warranties visit:
<http://pentair.com/assets/foodservice-warranty>

It is recommended that filter cartridges be replaced every six (6) months on a regular scheduled program, or when capacity is reached or if water pressure or flow to equipment becomes inadequate.

Always replace filter cartridges at least once per year.

The contaminants or other substances removed or reduced by this drinking water system are not necessarily in your water. Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system.

Systems certified for cyst reduction may be used on disinfected water that may contain filterable cysts.

Since the conditions under which our products may be used are beyond our control, we cannot accept any liability with respect to the improper installation, application and/or use of our products.



System Tested and Certified by NSF International against NSF/ANSI Standard 42 for the reduction of:

STANDARD NO. 42 –
 AESTHETIC EFFECTS
 Bacteriostatic Effects
 Chemical Reduction
 Taste & Odor
 Chlorine
 Mechanical Filtration
 Nominal Particulate Class III



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India | Boulevard, B-9/A, 7th Floor - Tower B Sector 62 | Noida - 201301 | 91.120.419.9444 Tel | indiacustomer@pentair.com

Europe | Pentair Water Belgium BVBA | Industriepark Wolfstee, Toekomstlaan 30, B-2200 Herentals | Belgium | +32.(0).14.283.504 Tel | sales@everpure-europe.com

Japan | Japan Inc. | Hashimoto MN Bldg. 7F, | 3-25-1 Hashimoto, Midori-ku, Sagami-hara-shi | Kanagawa 252-0143 | Japan | 81.(0)42.775.3011 Tel | info@everpure.co.jp

Southeast Asia | 390 Havelock Road, | #04-01 King's Centre | Singapore 169662 | 65.6768.5800 Tel | cseverpure@pentair.com

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EVERPURE® 4FC5-S FILTER CARTRIDGE

DELIVER PREMIUM QUALITY DRINKING WATER FOR ICE, STEAM AND COFFEE APPLICATIONS

4FC5-S Replacement Cartridge (1 PK): EV9693-31



APPLICATIONS

Ice	Combi Ovens
Steam Ovens	Coffee

FEATURES • BENEFITS

Integrated beaded phosphate with levels specifically selected for greater life and scale inhibition

Sanitary cartridge replacement is simple, quick and clean; internal filter parts are never exposed to handling or contamination

Protects drink system seals, pump, tubing and small orifices from clogging, corrosion and abrasive wear

Reduces chlorine taste & odor and other offensive contaminants that can adversely affect the taste of beverages

Balanced cartridge for optimum performance in varying water qualities

Improves the taste of fountain beverages and helps retain the drink's carbonation

New Fibredyne™ II media with AgION® antimicrobial protection inhibits any potential bacterial growth

Reduces dirt and particles as small as five (5) microns in size

Increased capacity for extended reduction of chemical and mechanical contaminants

Compatible with Insurice®, Insurice PF, QC7I, QL2, QL3B and QL3 Heads

NSF® Certified under NSF/ANSI Standard 42

INSTALLATION TIPS

Install vertically so cartridge hangs down. Allow 2-1/2" (6.3 cm) clearance below the cartridge for easy cartridge replacement. Flush cartridge by running water through system for five (5) minutes at full flow.

OPERATION TIPS

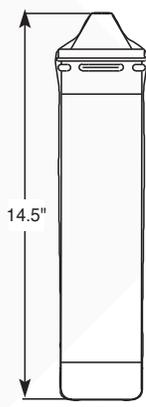
Change cartridge on a regular six (6) month preventative maintenance program. Change cartridge when capacity is reached or when pressure falls below 10 psi (0.6 bar). Always flush the filter cartridge at time of installation and cartridge change.

SIZING

Service Flow Rate: 2.5 gpm (9.5 Lpm)
Rated Capacity: 15,000 gallons (56,781 L)

EVERPURE® 4FC5-S FILTER CARTRIDGES

EV9693-31



SPECIFICATIONS

Service Flow Rate

2.5 gpm (9.5 Lpm)

Rated Capacity

15,000 gallons (56,781 L)

Pressure Requirements

10 - 125 psi (0.7 - 8.6 bar), non-shock

Temperature Requirements

35 - 100°F (2 - 38°C)

Overall Dimensions

14.5" L x 3.25" D (36.8 cm x 8.3 cm)



System Tested and Certified by NSF International against NSF/ANSI Standards 42 and 53 for the reduction of:

STANDARD NO. 42 — AESTHETIC EFFECTS

- Bacteriostatic Effects
- Chemical Reduction
- Taste & Odor
- Chlorine

- Mechanical Filtration
- Nominal Particulate, Class III

WARRANTY

Everpure by Pentair® water treatment systems (excluding replaceable elements) are covered by a limited warranty against defects in material and workmanship for a period of five years after date of purchase. Everpure replaceable elements (filter cartridges and water treatment cartridges) are covered by a limited warranty against defects in material and workmanship for a period of one year after date of purchase. See printed warranty for details. Pentair will provide a copy of the warranty upon request.



WATER QUALITY SYSTEMS

EVERPURE-SHURFLO WORLD HEADQUARTERS, 1040 MUIRFIELD DRIVE, HANOVER PARK, IL 60133 USA • FOODSERVICE.PENTAIR.COM
800.942.1153 MAIN (US ONLY) • 630.307.3000 MAIN • 630.307.3030 FAX • CSEVERPURE@PENTAIR.COM EMAIL

EVERPURE-SHURFLO AUSTRALIA, 1-21 MONASH DRIVE, DANDENONG SOUTH, VIC 3175, AUSTRALIA
011.1300.576.190 TEL • 011.61.39.562.7237 FAX • AU.EVERPURE@PENTAIR.COM EMAIL

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86.21.3211.4588 TEL • 86.21.3211.4580 FAX • CHINA.WATER@PENTAIR.COM EMAIL

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EVERPURE-SHURFLO JAPAN INC., HASHIMOTO MN BLDG. 7F, 3-25-1 HASHIMOTO, MIDORI-KU, SAGAMIHARA-SHI KANAGAWA 252-0143, JAPAN
81.(0)42.775.3011 TEL • 81.(0)42.775.3015 FAX • INFO@EVERPURE.CO.JP EMAIL

EVERPURE-SHURFLO SOUTHEAST ASIA, SOUTHEAST ASIA, 390 HAVELOCK ROAD, #04-01, KING'S CENTRE, SINGAPORE 169662
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SlimJim®

The Slim Jim® container delivers the durability needed for commercial environments combined with brand new innovation to increase worker productivity. New product features and accessories deliver the most efficient solution for collection, transportation, and disposal of multi-stream waste and recyclables.

Features and Benefits:

- Venting channels make removing liners up to 80% easier, improving productivity and reducing the risk of worker injury
- Four bag cinches secure liners around the rim of the container and allow for quick, knot-free liner changes
- Handles at the base and rim of the container improve grip and control while lifting and emptying full containers
- Rim with rib-strengthened design increases strength and resists crushing
- Build a recycling station with a variety of dolly and lid options to meet any facility need

COLORS AVAILABLE

Blue, Green, Black, Beige, Brown, Gray, Yellow*, Red*

* 23-gallon only

Material Composition:

Injection molded with a high-quality resin blend.

Accessories:

STAINLESS STEEL DOLLIES

- Slim Jim® Single Dolly
- Slim Jim® Double Dolly
- Slim Jim® Triple Dolly
- Slim Jim® Quadruple Dolly

RESIN DOLLY

- Slim Jim® Trainable Dolly

LIDS

- Bottles and Cans Lid
- Paper Lid
- Mixed Recycling Lid
- Hinged Lid
- Swing Lid

SLIM JIM® CONTAINERS



23-Gallon Slim Jim® Container



16-Gallon Slim Jim® Container

SLIM JIM® CONTAINERS

SKU #	DESCRIPTION	COLOR	CAPACITY		LENGTH		WIDTH		HEIGHT		PACK SIZE
			GAL	L	IN	CM	IN	CM	IN	CM	
1971258	SLIM JIM® CONTAINER	GRAY	16	61	22"	55.88	11"	27.94	25"	63.50	4
1955959	SLIM JIM® CONTAINER	BLACK	16	61	22"	55.88	11"	27.94	25"	63.50	4
1971259	SLIM JIM® CONTAINER	BEIGE	16	61	22"	55.88	11"	27.94	25"	63.50	4
1956181	SLIM JIM® CONTAINER	BROWN	16	61	22"	55.88	11"	27.94	25"	63.50	4
1971257	SLIM JIM® CONTAINER	BLUE	16	61	22"	55.88	11"	27.94	25"	63.50	4
1955960	SLIM JIM® CONTAINER	GREEN	16	61	22"	55.88	11"	27.94	25"	63.50	4
FG354060GRAY	SLIM JIM® CONTAINER	GRAY	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354060BLA	SLIM JIM® CONTAINER	BLACK	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354060BEIG	SLIM JIM® CONTAINER	BEIGE	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956187	SLIM JIM® CONTAINER	BROWN	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956185	SLIM JIM® CONTAINER	BLUE	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956186	SLIM JIM® CONTAINER	GREEN	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956188	SLIM JIM® CONTAINER	YELLOW	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956189	SLIM JIM® CONTAINER	RED	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354007BLUE	SLIM JIM® CONTAINER	BLUE (RECYCLING)	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354007GRN	SLIM JIM® CONTAINER	GREEN (RECYCLING)	23	87	22"	55.88	11"	27.94	30"	76.20	4



R-102™ RESTAURANT FIRE SUPPRESSION SYSTEMS

Data/Specifications



FEATURES

- Low pH Agent
- Proven Design
- Reliable Cartridge Operated
- Aesthetically Appealing
- UL Listed – Meets Requirements of UL 300
- ULC Listed – Meets Requirements of ULC/ORD-C1254.6
- ▶ ■ CE Marked

APPLICATION

The ANSUL® R-102™ Restaurant Fire Suppression System is an automatic, pre-engineered, fire suppression system designed to protect the following areas associated with cooking equipment; ventilating equipment including hoods, ducts, plenums, and filters; fryers; griddles and range tops; upright, natural charcoal, or chain-type broilers; electric, lava rock, mesquite or gas-radiant char-broilers and woks.

The system is ideally suitable for use in restaurants, hospitals, nursing homes, hotels, schools, airports, and other similar facilities.

Use of the R-102 system is limited to interior applications only. The regulated release and tank assemblies must be mounted in an area where the air temperature will not fall below 32 °F (0 °C) or exceed 130 °F (54 °C). The system must be designed and installed within the guidelines of the UL/ULC Listed Design, Installation, Recharge, and Maintenance Manual.

SYSTEM DESCRIPTION

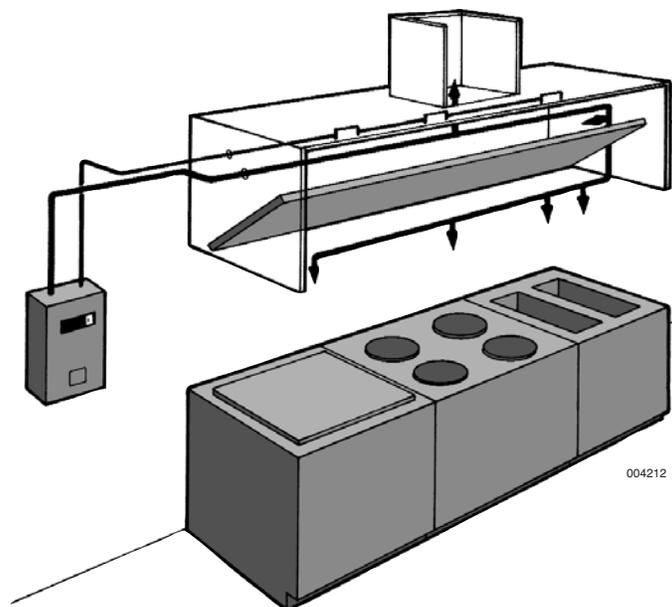
The restaurant fire suppression system is a pre-engineered, wet chemical, cartridge-operated, regulated pressure type with a fixed nozzle agent distribution network. It is listed with Underwriters Laboratories, Inc. (UL/ULC).



004215

The system is capable of automatic detection and actuation and/or remote manual actuation. Additional equipment is available for mechanical or electrical gas line shut-off applications.

The detection portion of the fire suppression system allows for automatic detection by means of specific alloy rated fusible links, which, when the temperature exceeds the rating of the link, the link separates, allowing the regulated release to actuate.



004212

A system owner's guide is available containing basic information pertaining to system operation and maintenance. A detailed technical manual is also available including system description, design, installation, recharge, and maintenance procedures, plus additional equipment installation and resetting instructions.

The system is installed and serviced by authorized distributors that are trained by the manufacturer.

The basic system consists of an ANSUL AUTOMAN® regulated release assembly which includes a regulated release mechanism and a wet chemical storage tank housed within a single enclosure. Nozzle blow-off caps, detectors, cartridges, agent, fusible links, and pulley elbows are supplied in separate packages in the quantities needed for fire suppression system arrangements.

Additional equipment includes remote manual pull station, mechanical and electrical gas valves, pressure switches, and electrical switches for automatic equipment and gas line shut-off. Accessories can be added such as alarms, warning lights, etc., to installations where required.

Tanks can be used in multiple arrangements to allow for larger hazard coverage. Each tank is limited to a listed maximum amount of flow numbers.



004213

COMPONENT DESCRIPTION

Wet Chemical Agent – The extinguishing agent is a mixture of organic salts designed for rapid flame knockdown and foam securement of grease related fires. It is available in plastic containers with instructions for wet chemical handling and usage.

Agent Tank – The agent tank is installed in a stainless steel enclosure or wall bracket. The tank is constructed of stainless steel.

Tanks are available in two sizes: 1.5 gallon (5.7 L) and 3.0 gallon (11.4 L). The tanks have a working pressure of 110 psi (7.6 bar), a test pressure of 330 psi (22.8 bar), and a minimum burst pressure of 600 psi (41.4 bar).

The tank includes an adaptor/tube assembly. The adaptor is chrome-plated steel with a 1/4 in. NPT female gas inlet and a 3/8 in. NPT female agent outlet. The adaptor also contains a bursting disc seal which prevents the siphoning of agent up the pipe during extreme temperature variations.

Regulated Release Mechanism – The regulated release mechanism is a spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to one or two agent tanks, depending on the capacity of the gas cartridge used. It contains a factory installed regulator deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar). It has automatic actuation capabilities by a fusible link detection system and remote manual actuation by a mechanical pull station.

The regulated release mechanism contains a release assembly, regulator, expellant gas hose, and agent storage tank housed in a stainless steel enclosure with cover. The enclosure contains knock-outs for 1/2 in. conduit. The cover contains an opening for a visual status indicator.

It is compatible with mechanical gas shut-off devices; or, when equipped with a field or factory-installed switch, it is compatible with electric gas line or appliance shut-off devices.

Regulated Actuator Assembly – When more than two agent tanks are required, the regulated actuator is available to provide expellant gas for additional tanks. It is connected to the cartridge receiver outlet of the regulated release mechanism providing simultaneous agent discharge. It contains a regulated actuator deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar). It has automatic actuation capabilities by a fusible link detection system and remote manual actuation by a mechanical pull station.

The regulated actuator assembly contains a regulated actuator, regulator, expellant gas hose, and agent tank housed in a stainless steel enclosure with cover. The enclosure contains knockouts to permit installation of the expellant gas line.

Discharge Nozzles – Each discharge nozzle is tested and listed with the R-102 system for a specific application. Nozzle tips are stamped with the flow number designation (1/2, 1, 2, and 3). Each nozzle must have a metal or rubber blow-off cap to keep the nozzle tip orifice free of cooking grease build-up.

APPROVALS

Applicable Standards: ULI listed under EX-3470; ULC listed under CEX-747; meets requirements of NFPA 96 (Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment); NFPA 17A (Standard on Wet Chemical Extinguishing Systems); CE Marked.

ORDERING INFORMATION

Order all system components through your local authorized ANSUL Distributor.

SPECIFICATIONS

An ANSUL R-102 Fire Suppression System shall be furnished. The system shall be capable of protecting all hazard areas associated with cooking equipment.

1.0 GENERAL

1.1 References

- 1.1.1 Underwriters Laboratories, Inc. (UL)
 - 1.1.1.1 UL Standard 1254
 - 1.1.1.2 UL Standard 300
- 1.1.2 Underwriters Laboratories of Canada (ULC)
 - 1.1.2.1 ULC/ORD-C 1254.6
- 1.1.3 National Fire Protection Association (NFPA)
 - 1.1.3.1 NFPA 96
 - 1.1.3.2 NFPA 17A

1.2 Submittals

- 1.2.1 Submit two sets of manufacturer's data sheets
- 1.2.2 Submit two sets of piping design drawings

1.3 System Description

- 1.3.1 The system shall be an automatic fire suppression system using a wet chemical agent for grease related fires.
- 1.3.2 The system shall be capable of suppressing fires in the following areas associated with cooking equipment: ventilating equipment including hoods, ducts, plenums, and filters; fryers; griddles and range tops; upright, natural charcoal, or chain-type broilers; electric, lava rock, mesquite or gas-radiant char-broilers.
- 1.3.3 The system shall be the pre-engineered type having minimum and maximum guidelines established by the manufacturer and listed by Underwriters Laboratories, Inc. (UL).
- 1.3.4 The system shall be installed and serviced by personnel trained by the manufacturer.
- 1.3.5 The system shall be capable of protecting cooking appliances by utilizing either dedicated appliance protection and/or overlapping appliance protection.

SPECIFICATIONS

1.4 Quality Control

- 1.4.1 Manufacturer: The R-102 Restaurant Fire Suppression System shall be manufactured by a company with at least thirty years experience in the design and manufacture of pre-engineered fire suppression systems. The manufacturer shall be ISO 9001 registered.
- 1.4.2 Certificates: The wet agent shall be a specially formulated, aqueous solution of organic salts with a pH range between 7.7 – 8.7, designed for flame knock-down and foam securement of grease-related fires.

1.5 Warranty, Disclaimer, and Limitations

- 1.5.1 The pre-engineered restaurant fire suppression system components shall be warranted for five years from date of delivery against defects in workmanship and material.

1.6 Delivery

- 1.6.1 Packaging: All system components shall be securely packaged to provide protection during shipment.

1.7 Environmental Conditions

- 1.7.1 The R-102 system shall be capable of operating in a temperature range of 32 °F to 130 °F (0 °C to 54 °C).

2.0 PRODUCT

2.1 Manufacturer

- 2.1.1 Ansul Fire Protection, One Stanton Street, Marinette, Wisconsin 54143-2542, Telephone (715) 735-7411.

2.2 Components

- 2.2.1 The basic system shall consist of an ANSUL AUTOMAN regulated release assembly which includes a regulated release mechanism and a wet chemical storage tank housed within a single enclosure. Nozzles, blow-off caps, detectors, cartridges, agent, fusible links, and pulley elbows shall be supplied in separate packages in the quantities needed for fire suppression system arrangements. Additional equipment shall include remote manual pull station, mechanical and electrical gas valves, pressure switches, and electrical switches for automatic equipment and gas line shut-off.
- 2.2.2 Wet Chemical Agent: The extinguishing agent shall be a specially formulated, aqueous solution of organic salts with a pH range between 7.8 – 8.2, designed for flame knockdown and foam securement of grease related fires.
- 2.2.3 Agent Tank: The agent tank shall be installed in a stainless steel enclosure or wall bracket. The tank shall be constructed of stainless steel. Tanks shall be available in two sizes; 1.5 gallon (5.7 L) and 3.0 gallon (11.4 L). The tanks shall have a working pressure of 110 psi (7.6 bar), a test pressure of 330 psi (22.8 bar), and a minimum burst pressure of 600 psi (41.4 bar). The tank shall include an adaptor/tube assembly containing a burst disc union.
- 2.2.4 Regulated Release Mechanism: The regulated release mechanism shall be a spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to one or two agent tanks depending on the capacity of the gas cartridge used. It shall contain a factory installed regulator deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar).
- It shall have the following actuation capabilities: automatic actuation by a fusible link detection system and remote manual actuation by a mechanical pull station.
- The regulated release mechanism shall contain a release assembly, regulator, expellant gas hose, and agent storage tank housed in a stainless steel enclosure with cover. The enclosure shall contain knock-outs for 1/2 in. conduit. The cover shall contain an opening for a visual status indicator.
- It shall be compatible with mechanical gas shut-off devices; or, when equipped with a field or factory-installed switch, it shall be compatible with electric gas line or appliance shut-off devices.

- 2.2.5 Regulated Actuator Assembly: When more than two agent tanks are required, the regulated actuator shall be available to provide expellant gas for additional tanks. It shall be connected to the cartridge receiver outlet of the regulated release mechanism providing simultaneous agent discharge. The regulator shall be deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar). The regulated actuator assembly shall contain a regulated actuator, regulator, expellant gas hose, and agent tank housed in a stainless steel enclosure with cover. The enclosure shall contain knockouts to permit installation of the expellant gas line.
- 2.2.6 Discharge Nozzles: Each discharge nozzle shall be tested and listed with the R-102 system for a specific application. Nozzles tips shall be stamped with the flow number designation (1/2, 1, 2, and 3). Each nozzle shall have a metal or rubber blow-off cap to keep the nozzle tip orifice free of cooking grease build-up.
- 2.2.7 Distribution Piping: Distribution piping shall be Schedule 40 black iron, chrome-plated, or stainless steel pipe conforming to ASTM A120, A53, or A106.
- 2.2.8 Detectors: The detectors shall be the fusible link style designed to separate at a specific temperature.
- 2.2.9 Cartridges: The cartridge shall be a sealed steel pressure vessel containing either carbon dioxide or nitrogen gas. The cartridge seal shall be designed to be punctured by the releasing device supplying the required pressure to expel wet chemical agent from the storage tank.

3.0 IMPLEMENTATION

3.1 Installation

- 3.1.1 The R-102 fire suppression system shall be designed, installed, inspected, maintained, and recharged in accordance with the manufacturer's listed instruction manual.

3.2 Training

- 3.2.1 Training shall be conducted by representatives of the manufacturer.

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Cornell King Shaw



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www.ansul.com
Jacobs Doland Beer, LLC

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Prodigy™ Pro 6-10 (E)

Electric

CE

Engineered for dependability, connectivity, and cost savings, Prodigy™ Pro combination ovens are an all-in-one solution for efficient and consistent food production. These ovens do the work of a convection oven, kettle, steamer, fryer, smoker and more. With advanced features and accessories and an intelligent, customizable control, Prodigy Pro combination ovens are designed to support—and connect—the most demanding kitchens.

ALTO-SHAAM



6-10 Pro

Standard features

- Boilerless steam generation
- Absolute Humidity Control™ for selecting any humidity level from 0-100% to maximize food quality, texture, and yield
- Three cooking modes—steam, convection, and combination
- 10.1" programmable, touchscreen control with customizable home screen options, recipe categorization and filtering, lockout features and more
- Easy recipe upload/download via USB port
- ChefLinc™ remote oven management to push and pull recipes, software or oven settings from anywhere
- Five fully automated cleaning cycles
- Front-accessible and retractable rinse hose
- LED illuminated door handle to provide visual notification of the oven status
- SafeVent™ automatic steam venting at the end of the cooking cycle
- Zero clearance design
- EPA 202 compliant
- Temperature range: 30°C to 302°C



CAPACITY

7 Seven* GN 1/1 pans
[*one less on models with smokers]

Two side racks with seven non-tilt support rails;
298mm horizontal width between rails, 70mm
vertical spacing between rails

33 kg product maximum

57 liters volume maximum

Copper Installation kits

Base kit selection on amp draw
found in electrical table

Electric

- 20A [5026970]
- 30A [5026932]
- 40A [5026972]
- 50A [5026973]
- 80A [5026974]
- 125A [5026977]
- 175A [5026978]
- 200A [5026979]

CPVC Installation kits

Base kit selection on amp draw found in
electrical table

Electric

- 20A [5021521]
- 30A [5021519]
- 40A [5021525]
- 50A [5021526]
- 80A [5021527]
- 125A [5021529]
- 150A [5021530]
- 200A [5021531]
- 250A [5021531]

Configuration for Electric Models (select one)

- Turbo [Increased energy usage for quicker preheat and recovery times]
- ECO [Designed for energy conservation—reference power requirements]

Electrical

- 380–415V 3ph

Door swing (select one)

- Right hinged
- Recessed door, optional [not available on ventless hood models]

ChefLinc connection

- Wi-Fi [standard]
- Ethernet [optional]

Options (select all that apply)

- Ventech™ Hood*
- Ventech™ PLUS Hood*
- CombiSmoke® feature—smoke hot or cold with real wood chips [not available on units with Ventech hoods]
- Automatic grease collection system
- *Electric models only

Cleaning (select one)

- Automatic tablet-based cleaning system [standard]
- Automatic liquid cleaning system [optional]

Probe choices

- Removable, quick-release, T-style probe [PR-37158] [standard]
- Removable, single-point, sous vide probe [PR-36576] [optional]

Extended warranty

- One-year warranty extension

[Accessories \(reference accessory catalog\)](#)



This equipment is UL listed for ventless operation. Ventless certification is for all food items, including foods classified as "fatty raw proteins." These foods include bone-in, skin-on chicken, raw hamburger meat, raw sausage, steaks, etc. Always consult local HVAC codes and authorities to ensure compliance with ventilation requirements. If you require further assistance, or local authorities and/or jurisdictions reject your request, please contact our dedicated Regulatory Compliance team.



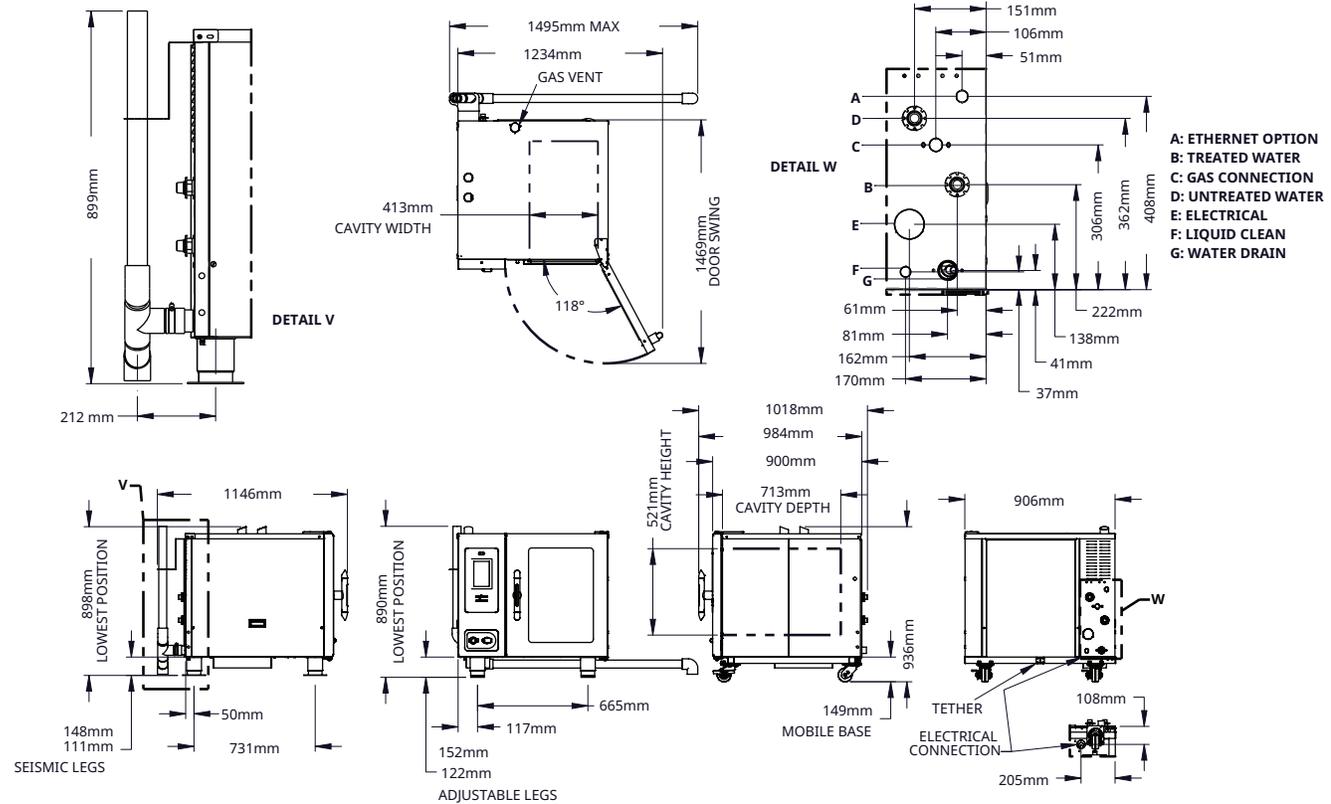
IP X5



Prodigi™ Pro 6-10 (E)



DIMENSIONS — standard door

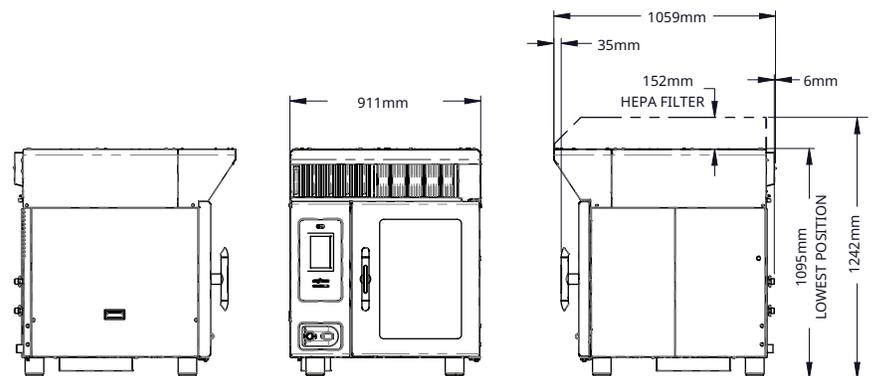


Model	Exterior (H x W x D)	Interior (H x W x D)	Net Weight
6-10	898mm x 906mm x 1018mm	521mm x 413mm x 713mm	190 kg
	Ship Dimensions (L x W x H)*	Ship Weight	
	1422mm x 1143mm x 1295mm	253 kg	

*Domestic ground shipping information. Contact factory for export weight and dimensions.

OVENS WITH VENTECH® HOOD

Electric only



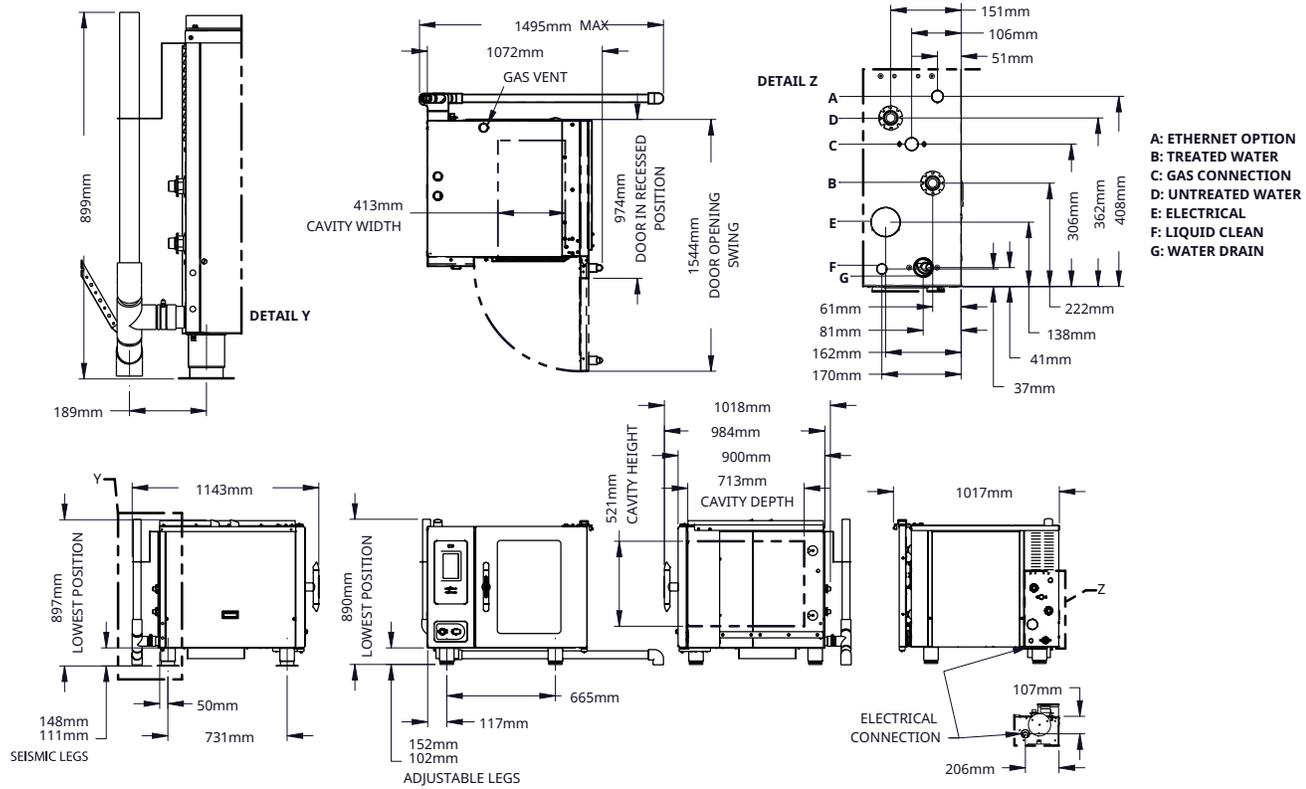
Model	Ventech Hood Exterior (H x W x D)	Net Weight	Ship Dimensions (L x W x H)*	Ship Weight*
VH-10	282mm x 911mm x 1058mm	55 kg	1422mm x 1245mm x 508mm	104 kg
	Ventech Hood Plus Exterior (H x W x D)	Net Weight	Ship Dimensions (L x W x H)*	Ship Weight*
	435mm x 911mm x 1058mm	79 kg	1500mm x 1245mm x 508mm	131 kg
	Oven with Ventech Hood (H x W x D)	Net Weight	Ship Dimensions (L x W x H)*	Ship Weight*
	1095mm x 911mm x 1059mm	Call factory	1422mm x 1143mm x 1651mm	Call factory
	Oven with Ventech Hood Plus (H x W x D)	Net Weight	Ship Dimensions (L x W x H)*	Ship Weight*
	1242mm x 911mm x 1059mm	Call factory	1422mm x 1143mm x 1651mm	Call factory

*Domestic ground shipping information. Contact factory for export weight and dimensions.

Prodigi™ Pro 6-10 (E)



DIMENSIONS — recessed door



Model Exterior (H x W x D)
6-10 897mm x 1017mm x 1018mm

Interior (H x W x D)
521mm x 413mm x 713mm

Net Weight
172 kg

Ship Dimensions (L x W x H)*
1422mm x 1143mm x 1295mm

Ship Weight
253 kg

*Domestic ground shipping information. Contact factory for export weight and dimensions.

OVENS WITH VENTECH® HOOD

Electric only

Eliminate the need for a traditional kitchen hood. Ventech Type 1 hoods with condensation technology condense steam while capturing and removing grease-laden air, vapors, and lingering smoke. For more demanding locations, Ventech PLUS™ hoods include a HEPA filter. These hoods combine the fine particulate filtering of a HEPA filter with condensation technology of the standard Ventech hood.



Prodigi™ Pro 6-10 (E)



CLEARANCE

Top: 508mm
 Left: 0mm
 457mm recommended service access
 Right: 0mm Non-combustible surfaces
 51mm combustible surfaces
 Bottom: 130mm
 Back: 102mm between plumbing and nearest object



REQUIREMENTS

- Oven must be installed level.
- Oven must be installed on noncombustible surface.
- Use a water supply shut-off valve and back-flow preventer when required by local code.
- Drain must not be located directly underneath the appliance unless a stand with solid top or shelf is used.



HEAT: ELECTRIC

Heat of rejection

6-10E	Heat Gain qs, BTU/hr	Heat Gain qs, kW
	630	0.18



NOISE: ELECTRIC

Noise emissions

Without hood system, a maximum 67 dBA was measured at 1 m from unit.
 With hood system, a maximum 73 dBA was measured at 1 m from unit.



6-10E ELECTRIC

6-10E	V	Ph	Hz	IEC**	ECO					Turbo Option*					Connection	
					A	A^	Breaker minimum	kW	kW^	IEC**	A	A^	Breaker minimum	kW		kW^
380-415V	380	3	50/60	1.5	13.4	15.5	17A/18A^	9.0	10.2	2.5	15.7	17.5	20A/22A^	10.3	11.5	3ø/N/PE
	415	3	50/60	1.5	14.6	16.9	19A/19A^	10.5	12.1	2.5	17.1	19.4	22A/25^	12.3	13.9	3ø/N/PE

With Smoker Option					ECO			Turbo Option*			Connection
6-10E	V	Ph	Hz	IEC**	A	Breaker minimum	kW	A	Breaker minimum	kW	
380-415V	380	3	50/60	2.5	14.6	19A	9.6	16.6	21A	10.9	3ø/N/PE
	415	3	50/60	2.5	15.6	20A	11.2	18.1	23A	13.0	3ø/N/PE

*No-cost option on electric models.
 ^Values for units with Ventech Hoods.

** Recommended minimum conductor sized at 90°C and ambient 30°C.

- Electrical connections must meet all applicable federal, state, and local codes.
- For use on individual branch circuit only.
- Ovens are not supplied with an electrical cord or plug.
- Electric supply may be hard-wired or use a cord and plug.
- Use a Type-B current protection device that accommodates a leakage current of 30mA.



WATER

Water requirements (per oven)

Two cold water inlets - drinking quality

- One treated water inlet: 3/4" NPT male connection. Line pressure 200 kPa minimum dynamic and 1000 kPa maximum static at a minimum flow rate of 1 L/min.
- One untreated water inlet: 3/4" NPT male connection. Line pressure 200 kPa minimum dynamic and 1000 kPa maximum static at a minimum flow rate of 10 L/min. Water drain: 40mm connection with a vertical vent to extend above the exhaust vent. Materials must withstand temperatures up to 93°C.

Water Quality Standards

It is the sole responsibility of the owner/operator/purchaser of this equipment to verify that the incoming water supply is comprehensively tested and, if required, a means of "water treatment" provided that would meet compliance requirements with the published water quality standards shown below. Non-compliance with these minimum standards will potentially damage this equipment and/or components and void the original equipment manufacturer's warranty.

Inlet Water Requirements		
Contaminant	Treated Water	Untreated Water
Free Chlorine	Less than 0.1 ppm (mg/L)	Less than 0.1 ppm (mg/L)
Hardness	30-70 ppm	30-70 ppm
Chloride	Less than 30 ppm (mg/L)	Less than 30 ppm (mg/L)
pH	7.0 to 8.5	7.0 to 8.5
Silica	Less than 12 ppm (mg/L)	Less than 12 ppm (mg/L)
Total Dissolved Solids (tds)	50-125 ppm	50-360 ppm



CLEARANCE

Clearance requirements for water filtration system

Do not install a water filtration system behind unit.

CONTACT US

WI64 N9221 Water Street | Menomonee Falls, Wisconsin 53051 | U.S.A.
 Phone: 262.251.3800 | 800.558.8744 U.S.A./Canada | Fax: 262.251.7067 | alto-shaam.com

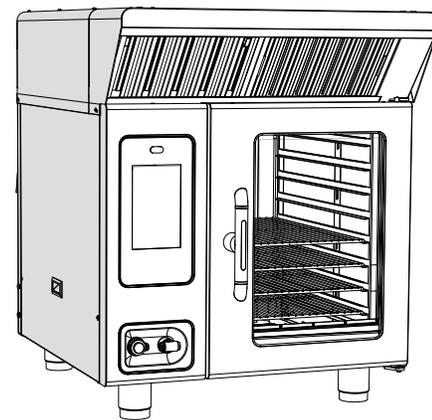
Combitherm® CTP6-10E

Ventech™ Type 1 Hood with Condensation



Combining multiple cooking functions into a single appliance, Combitherm® ovens provide endless versatility, reliability and unmatched performance. An all-in-one solution for efficient and consistent food production. Combitherm ovens do the work of a convection oven, kettle, steamer, fryer, smoker and more. Execute every dish, no matter how simple or complex, faster than ever with flawless precision and consistency.

Eliminate the need for a traditional kitchen hood. Ventech Type 1 hoods with condensation technology condense steam while capturing and removing grease-laden air, vapors, and lingering smoke. For more demanding locations, Ventech PLUS™ hoods include a HEPA filter. These hoods combine the fine particulate filtering of a HEPA filter with condensation technology of the standard Ventech hood.



CTP6-10E

Also available for CTC ovens. Contact factory for details.

Standard features

- Four cooking modes—steam, convection, combination, and retherm
- Programmable, touchscreen control
- Easy recipe upload/download via USB port
- Five fully automated cleaning cycles
- Front-accessible and retractable rinse hose
- LED illuminated door handle is designed for the needs of the busy kitchen, and provides visual notification of the oven status
- Absolute Humidity Control™ allows for selection any humidity level from 0-100% to maximize food quality, texture, and yield
- CoolTouch3™ triple panel glass door keeps the heat inside, while keeping the glass cool to the touch and providing 15% greater thermal retention to improve performance and efficiency
- SafeVent™ provides automatic steam venting at the end of the cooking cycle



CAPACITY

- 7** Seven full-size or GN 1/1 pans; seven half-size sheet pans, one row deep
- 2** Two side racks with seven non-tilt support rails; 11-3/4" [298mm] horizontal width between rails, 2-3/4" [70mm] vertical spacing between rails
- 72 lb [33 kg] product maximum
- 45 quarts [57 liters] volume maximum
- Three [3] shelves included. Additional wire shelves required for maximum capacity.

Condensable Particulate Matter (CPM) emissions produced through the most aggressive testing methods available were measured at 0.77 mg/m³ for 11,660 beef patties which is below the maximum allowable level of 5.0 mg/m³ established by EPA test method 202. This product is UL listed under KNLZ in the U.S. and Canada.

Cooking appliance with integral systems for limiting the emission of grease laden air IP35.

Configurations (select one)

- Boiler-free, standard
- Boiler-free, PROpower™
- Boiler version
- Boiler version, PROpower™

Door swing

- Right hinged

Electrical

- 208-240V, 1ph
- 380-415V, 3ph
- 208-240V, 3ph
- 440-480V, 3ph

Accessories (select all that apply)

- CombiLatch™
- Ventech Plus™ HEPA filter
- Door steam condenser, optional
- Seismic feet package, optional
- Mobile base, optional [U.S. only]
- Extended one-year warranty
- Automatic grease collection system, includes four 6-piece, self-trussing poultry racks #5014438, interior drip collection pan, and grease collection container with shut-off valve

Cleaning

- Automatic tablet-based cleaning system, standard
- Automatic liquid cleaning system, optional

Probe choices

- Removable, single-point, quick-connect core temperature probe, standard
- Removable, single-point, quick-connect sous vide temperature probe, optional
- Hard-wired, multi-point core temperature probe, optional [factory only installed]

Security devices for correctional facility use

- Optional base package [not available with recessed door]: includes tamper-proof screw package, excludes temperature probe
- Anti-entrapment device, optional
- Control panel security cover, optional
- Hasp door lock [padlock not included], optional
- Removable, single-point, quick-connect core temperature probe, optional

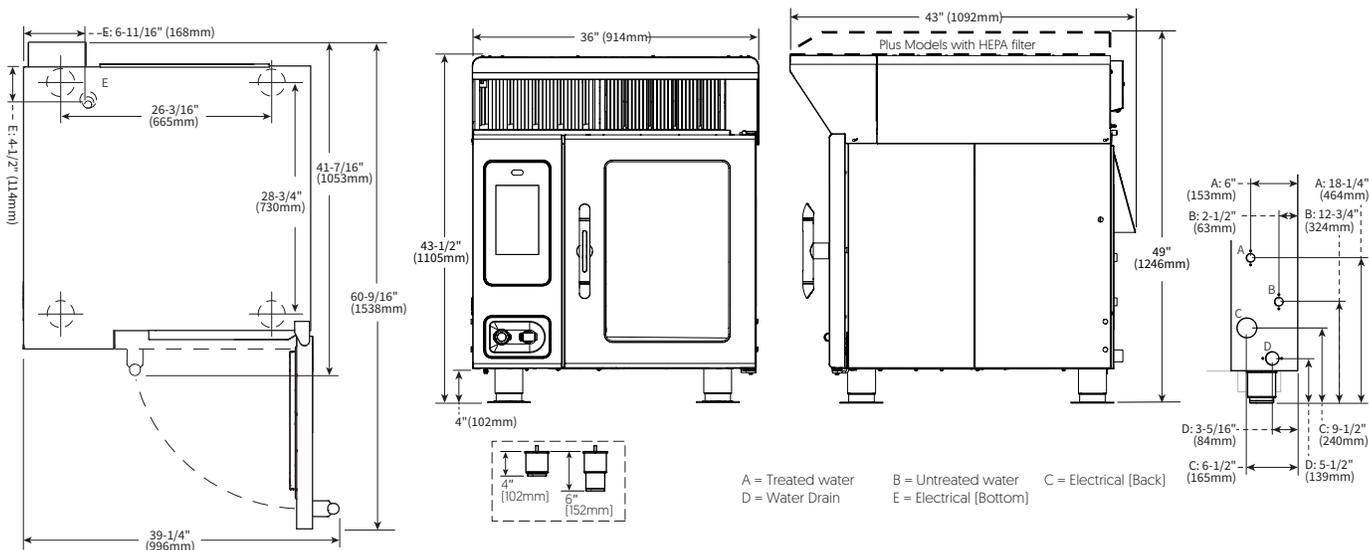
Installation options (select one)

- Alto-Shaam Combination Factory Authorized Installation Program - available in the U.S. and Canada only. Ventech hood field install extra
- Installation Start-Up Check - available through an Alto-Shaam authorized service agency

Combitherm® CTP6-10E



Specification



DIMENSIONS

Model
CTP6-10E

Exterior with Ventech (H x W x D)
49" x 36" x 43" [1246mm x 914mm x 1092mm]

Interior (H x W x D)
20-1/2" x 16-1/4" x 28-1/16" [520mm x 411mm x 712mm]

Net Weight
645 lb [293 kg]

CTP6-10E 49" x 41" x 49" [1246mm x 1041mm x 1246mm]

Ship Dimensions (L x W x H)*

Ship Weight*
695 lb [315 kg]

*Domestic ground shipping information. Contact factory for export weight and dimensions.

Model
VH1

Ventech Hood Exterior (H x W x D)
5.5" x 36" x 43" [141mm x 914mm x 1092mm]

Net Weight
121 lb [55 kg]

VH1 49" x 49" x 12" [1245mm x 1245mm x 305mm]

Ship Dimensions (L x W x H)*

Ship Weight*
151 lb [68 kg]

*Domestic ground shipping information. Contact factory for export weight and dimensions.



CLEARANCE

- Top: 20" [508mm]
- Left: 0" [0mm]
- Right: 0" [0mm] Non-combustible surfaces
2" [51mm] combustible surfaces
- Bottom: 5-1/8" [130mm]
- Back: 4" [102mm]
- 4-5/16" [109mm] optional plumbing kit



CHECK FIRST

- Oven must be installed level.
- Water supply shut-off valve and back-flow preventer when required by local code.
- Drain must not be located directly underneath the appliance.



HEAT

CTP6-10E	Heat of rejection	
	Heat Gain qs, BTU/hr	Heat Gain qs, kW
	630	0.18



NOISE

Noise emissions
With hood system, a maximum 71 dBA was measured at 3.3 ft (1 m) from unit.

Combitherm® CTP6-10E



CTP6-10E	V	Ph	Hz	Awg	ECO Standard			PROpower™ Option**			Connection
					A	Breaker	kW	A	Breaker	kW	
208-240V	208	1*	50/60	6	37.9	40	7.9	44.2	45	9.2	L1, L2/N, G
	240	1*	50/60	6	43.8	50	10.5	51.3	60	12.3	L1, L2/N, G
208-240V	208	3	50/60	8	21.9	25	7.9	28.4	30	9.2	L1, L2, L3, G
	240	3	50/60	8	25.3	30	10.5	32.6	35	12.3	L1, L2, L3, G
380-415V	380	3	50/60	8	13.4	16	9.0	20.3	32	10.3	L1, L2, L3, N, G
	415	3	50/60	8	14.6	16	10.5	22.1	32	12.3	L1, L2, L3, N, G
440-480V	440	3*	50/60	10	11.6	15	9.1	15.0	15	10.4	L1, L2, L3, G
	480	3*	50/60	8	12.6	15	10.5	16.7	20	12.3	L1, L2, L3, G

Electrical connections must meet all applicable federal, state, and local codes. No cord, no plug, dedicated circuit required.

*Electrical service charge applies.

**No-cost option on electric models.



Water requirements (per oven)

- Two cold water inlets - drinking quality
- One treated water inlet: 3/4" NPT connection. Line pressure 30 psi minimum dynamic and 90 psi maximum static [200-600 kPa] at a minimum flow rate of 0.26 gpm [1 L/min].
- One untreated water inlet: 3/4" NPT connection. Line pressure 30 psi minimum dynamic and 90 psi maximum static [200-600 kPa] at a minimum flow rate of 2.64 gpm [10 L/min]. Water drain: 1-1/2" [40mm] connection with a vertical vent to extend above the exhaust vent. Materials must withstand temperatures up to 200°F [93°C].

Water Quality Standards

It is the sole responsibility of the owner/operator/purchaser of this equipment to verify that the incoming water supply is comprehensively tested and, if required, a means of "water treatment" provided that would meet compliance requirements with the published water quality standards shown below. Non-compliance with these minimum standards will potentially damage this equipment and/or components and void the original equipment manufacturer's warranty. Alto-Shaam recommends using OptiPure [www.optipurewater.com] products to properly treat your water.

Inlet Water Requirements		
Contaminant	Treated Water	Untreated Water
Free Chlorine	Less than 0.1 ppm [mg/L]	Less than 0.1 ppm [mg/L]
Hardness	30-70 ppm	30-70 ppm
Chloride	Less than 30 ppm [mg/L]	Less than 30 ppm [mg/L]
pH	7.0 to 8.5	7.0 to 8.5
Silica	Less than 12 ppm [mg/L]	Less than 12 ppm [mg/L]
Total Dissolved Solids [tds]	50-125 ppm	50-360 ppm



Clearance requirements for water filtration system

Do not install a water filtration system behind unit.

North American Certificates and Listings

- Certificate File Number: E180237 – 20131227
- UL 710B, Standard for Recirculating Systems
- UL 197, Standard for Electric Commercial Cooking Appliances
- CSA C22.2 No. 109-M1981, Standards for Commercial Cooking Appliances
- NFPA 96
- NSF / ANSI-4
- EPA 202
- ANSI / UL 900
- ASTM F2800 Type 1 Hood

International Certificates and Listings

- EAC, EURASIAN ECONOMIC UNION DECLARATION OF CONFORMITY
- Australian Water Mark, WMTS-104-2005, Watermark Level 2
- RCM, Australian Regulatory Compliance
- CE, European Harmonized Performance and Safety Compliance
- IPX5, Ingress Protection Rating



CONTACT US

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EVERPURE® KLEENSTEAM® II SINGLE SYSTEM

EVERPURE'S SECOND GENERATION OF TOTAL WATER TREATMENT SYSTEM FOR STEAM APPLICATIONS

Kleensteam II Single System: EV9797-21
 7CB5 Replacement Cartridge: Ev9618-11
 SS-10 Cartridge: EV9799-02



APPLICATIONS

Commercial Steam Combi Oven
 Foodservice Steamer

FEATURES • BENEFITS

Sophisticated Hydroblend compound prevents limescale formation in high temperature steam applications

A total system delivering high quality filtered water with cleaning and deliming capabilities

Filters incoming water to improve the performance, maximize energy efficiency and increase the life of steam equipment

New dual cartridge design provides enhanced performance for low or high flow capacity steamers and flexibility for expanding to meet future needs

Reduces chlorine-induced corrosion

System is simple to install, operate and maintain

The Kleensteam II Single System is shipped with one 7CB5 Cartridge (for first filter head) and one filter head plug installed in the second filter head; capacity is expandable by adding a second 7CB5 Cartridge

Longer lasting SS-10 Cartridge is more effective in higher alkalinity/hardness/ TDS/temperature installations

ScaleStick is NSF® Certified under NSF/ANSI Standard 42 for materials

Easy deliming with Everpure ScaleKleen, which is fed directly into the boiler through the SR-X Bowl without use of hazardous chemicals or special piping

INSTALLATION TIPS

Choose a mounting location suitable to support the full weight of the system when operating.

Use minimum 1/2" inlet water line (3/4" preferred).

Connect the system to the boiler water only. Do not connect system to the condenser.

Install vertically with cartridges hanging down.

Allow 2 1/2" (6.35 cm) clearance below the cartridge for easy cartridge replacement.

Flush cartridges by running water through system for five (5) minutes at full flow.

OPERATION TIPS

Change 7CB5 Cartridge on a regular six (6) month preventative maintenance program, when capacity is reached or when pressure falls below 10 psi (0.7 bar).

Change SS-10 Cartridge before Hydroblend™ compound is completely used up.

Service flow rate must not exceed 2.5 gpm (9.46 Lpm) for single cartridge systems or 5.0 (18.92 Lpm) for dual cartridge systems.

Always flush the filter cartridge at time of installation and cartridge change.

Use for periodic deliming as needed by installing the dip tube assembly in place of the SS-10 and dissolving ScaleKleen in SR-X Housing. Full deliming instructions are provided with the system.

SIZING

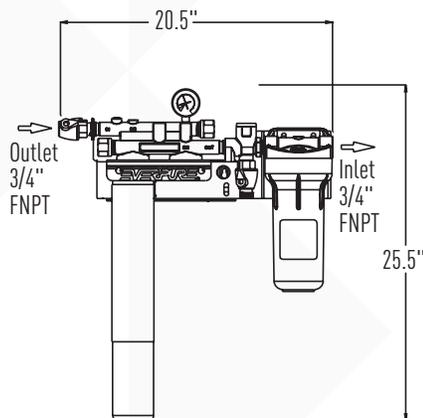
Service Flow Rate:

Maximum 2.5 gpm (9.5 Lpm) single cartridge

Maximum 5.0 gpm (18.9 Lpm) dual cartridge

EVERPURE® KLEENSTEAM® II SINGLE SYSTEM

EV9797-21



The contaminants or other substances removed or reduced by this drinking water system are not necessarily in your water. Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system.

SPECIFICATIONS

Service Flow Rate

Maximum 2.5 gpm (9.5 Lpm) single cartridge

Maximum 5.0 gpm (18.9 Lpm) dual cartridge

Pressure Requirements

10 - 125 psi (0.7 - 8.6 bar), non-shock

Maximum Water Temperature at Inlet

100°F (38°C)

Overall Dimensions

25.5" H x 20.5" W x 7" D
(64.7 cm x 52.0 cm x 17.7 cm)

Inlet Connection

3/4" FNPT

Outlet Connection

3/4" FNPT

Operating Weight

32 lbs (14.5 kgs)

Shipping Weight

26 lbs (11.7 kgs)

Electrical Connection

None required

Alkalinity Range

2 to 12 grains per gallon

WARRANTY

Everpure water treatment systems by Pentair® (excluding replaceable elements) are covered by a limited warranty against defects in material and workmanship for a period of five years after date of purchase. Everpure replaceable elements (filter cartridges and water treatment cartridges) are covered by a limited warranty against defects in material and workmanship for a period of one year after date of purchase. See printed warranty for details. Pentair will provide a copy of the warranty upon request.



WATER QUALITY SYSTEMS

EVERPURE-SHURFLO WORLD HEADQUARTERS, 1040 MUIRFIELD DRIVE, HANOVER PARK, IL 60133 USA • FOODSERVICE.PENTAIR.COM
800.942.1153 (US ONLY) • 630.307.3000 MAIN • 630.307.3030 FAX • CSEVERPURE@PENTAIR.COM EMAIL

EVERPURE-SHURFLO AUSTRALIA, 1-21 MONASH DRIVE, DANDENONG SOUTH, VIC 3175 AUSTRALIA
011.1300.576.190 TEL • 011.61.39.562.7237 FAX • AU.EVERPURE@PENTAIR.COM EMAIL

EVERPURE-SHURFLO CHINA, 21F CLOUD 9 PLAZA, NO 1118, SHANGHAI, 200052, CHINA
86.21.3211.4588 TEL • 86.21.3211.4580 FAX • CHINA.WATER@PENTAIR.COM EMAIL

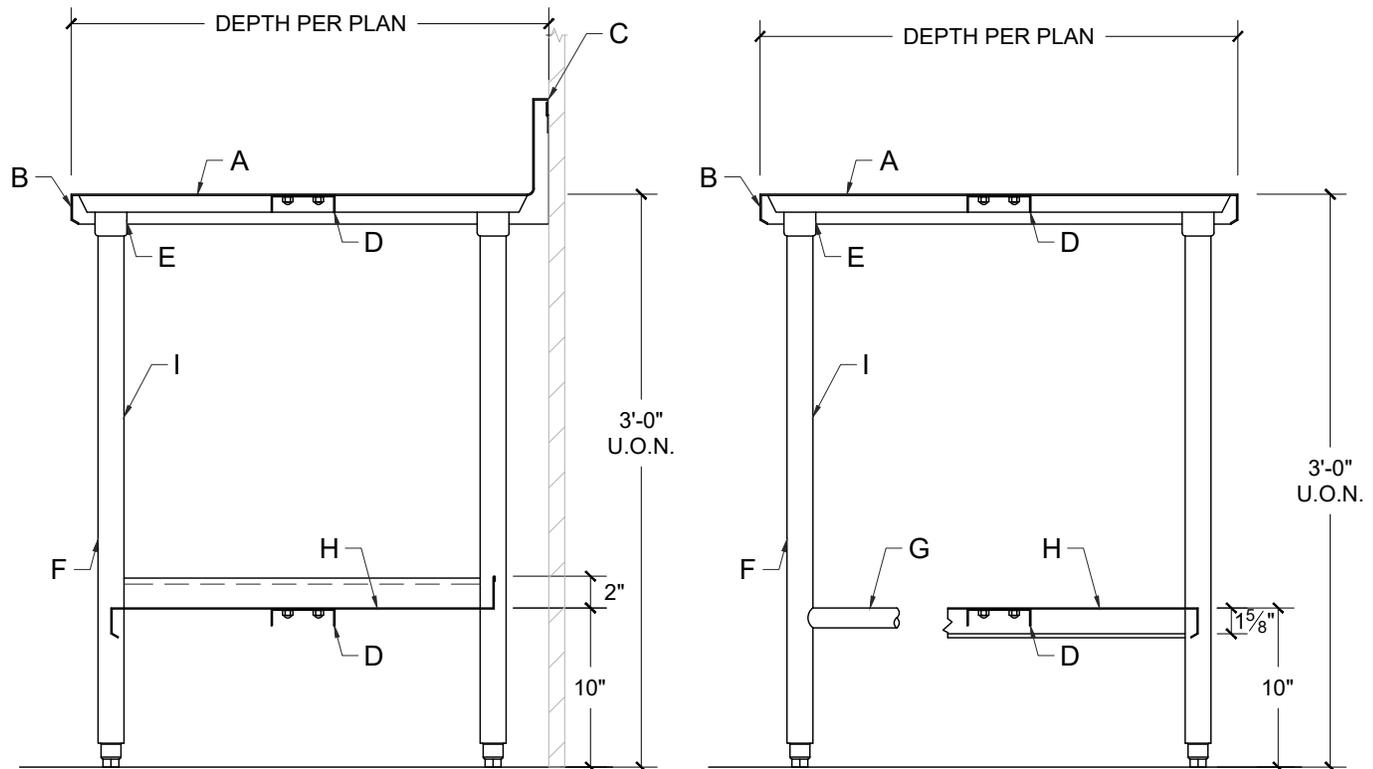
EVERPURE-SHURFLO INDIA, GREEN BOULEVARD, B-9/A, 7TH FLOOR - TOWER B SECTOR 62, NOIDA - 201301
91.120.419.9444 TEL • 91.120.419.9400 FAX • INDIACUSTOMER@PENTAIR.COM EMAIL

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SECTIONS

1" = 1'-0"

- A. 14GA. TYPE 304 S/S TOP WITH SOUND DEADENING
- B. EDGE PER DETAIL 1-1; EDGE TYPE PER SPECIFICATION
- C. BACK AND/OR SIDE SPLASHES PER THE PLAN AND DETAIL 1-2; SPLASH TYPE PER SPECIFICATIONS
- D. 4"X1" 14 GA. S/S HAT CHANNEL; CAP WITH S/S ACORN NUTS
- E. S/S GUSSETS FULLY WELDED TO 14 GA. S/S HAT CHANNELS
- F. 1-5/8" O.D. 16 GA. S/S LEGS WITH ADJUSTABLE S/S BULLET FEET
- G. WHERE CROSSBRACING IS SPECIFIED, PROVIDE 16 GA. 1-1/4" O.D. S/S CROSSRAIL FULLY WELDED, GROUND & POLISHED AT JUNCTURES, SIDES AND REAR
- H. WHERE UNDERSHELF IS SPECIFIED, PROVIDE 16 GA. S/S SHELF WITH EDGE PER DETAIL 1-1 TYPE A
- I. 5'-0" MAXIMUM O.C. BETWEEN LEGS U.O.N

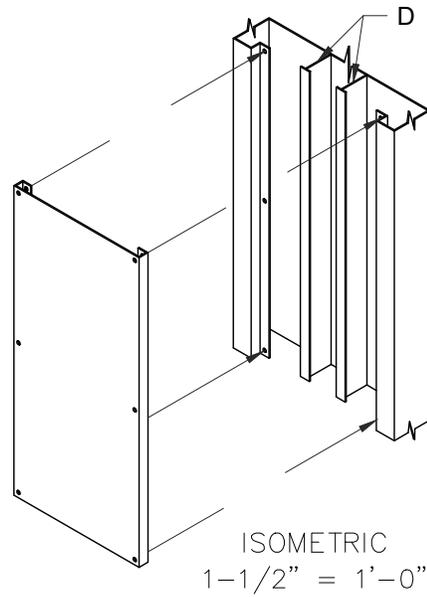
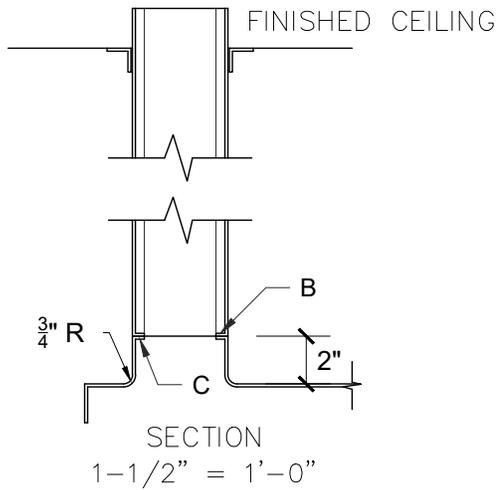
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192 LEXINGTON AVE, SUITE 804
NEW YORK, NY 10016
TEL: (212) 206-0736

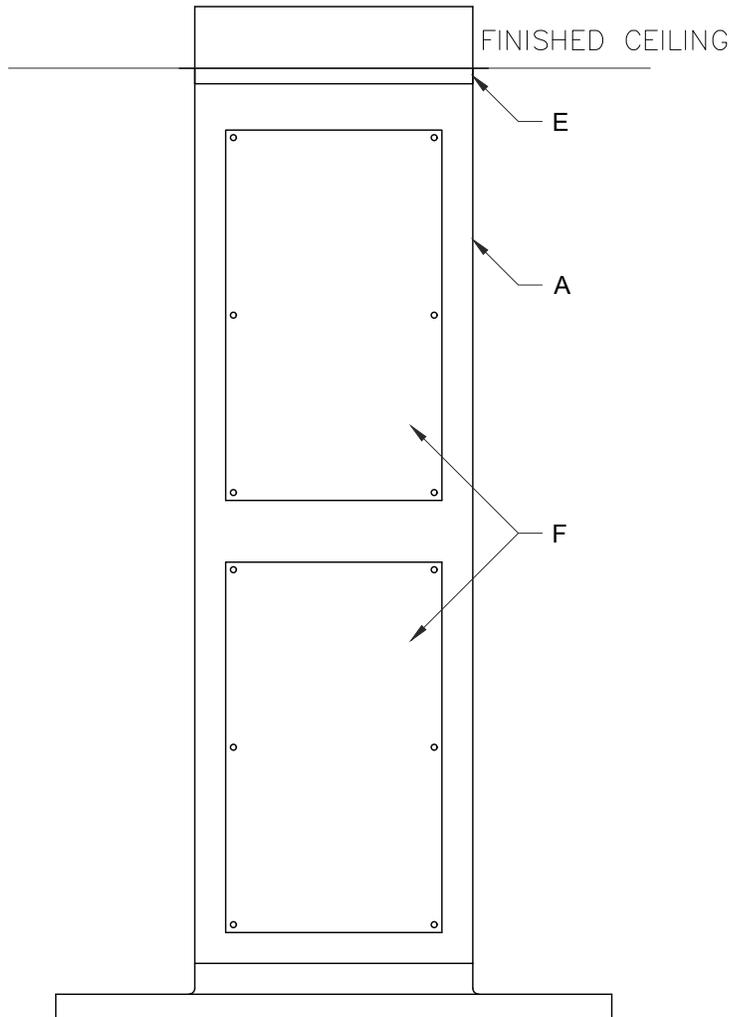
WORKTABLE

FABRICATION
DETAIL

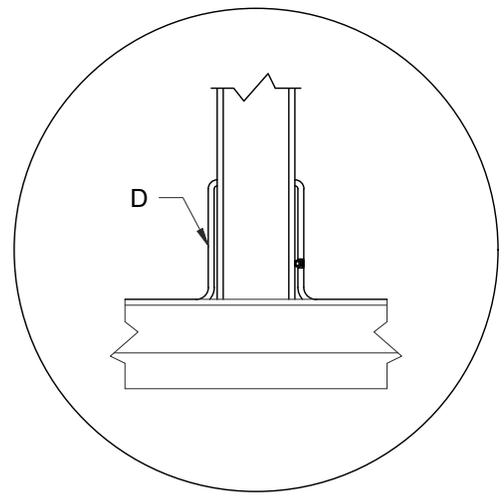
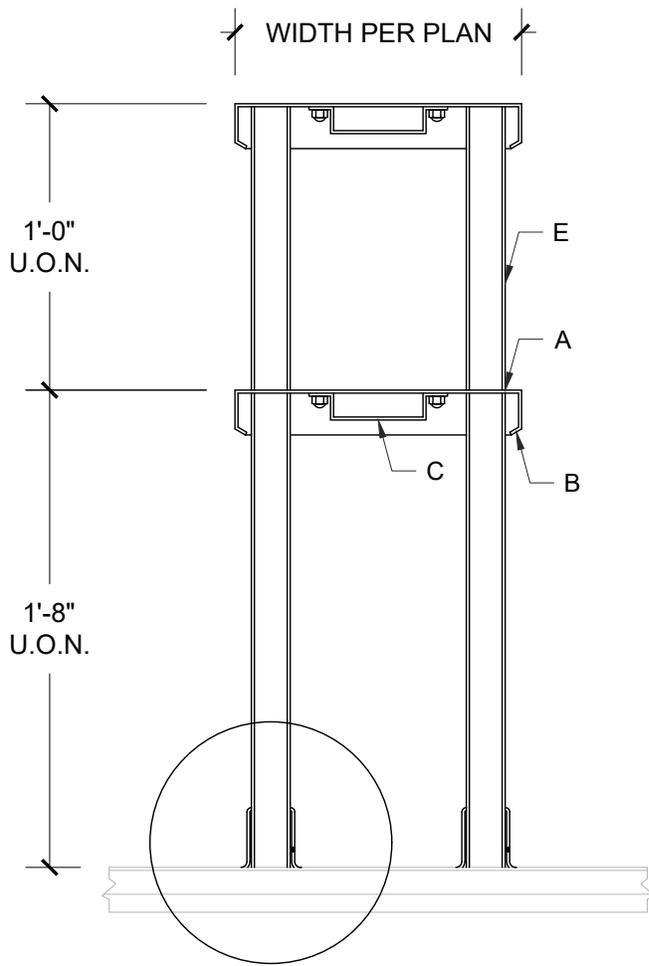
1-3



LENGTH PER PLAN



- A. 16 GA. S/S
- B. SECURE & SEAL CHASE TO SPLASH OR 2" COVERED TURN-UP ON FIXTURE TOP
- C. FLANGE BACK, WELD CORNERS & SEAL AND SECURE TO UTILITY CHASE
- D. PROVIDE DIVIDERS TO SEPARATE ELECTRICAL WIRING FROM PLUMBING/REFRIGERATION LINES IN CHASES CONTAINING MULTIPLE SERVICES
- E. 1" S/S ANGLE COLLAR AT PERIMETER
- F. PAN SHAPED, S/S REMOVABLE ACCESS PANEL. ACCESS PANEL NOT TO EXCEED 1'-6" X 4'-0" LONG.



DETAIL: TABLE MOUNTING
3" = 1'-0"

SECTION
1-1/2" = 1'-0"

- A. 16 GA S/S SHELF
- B. SQUARE EDGE PER DETAIL 1-1 TYPE A
- C. 1" X 4" X 1" 18 GA S/S HAT CHANNEL; CAP WITH S/S ACORN NUTS
- D. FULLY WELDED S/S GUSSET WITH SET SCREW
- E. 1-5/8" DIA S/S TUBING

Point-of-Sale (POS) Printer

N.I.C. (Not in Contract)

This item is not in the Foodservice Equipment Contract

Item to be provided by:

- Vendor
- Owner
- General Contractor
- Millwork
- Other

Notes:

Kitchen Equipment Contractor (KEC) to coordinate the final location of this item

KEC to verify final equipment selection with the Owner and coordinate the utility requirements with the MEP Engineer

Refer to the foodservice and architectural plans for item location

ALTO-SHAAM

750-S

Low Temperature Hot Food Holding Cabinet

Keeping food that has been cooked to perfection hot and fresh until the moment it is served demands the gentle precision of Alto-Shaam's exclusive Halo Heat® technology. With controlled temperatures and a closed environment free from forced air, harsh heating elements and added humidity, food is kept warm and flavorful, just as intended.

Standard features

- Simple and intuitive pushbutton control that commands all appliance functions with easily identifiable icons
- Halo Heat—a controlled, uniform heat source that gently surrounds food for better appearance, taste, and longer holding time
- Stainless steel interior resists corrosion
- Digital control senses temperature drops faster, providing quick heat recovery time
- Close temperature tolerance and even heat application maintain ideal serving temperature throughout the cabinet
- Door venting holds crispy food better

Deluxe control option (select one)

Deluxe control features SureTemp™ heat recovery system. SureTemp™ reacts immediately to compensate for any loss of heat whenever the door is opened.

- Deluxe control (A)
- Deluxe control with probe (A)
- Deluxe control with six (6) independent shelf timers (B)
- Deluxe control with probe and shelf timers (B)



TEMPERATURE

Temperature range: 60°F to 200°F (16°C to 93°C)



CAPACITY

- 10** Ten full-size or GN 1/1 pans 2-1/2" [65mm] deep
- 6** Six full-size or GN 1/1 pans 4" [100mm] deep
- 4** Four full-size or GN 1/1 pans 6" [150mm] deep
- 6** Six full-size sheet pans (on wire shelves only)
- Two side racks with eleven pan positions spaced on 1-3/8" [35mm] centers
- 120 lb [54 kg] product maximum
- 100 qt [95 L] volume maximum
- Includes three shelves. Additional shelves required for maximum capacity.



IP X3



750-S

Configurations (select one)

Door choices

- Solid door, standard
- Window door, optional

Door swing

- Right hinged, standard
- Left hinged, optional

Cabinet choices

- Reach-in, standard
- Pass-through, optional—note: pass-through cabinets cannot have doors hinged on the same side

Electrical

- 120V, 1 ph
- 208–240V, 1 ph
- 230V, 1 ph

Accessories (select all that apply)

- Bumper, full perimeter [5010371]—not available with 2-1/2" casters
- Handle, push/pull [55662]
- Door lock with key [LK-22567]
- Security panel with lock—requires door lock [LK-22567][5013936]
- Drip tray—external [5010391]
- Pan grid, wire—18" x 16" [457mm x 406mm] pan insert [PN-2115]
- Legs, 6" [152mm], flanged—set of four [5011149]
- Carving holder, prime rib [HL-2635]
- Carving holder, steamship (cafeteria) round [4459]
- Drip pan with drain, 1-1/16" [43mm] deep [14831]
- Drip pan without drain, 1-5/8" [41mm] deep [1014684]

Casters, stem—2 rigid, 2 swivel w/ brake

- 5" [127mm] [5004862]
- 3-1/2" [89mm] [5008017]
- 2-1/2" [64mm][5008022]—standard

Shelves

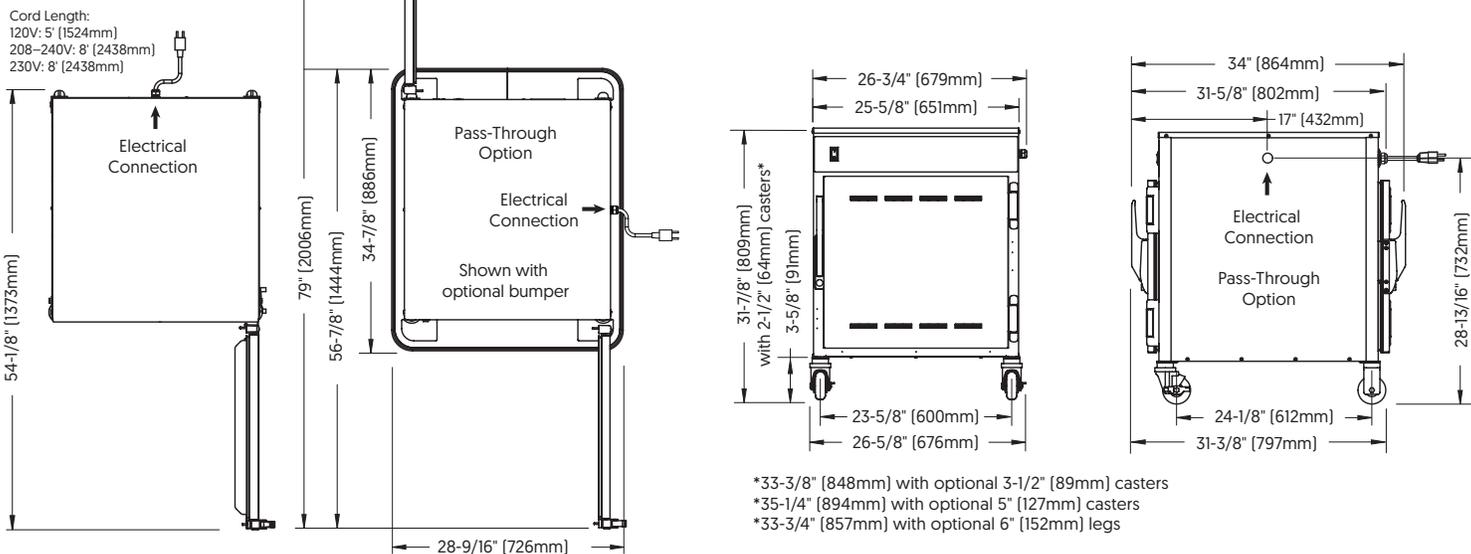
- Chrome wire, reach-in [SH-2105]
- Chrome wire, pass-through [SH-2327]
- Stainless steel, flat wire, reach-in [SH-2324]
- Stainless steel, rib rack [SH-2743]

Stacking hardware

- Over or under 750-TH, 767-SK, 750-S-Series [5004864]
- Under CTX4-10 Combitherm®

750-S

Specification



Model

750-S

Exterior (H x W x D)

31-7/8" x 26-5/8" x 31-3/8" [809mm x 676mm x 797mm]

Interior (H x W x D)

20" x 21-15/16" x 26-1/2" [507mm x 556mm x 673mm]

Pass-Through Exterior

31-7/8" x 26-3/4" x 33-13/16" [809mm x 679mm x 858mm]

Net Weight

157 lb [71 kg]

Ship Dimensions (L x W x H)*

750-S 35" x 35" x 41" [889mm x 889mm x 1041mm]

Ship Weight*

228 lb [103 kg]

*Domestic ground shipping information. Contact factory for export weight and dimensions.



CHECK FIRST

- Appliance must be installed level.
- Appliance must not be installed in any area where it may be affected by steam, grease, dripping water, extreme temperatures, or any other severely adverse conditions.
- Appliances with casters and no cord or plug must be secured to the building structure with a flexible connector. Not factory supplied.



CLEARANCE

- Top: 2" [51mm]
- Left: 1" [25mm]
- Right: 1" [25mm]
- Back: 3" [76mm]



ELECTRIC

750-S	V	Ph	Hz	A	kW	Cord & Plug
120V	120	1	50/60	9.0	1.1	NEMA 5-15p 15A-125V plug
208-240V	208	1	50/60	3.9	.81	NEMA 6-15p 15A-250V plug (U.S.A. only)
	240	1	50/60	4.5	1.1	
230V	230	1	50/60	4.3	1.0	plugs rated 250V CEE 7/7
						CH2-16p
						BS 1363 [U.K. only]
						AS/NZS 3112



HEAT

Heat of rejection

750-S	Heat Gain qs, BTU/hr	Heat Gain qs, kW
	223	0.07

CONTACT US

W164 N9221 Water Street | Menomonee Falls, Wisconsin 53051 | U.S.A.
Phone: 262.251.3800 | 800.558.8744 U.S.A./Canada | Fax: 262.251.7067 | alto-shaam.com

 REFRIGERATOR MANUFACTURER Turbo air more durable, efficient, beautiful	4184 E. Conant St. Long Beach, CA 90808 Tel. 310-900-1000 Fax. 310-900-1077 www.turboairinc.com		Project:
			Model #:
			Item #:
	Available W/H:	Qty:	
	Approval:		
	AIA #:	SIS #:	
			CSI Section 11400

Undercounter Refrigerator - Front Breathing Airflow

Undercounters
PRO Series

Patented Self-Cleaning Condenser



This product is equipped with a fine mesh filter to the front of the condenser to catch dust, and a rotating brush that moves up and down daily to remove excess buildup outward and away.

Model : PUR-60-FB-N



≡ FEATURES & BENEFITS ≡

- Self-Cleaning Condenser**
 The accumulation of dust in the condenser can cause the failure or breakdown of refrigerators. Refrigerators run normally until they reach a certain level of accumulation. At some point, when they are over the limit, their performance drops quickly resulting in damage to, or disposal of the stored products inside. The Self-Cleaning Condenser device keeps the condenser clean and prevents system failure by automatically brushing daily.
- Digital temperature control & monitor system**
 Keeps food products safe by maintaining constant temperatures. External digital display allows for easy monitoring.
- Front Breathing airflow**
 Front Breathing airflow is designed to draw in air and discharge from the front, allowing units to run at high efficiency in tight spaces and eliminates the need for surrounding clearances.
- Hydrocarbon refrigerants (R-290)**
 With innovative and eco-friendly technology, Turbo Air brings you hydrocarbon refrigerators designed to meet DOE's Energy Conservation Standards in 2017 and to use EPA's SNAP Program approved HC refrigerants. Hydrocarbon refrigerants do not deplete the ozone layer and have very low contribution to global warming (ODP-0, GWP-3).
- Stainless steel cabinet construction**
 The PRO series model boasts a stainless steel interior (Aluminum door liner) and a **22 gauge** stainless steel exterior (galvanized steel bottom). It guarantees the utmost in cleanliness and long product life. The PRO series adds a touch of style to the most refined setting.
- Sturdy, clean stainless steel shelving**
 Shelves are the most important part of cleanliness as they come in direct contact with food. Only the PRO series uniquely provides stainless steel shelving.
- Spring assisted heavy duty gravity hinge**
- LED interior lighting & fan control**
 Energy efficient LED lighting lights every corner, making items easy to find. Fan control function automatically shuts off the fan when the door is open, which prevents hot air from being drawn in, thus maintaining the cool inner temperature.
- Ergonomically designed doors**
 Customers' fatigue fades away with easy grip handles and doors that open effortlessly. These features along with self-closing doors make this the ultimate choice in customer convenience.
- High-density polyurethane insulation**
 The entire cabinet structure and solid doors are foamed-in-place using high density, CFC free polyurethane insulation.
- Lifetime guaranteed heavy duty hinges and handles**
- Built to maintain NSF standard temperatures in 100°F ambient**
- Refrigerator holds 33°F ~ 38°F for the best in food preservation**



Model	Swing Doors	CU./FT.	#of Shelves	HP	AMPS	Crated Weight (lbs.)	L x D* x H† (inches)
PUR-60-FB-N	2	14.8	2	1/6	8.9	282	60 1/4 x 30 x 30 1/2

Undercounter Refrigerator - Front Breathing Airflow

Undercounters
PRO Series

Model : PUR-60-FB-N

ELECTRICAL DATA	
Voltage	115/60/1
Plug Type	 NEMA 5-15P
Full Load Amperes	8.9
Compressor HP	1/6
Cord Length (ft.)	10
Refrigerant	R-290
DIMENSIONAL DATA	
Net Capacity (cu. ft.)	14.8
Ext. Length Overall (in.)	60 1/4 (1530mm)
Ext. Depth Overall (in.)*	30 (762mm)
Ext. Height Overall (in.)†	30 1/2 (776mm)
# of Doors	2
# of Shelves	2
Shelf Size (L x D) (in.)	27 x 17
Net Weight (lbs.)	255
Gross Weight (lbs.)	282

Design and specifications subject to change without notice.

Actual shipping weight may differ due to extra packing materials for product protection.

* Depth does not include 3/4" for door handles.

† Height does not include 5-1/8" for caster height.

■ WARRANTY : 5 Year Parts and Labor Warranty 7 Year Compressor Warranty

■ STANDARD FEATURES

- *Anti-corrosion coated evaporator*
- *Self-contained system*
- *4" dia. swivel casters with locks on the front set*
- *Door locks*

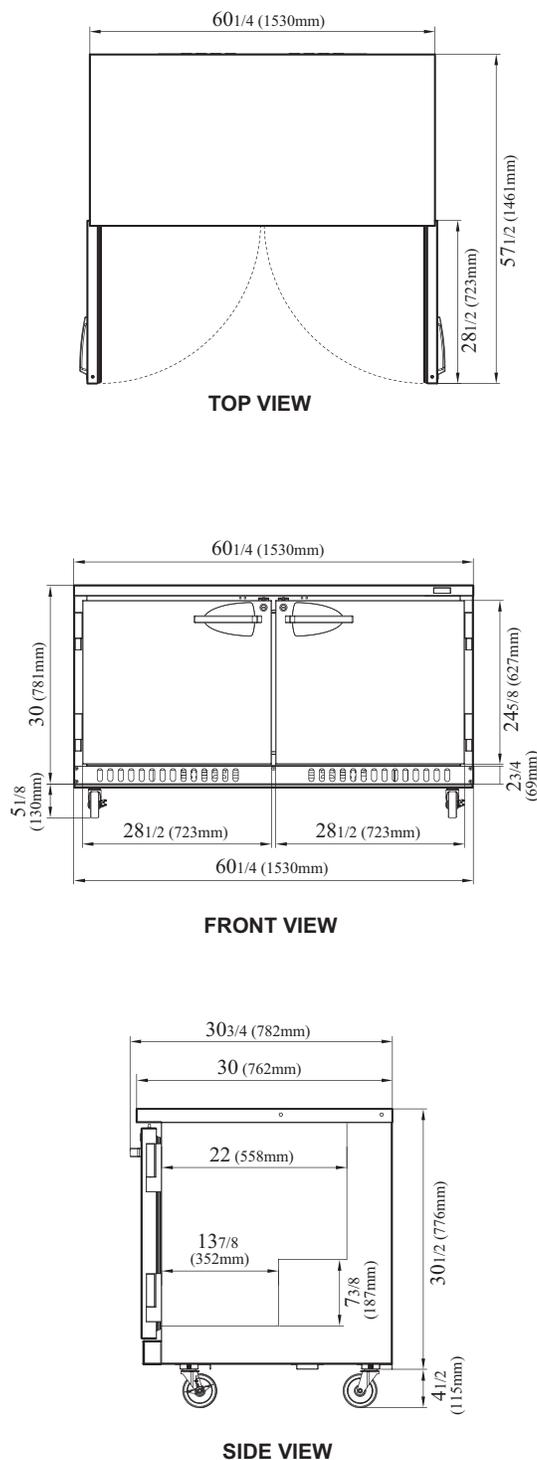
■ OPTIONAL ACCESSORIES

- 1" caster, 1/2" diameter & 13 TPI: S28R813660 (non-brake)
- 2.5" caster, 1/2" diameter & 13 TPI: 30265H0100 (non-brake), 30265H0200 (w/ brake)
- 5" caster, 1/2" diameter & 13 TPI: M726500100 (non-brake), M726500200 (w/ brake)
- Leveling leg, 1/2" - 13 TPI x 1.54": LFM1213566
- 6" ABS plastic leg: 30221M0200
- 6" stainless steel leg: 30221M0600
- Single overshef, stainless steel, 60-3/8" W: TSOS-5S

Ver.20241028

PLAN VIEW

(unit : inch)



NATURAL
Refrigerant



- Turbo Air: 800-627-0032
- Radiance: 800-500-3519
- Warranty: 800-381-7770
- AC: 888-900-1002

TURBO AIR REFRIGERATOR MANUFACTURER

Turbo air

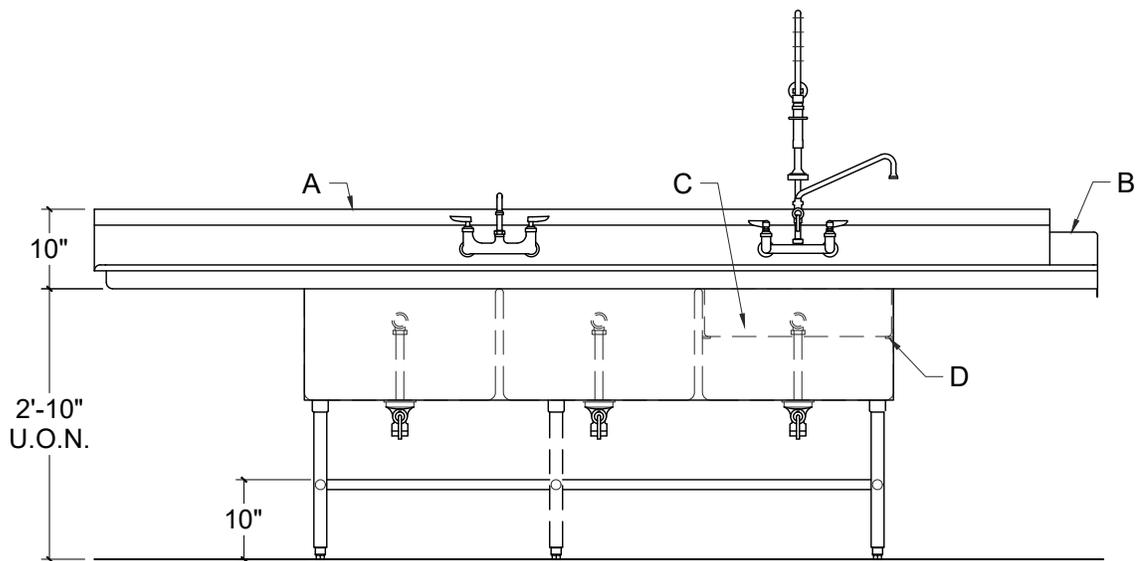
RADIANCE

TURBO AIR REFRIGERATION SYSTEM

Turbo air

TEXAKING

Continued product development may necessitate specification changes without notice.



ELEVATION

1/2"=1'-0"

- A. THREE COMPARTMENT SINK PER DETAIL 4-3
- B. WHERE DISHTABLE MEETS THE DISHWASHER, TURN DOWN PER DETAIL 4-1 NOTE E
- C. LIFT-OUT SCRAP BASKET PER DETAIL 4-2
- D. ROD SUPPORTS IN EACH CORNER 6" BELOW WORK SURFACE PER DETAIL 3-3 NOTE C

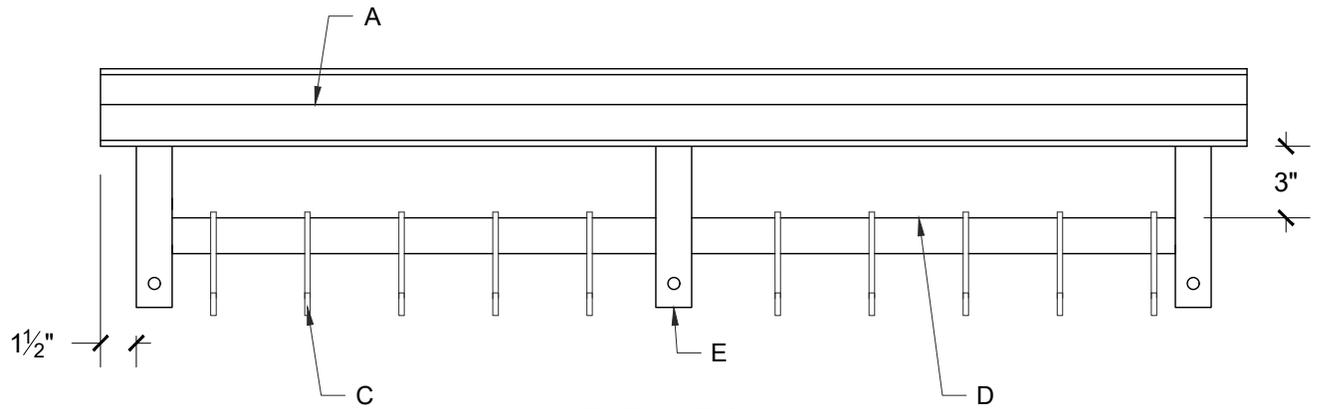
JACOBS | DOLAND | BEER

192 LEXINGTON AVE, SUITE 804
 NEW YORK, NY 10016
 TEL: (212) 206-0736

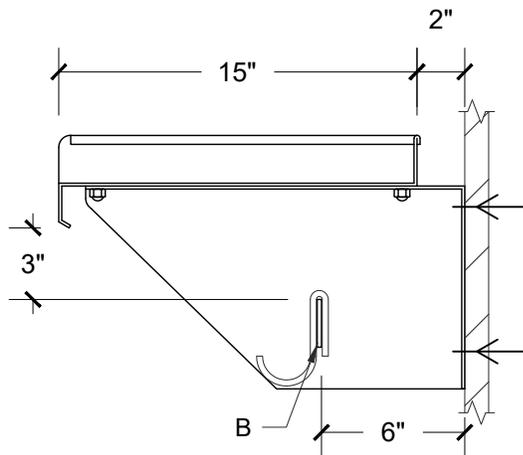
THREE-COMPARTMENT SINK WITH
 SCRAP BASKET

FABRICATION
 DETAIL

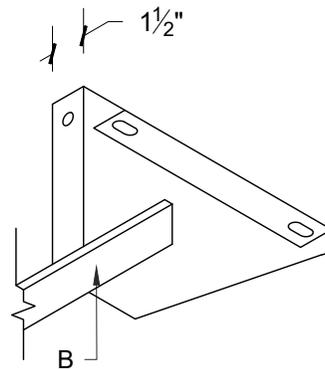
4-5



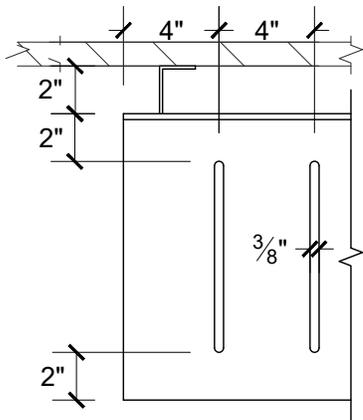
ELEVATION
1-1/2" = 1'-0"



SECTION
1-1/2" = 1'-0"



BRACKET DETAIL
1-1/2" = 1'-0"



PLAN: SLOTTED SHELF
1-1/2" = 1'-0"

- A. WALL SHELF PER DETAIL 2-1
- B. 2" X 3/16" S/S FLAT BAR, FULLY WELDED TO BRACKETS
- C. S/S SINGLE-SERVICE POT HOOKS EVERY 6"
- D. MOUNT AT 5'-6" A.F.F. TO BOTTOM OF RACK U.O.N.
- E. 2" X 3/16" S/S FLAT BAR SUPPORT; NO MORE THAN 5'-0" APART O.C.

Champion®

The Dishwashing Machine Specialists

PROJECT: _____

ITEM # _____ QTY: _____

MODEL # _____

AIA # _____ SIS # _____

DH2000

HIGH TEMPERATURE DOOR MACHINE

HIGH TEMPERATURE DOOR MACHINE



Rendered image is for general visual representation only. Please refer to specifications for the latest detailed product information.

STANDARD FEATURES

- **Exclusive Field Convertible**
to single or three phase, 208 or 240 volt, corner or straight through operation
- **Built-In Booster Configured For 70° Rise**
- **Rinse Sentry**
ensures 180°F final rinse
- **Auto Start**
starts unit when doors are closed
- **High Temperature**
- **Single Point Connection**
- **High Efficiency 1 HP Pump**
- **55 Racks Per Hour**
- **Self Draining Pump**
- **Automatic Tank Fill**
- **Detergent/Chemical Connections**
- **Interchangeable Upper And Lower Arm**
- **Top Mounted Splash Proof Controls**
- **Automatic Drain Valve**
- **Vent Fan Control**
- **Pressure Regulating Valve**
- **Low Water Tank Heat Protection**

OPTIONS & ACCESSORIES

- Drain Tempering Kit (unmounted)
- Side Panels
- Champion ION scale prevention system



SPECIFIER STATEMENT

Specified unit will be Champion model DH2000 high temperature door-type dishwashing machine. Features top mounted splash proof controls, rinse sentry, auto start, interchangeable stainless steel wash and rinse arms, up to 55 racks/hr., .90 US gals/rack.

1 Year parts and labor warranty.

In the USA:

3765 Champion Blvd, Winston-Salem, NC 27105
Tel: (336) 661-1556 Fax: (336) 661-1979
www.championindustries.com

In Canada:

2674 N. Service Rd., Jordan Station, Ontario, Canada LOR1S0
Tel: (905) 562-4195 Fax: (905) 562-4618
www.championindustries.com/1canada

Champion®

The Dishwashing Machine Specialists

DH2000

HIGH TEMPERATURE DOOR MACHINE

Shipping weight crated: 300 lbs. Dimensions shown in inches

SPECIFICATIONS

Capacities

Racks per hr. (NSF rated) 55
Wash tank (gal.) 9.5

Motor Horsepower

1 HP

Water Consumption

Gal. per hr. (max. use) 49.5
Gal. per rack .9

Temperature °F

Wash 150
Rinse 180

Time Cycle in seconds

Wash 40
Dwell 1
Rinse 12
Sanitary Dwell 7
Total cycle 60

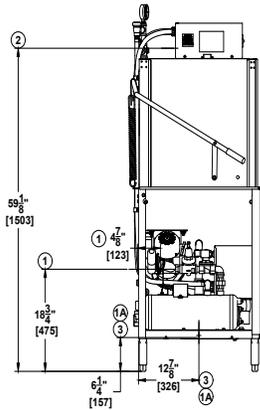
Machine and Electric 40°F/70°F OR 70°F Rise Booster

Elec. Specs	Rated Amps	Minimum Supply Ckt. Conductor Ampacity	Maximum Overcurrent Protective Device
208/60/1	65	80	80
240/60/1	75	80	80
208/60/3	40	50	50
240/60/3	45	50	50

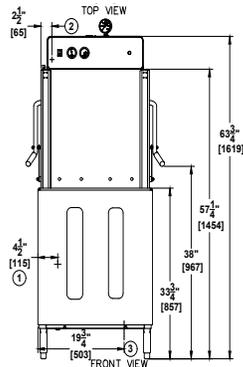
Utilities

- Water**
3/4" NPT Flow pressure 20-25 PSI
Hot water 110°F/43°C - 140°F/82°C
- Electrical 70° Booster**
A. 208-220/60/1 (See Box)
B. 208-220/60/3 (See Box)
- Drain**
1" NPT Connection Gravity flow
15 Drain Max Flow Rate (g/min)
- Drain**
250 CFM Hood Required

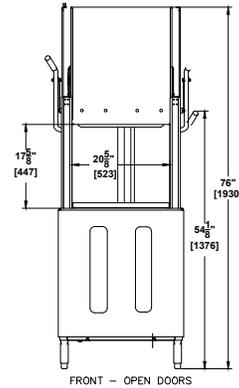
Warning: Plumbing, electrical connections should be made by qualified personnel who will observe all the applicable plumbing, sanitary and safety codes and the National Electrical Code.



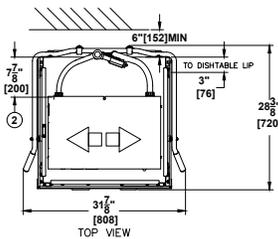
Side View



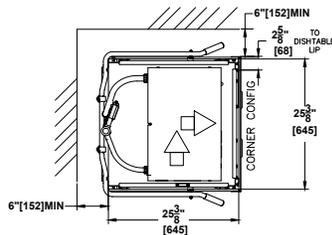
Front View



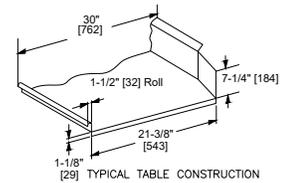
Door Clearance



Straight Through



Corner Configuration



Typical Table Construction

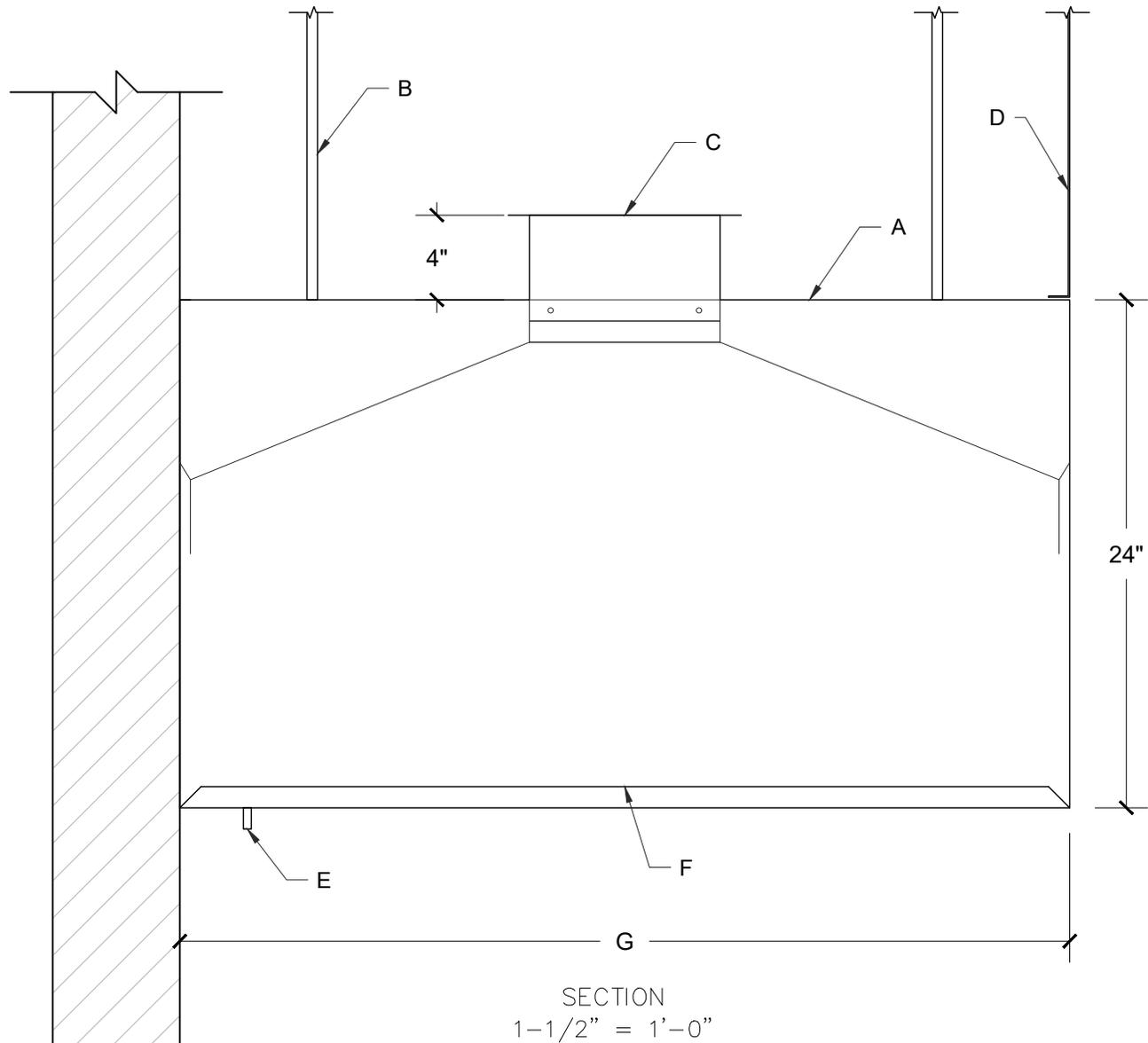
In the USA: 3765 Champion Blvd, Winston-Salem, NC 27105 | Tel: (336) 661-1556 Fax: (336) 661-1979 | www.championindustries.com

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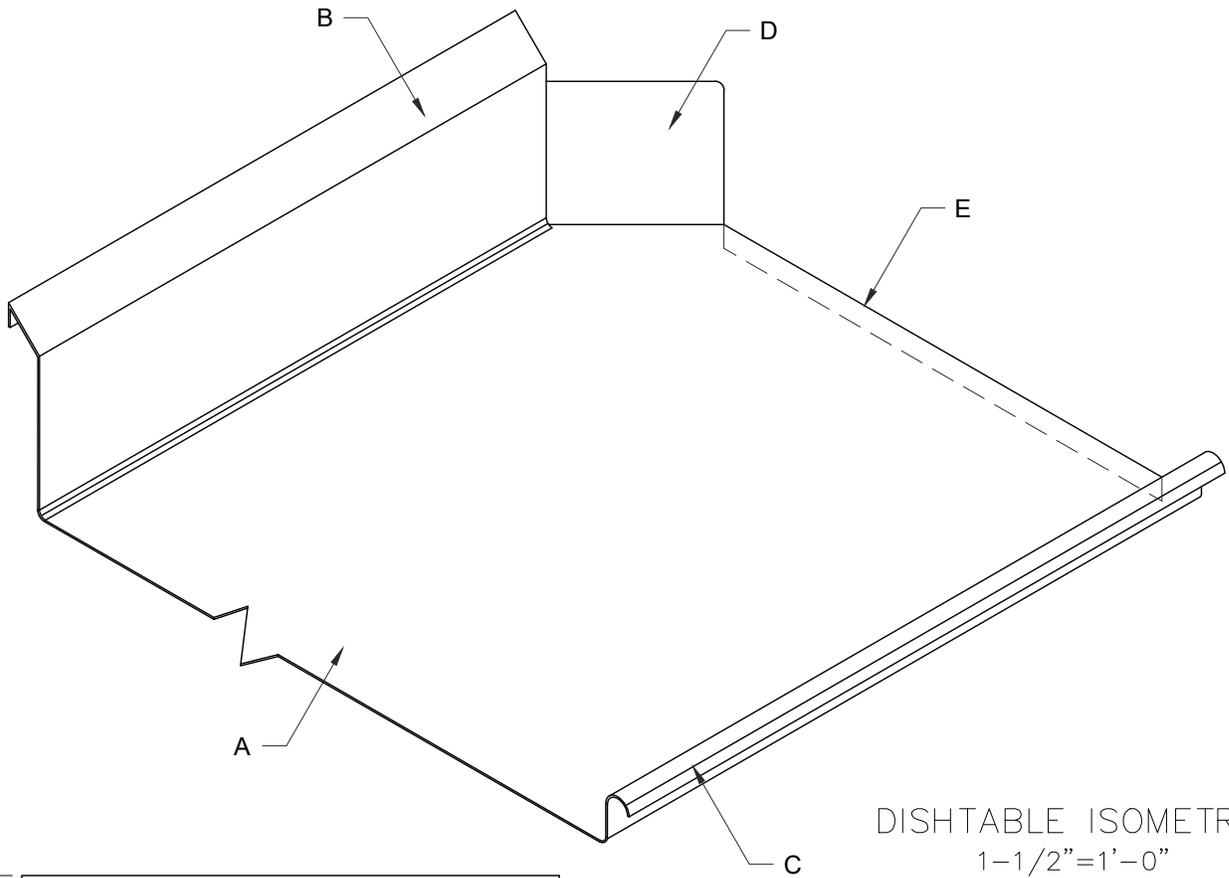
Rev. 09/2024 Printed in U.S.A.

Due to an ongoing value analysis program at Champion, specifications contained in this catalog are subject to change without notice.

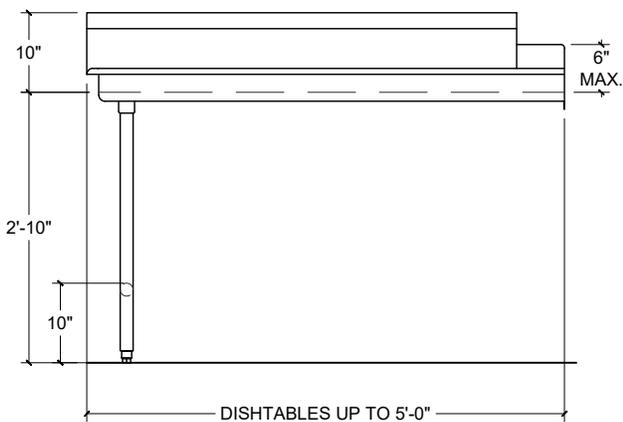
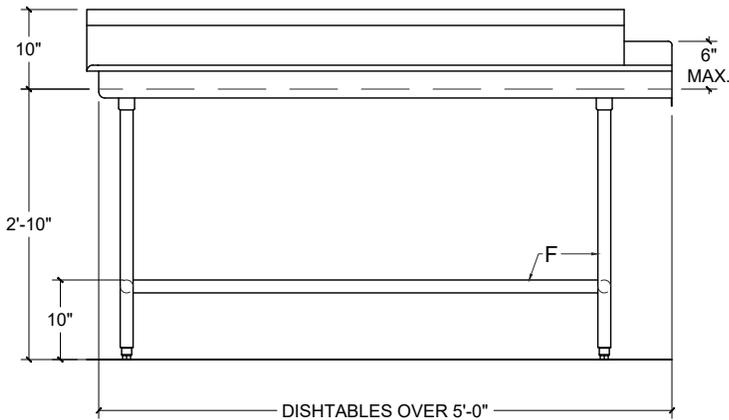




- A. CONSTRUCTED ENTIRELY OF 18 GA. TYPE 304 S/S
- B. 1/2" S/S ROD HANGER TO STRUCTURE ABOVE BY KEC
- C. DUCT COLLAR FULLY WELDED TO DUCTWORK BY GC
- D. CEILING ENCLOSURE PANEL BY HOOD MANUFACTURER, INSTALLED BY KEC
- E. 3/8" DRAIN TUBE AT REAR
- F. PERIMETER GUTTER
- G. WHERE LOCATED OVER DISHWASHER, COORDINATE SIZE AND LOCATION WITH DISHWASHER MODEL



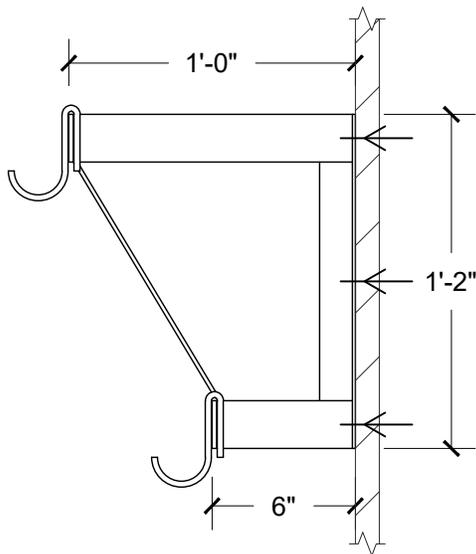
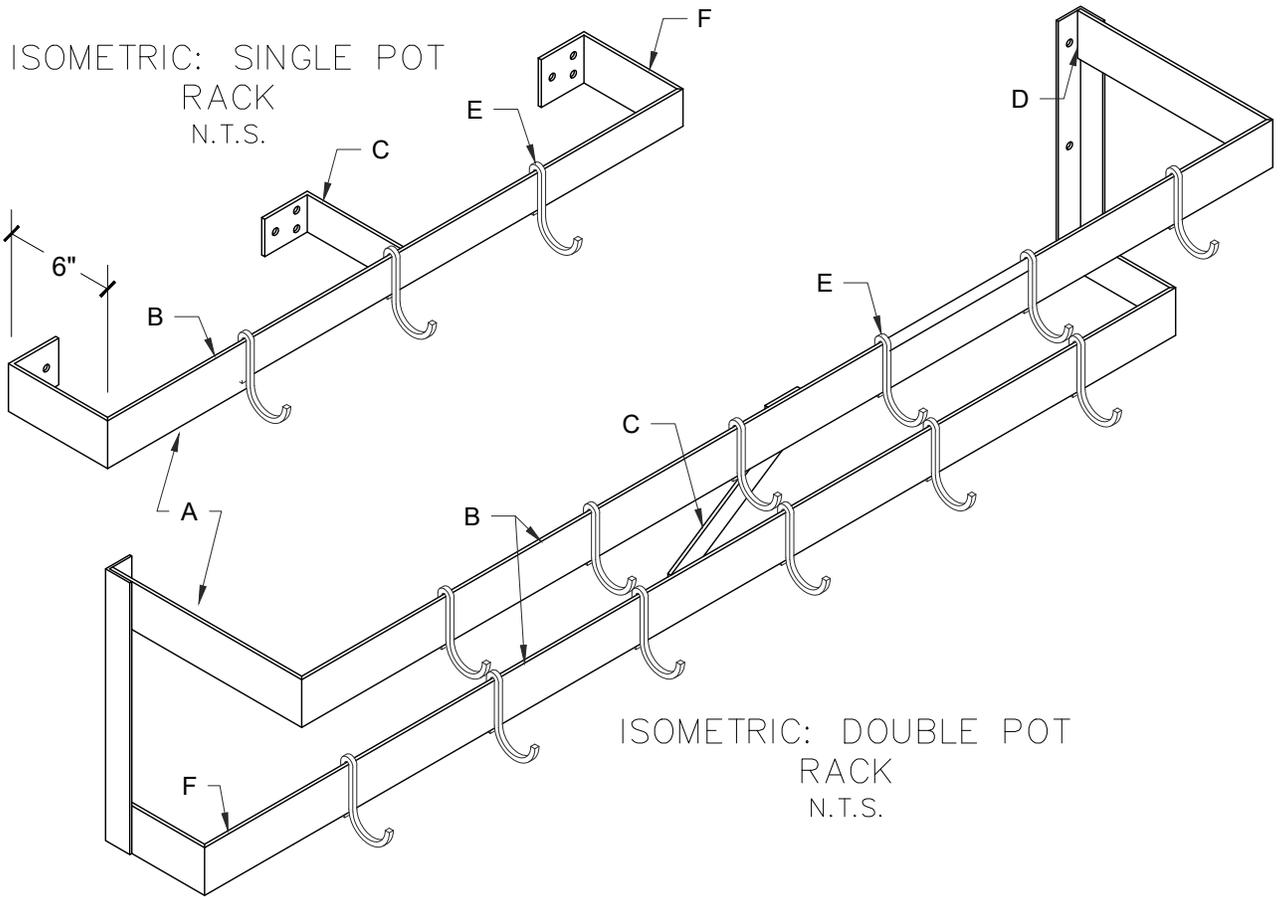
DISHTABLE ISOMETRIC
1-1/2" = 1'-0"



ELEVATIONS

1/2" = 1'-0"

- A. TABLE PER DETAIL 1-3
- B. SPLASH PER DETAIL 1-2 TYPE C
- C. RAISED ROLLED EDGE PER DETAIL 1-1 TYPE E
- D. 6" HIGH MAXIMUM; COORDINATE WITH DISHWASHER REQUIREMENTS
- E. TURN DOWN 1" AT MACHINE; VERIFY OPENING SIZE WITH MACHINE
- F. PROVIDE REAR & SIDE CROSS BRACING FOR DISHTABLES OVER 60"



SECTION: DOUBLE POT RACK
 1-1/2" = 1'-0"

- A. SINGLE OR DOUBLE BAR DESIGN PER SPECIFICATIONS
- B. 2" x 3/16" S/S FLAT BAR CONSTRUCTION
- C. 2" x 3/16" S/S FLAT BAR SUPPORT; NO MORE THAN 5'-0" APART O.C.
- D. FULLY WELDED TO S/S ANGLES AND SECURED TO WALL
- E. S/S SINGLE SERVICE POT HOOKS EVERY 6"
- F. MOUNT AT 6'-6" A.F.F. TO BOTTOM OF RACK U.O.N.



Slim Jim®

The Slim Jim® container delivers the durability needed for commercial environments combined with brand new innovation to increase worker productivity. New product features and accessories deliver the most efficient solution for collection, transportation, and disposal of multi-stream waste and recyclables.

Features and Benefits:

- Venting channels make removing liners up to 80% easier, improving productivity and reducing the risk of worker injury
- Four bag cinches secure liners around the rim of the container and allow for quick, knot-free liner changes
- Handles at the base and rim of the container improve grip and control while lifting and emptying full containers
- Rim with rib-strengthened design increases strength and resists crushing
- Build a recycling station with a variety of dolly and lid options to meet any facility need

COLORS AVAILABLE

Blue, Green, Black, Beige, Brown, Gray, Yellow*, Red*

* 23-gallon only

Material Composition:

Injection molded with a high-quality resin blend.

Accessories:

STAINLESS STEEL DOLLIES

- Slim Jim® Single Dolly
- Slim Jim® Double Dolly
- Slim Jim® Triple Dolly
- Slim Jim® Quadruple Dolly

RESIN DOLLY

- Slim Jim® Trainable Dolly

LIDS

- Bottles and Cans Lid
- Paper Lid
- Mixed Recycling Lid
- Hinged Lid
- Swing Lid

SLIM JIM® CONTAINERS



23-Gallon Slim Jim® Container



16-Gallon Slim Jim® Container

SLIM JIM® CONTAINERS

SKU #	DESCRIPTION	COLOR	CAPACITY		LENGTH		WIDTH		HEIGHT		PACK SIZE
			GAL	L	IN	CM	IN	CM	IN	CM	
1971258	SLIM JIM® CONTAINER	GRAY	16	61	22"	55.88	11"	27.94	25"	63.50	4
1955959	SLIM JIM® CONTAINER	BLACK	16	61	22"	55.88	11"	27.94	25"	63.50	4
1971259	SLIM JIM® CONTAINER	BEIGE	16	61	22"	55.88	11"	27.94	25"	63.50	4
1956181	SLIM JIM® CONTAINER	BROWN	16	61	22"	55.88	11"	27.94	25"	63.50	4
1971257	SLIM JIM® CONTAINER	BLUE	16	61	22"	55.88	11"	27.94	25"	63.50	4
1955960	SLIM JIM® CONTAINER	GREEN	16	61	22"	55.88	11"	27.94	25"	63.50	4
FG354060GRAY	SLIM JIM® CONTAINER	GRAY	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354060BLA	SLIM JIM® CONTAINER	BLACK	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354060BEIG	SLIM JIM® CONTAINER	BEIGE	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956187	SLIM JIM® CONTAINER	BROWN	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956185	SLIM JIM® CONTAINER	BLUE	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956186	SLIM JIM® CONTAINER	GREEN	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956188	SLIM JIM® CONTAINER	YELLOW	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956189	SLIM JIM® CONTAINER	RED	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354007BLUE	SLIM JIM® CONTAINER	BLUE (RECYCLING)	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354007GRN	SLIM JIM® CONTAINER	GREEN (RECYCLING)	23	87	22"	55.88	11"	27.94	30"	76.20	4



EXISTING EQUIPMENT

This item is not in the Foodservice Equipment Contract

Item is existing:

- Where Shown
- Relocated
- Modified

Notes:

Refer to the foodservice and architectural plans for item location



HIGH FLOW CSR TWIN-MC² SYSTEM

DELIVERS PREMIUM QUALITY WATER FOR COMBINATION APPLICATIONS

High Flow CSR Twin-MC2 System: EV9330-42
 MC2 Replacement Cartridge: EV9612-56
 EC210 Prefilter Cartridge: EV9534-26
 SS-IMF Cartridge: EV9799-32



APPLICATIONS

- ◆ Combination of Coffee Brewers, Espresso Machines, Hot Chocolate Dispensers, Fountain and Ice Machines
- ◆ Multiple Equipment and Combinations

FEATURES • BENEFITS

- ◆ One system provides premium quality water to high flow fountain, coffee and ice machines
- ◆ Sanitary cartridge replacement is simple, quick and clean. Internal filter parts are never exposed to handling or contamination
- ◆ Proprietary Pentair® Everpure® MicroPure® II filtration media effectively inhibits the growth of bacteria on the filter media that can decrease product life
- ◆ Exclusive precoat filtration provides superior chlorine taste & odor reduction and micro-filters dirt and particles as small as 0.2* micron in size by mechanical means
- ◆ Increases the overall efficiency of foodservice equipment
- ◆ Reduces chlorine taste & odor and other offensive contaminants that can adversely affect the taste of beverages
- ◆ Pentair Everpure SR-X with Pentair Everpure SS-IMF Cartridge inhibits scale buildup in ice machines and coffee brewers
- ◆ 20" prefilter captures larger dirt particles
- ◆ NSF/ANSI Standard 53 certified to reduce cysts such as *Cryptosporidium* and *Giardia* by mechanical means

INSTALLATION TIPS

- ◆ Choose a mounting location suitable to support the full weight of the system when operating.
- ◆ Use 3/4" water line.
- ◆ Fountain equipment connections are made to the outlet part of the system before the SR-X system.
- ◆ Coffee brewer and ice machine connections are made after the SR-X feeder; a tee is required.
- ◆ Install vertically with cartridges hanging down and allow 2 1/2" (6.35 cm) clearance below the cartridge for easy cartridge replacement.
- ◆ Flush cartridges by running water through flushing valve for five (5) minutes at full flow.

OPERATION TIPS

- ◆ Change cartridges on a regular six (6) month preventative maintenance program.
- ◆ Change cartridges when capacity is reached or when pressure falls below 10 psi (0.7 bar).
- ◆ Change SS-IMF Cartridge before Hydroblend® compound is completely used up.
- ◆ Change prefilter cartridge when excessively dirty.
- ◆ Always flush the filter cartridge at time of installation and cartridge change.

SIZING

- ◆ Service Flow Rate:
Maximum 3.34 gpm (12.6 Lpm)
- ◆ Rated Capacity:
18,000 gallons (68,137 L)

*Validated by ISO 17025 accredited lab for 99.999% reduction of *Pseudomonas diminuta* following the ASTM F838-05 protocol for the validation of 0.2 µm sterilizing grade filters.

HIGH FLOW CSR TWIN-MC² SYSTEM

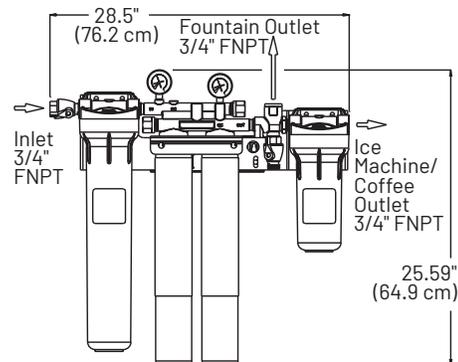
EV9330-42

High Flow CSR Twin-MC2 System: EV9330-42

MC2 Replacement Cartridge: EV9612-56

EC210 Prefilter Cartridge: EV9534-26

SS-IMF Cartridge: EV9799-32çç



SPECIFICATIONS

- ◆ **Service Flow Rate**
Maximum 3.34 gpm (12.6 Lpm)
- ◆ **Rated Capacity**
18,000 gallons (68,137 L)
- ◆ **Pressure Requirements**
10 – 125 psi (0.7 – 8.6 bar), non-shock
- ◆ **Temperature Limits**
35 – 100°F (2 – 38°C)
- ◆ **Overall Dimensions**
25.59" L x 25.8" W x 6.74" D
(64.9 cm x 65.5 cm x 17.1 cm)
- ◆ **Inlet Connection** 3/4"
- ◆ **Outlet Connection** 3/4"
- ◆ **Operating Weight**
42 lbs (19 kgs)
- ◆ **Shipping Weight**
30 lbs (13.6 kgs)
- ◆ **Electrical Connection**
None required



System Tested and Certified by NSF International against NSF/ ANSI Standards 42 and 53 for the reduction of:

STANDARD NO. 42 – AESTHETIC EFFECTS	STANDARD NO. 53 – HEALTH EFFECTS
Chemical Reduction Taste & Odor Chlorine	Mechanical Filtration Cyst
Mechanical Filtration Nominal Particulate Class I	

EPA Est. No. 002623-IL-002

WARRANTY

Everpure water treatment systems by Pentair (excluding replaceable elements) are covered by a limited warranty against defects in material and workmanship for a period of five years after date of purchase. Everpure replaceable elements (filter cartridges and water treatment cartridges) are covered by a limited warranty against defects in material and workmanship for a period of one year after date of purchase. See printed warranty for details. Pentair will provide a copy of the warranty upon request.

The contaminants or other substances removed or reduced by this drinking water system are not necessarily in your water. Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system. Systems certified for cyst reduction may be used with disinfected water that may contain filterable cysts.

Since the conditions under which our products may be used are beyond our control, we cannot accept any liability with respect to the improper installation, application and/or use of our products



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Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Hand Sink, model HSA-10-FDP. Constructed of type 304 stainless steel, all-welded with deep-drawn positive drain sink bowl, inverted "V" edge to prevent spillage, drain, paper towel dispenser, soap dispenser and splash mounted gooseneck faucet.

Eagle Hand Sink, model HSA-10-FDPS. Features are the same as #HSA-10-FDP, plus stainless steel sink skirt.

Eagle Hand Sink, model HSA-10-FLDP. Features are the same as #HSA-10-FDP, plus polymer lever drain.

Eagle Hand Sink, model HSA-10-FODP. Features are the same as #HSA-10-FDP, plus polymer lever drain with overflow.

Eagle Hand Sink, model HSA-10-FWLDP-LRS. Features splash mount gooseneck faucet with wrist handles, towel dispenser, soap dispenser, polymer lever drain, and end splashes.



#HSA-10-FDP

Options / Accessories

- P-trap
- Tail piece
- End splashes
- Front skirt**
- Side mount wall bracket
- MICROGARD® antimicrobial agent***

** Front skirt available only for models HSA-10-FDP and HSA-10-FDPS.

*** For hand sinks #HSA-10-FDP and #HSA-10-FDPS only.

EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA

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Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our SpecFAB® Division.

Phone: 302-653-3000 • Fax: 302-653-2065 • e-mail: quotes@eaglegrp.com

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Hand Sinks* with Towel and/or Soap Dispenser

MODELS:

- HSA-10-FDP
- HSA-10-FDPS
- HSA-10-FLDP
- HSA-10-FODP
- HSA-10-FWLDP-LRS

Design & Construction Features

- Heavy gauge type 304 stainless steel all-welded construction.
- Inverted "V" edge rim retards spillage.
- Backsplash with a 2" (51mm) return on a 45° angle.
- ½" (13mm) NPS water inlet, 1½" (38mm) NPS drain outlet.
- Unique deep-drawn positive-drain bowl assures complete drainage to meet the most stringent health code requirements.
- All-welded towel dispenser features hinged top assembly, sight window to visually inspect towel level, quick-fill soap dispenser, and is designed to accommodate 4" x 10" (102 x 254mm) C-fold disposable paper towels.
- Comes with mounting bracket to facilitate wall mount installation.

* Non-electric. For hand sinks with electric soap dispenser and faucets, see spec sheet #20.42.

For hand sinks with deck-mounted soap dispensers, see spec sheets #EG20.05 and #EG20.07.

Certifications / Approvals



AUTOQUOTES



Spec sheets available for viewing, printing or downloading from our online literature library at www.eaglegrp.com

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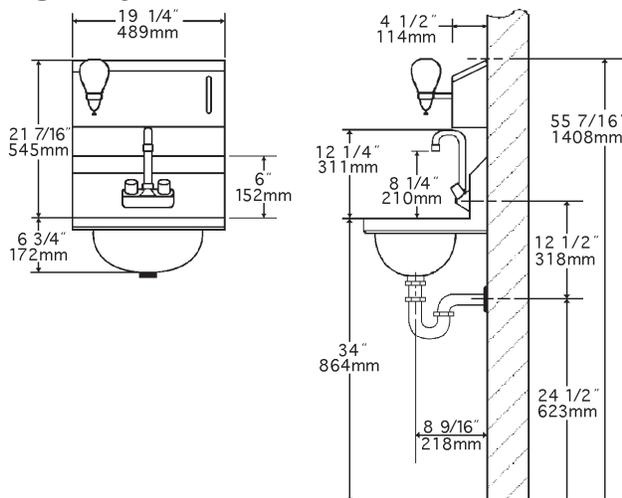


Profit from the Eagle Advantage®

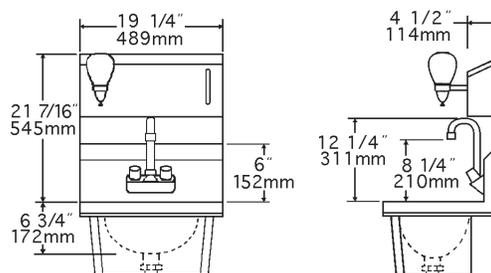
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 Project No.: _____
 S.I.S. No.: _____

Hand Sinks with Towel and/or Soap Dispensers

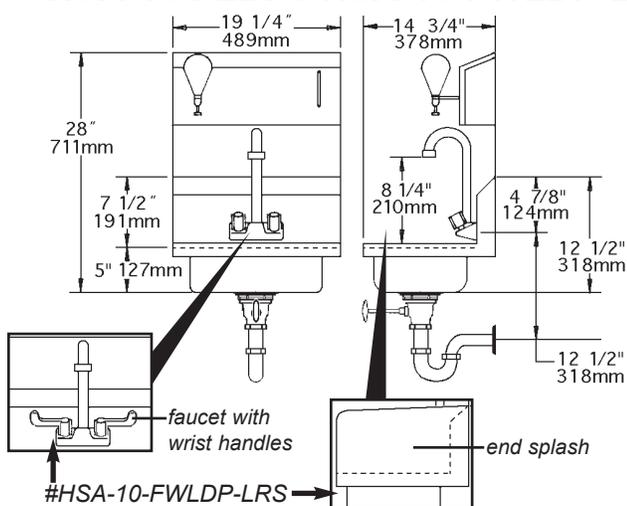
HSA-10-FDP



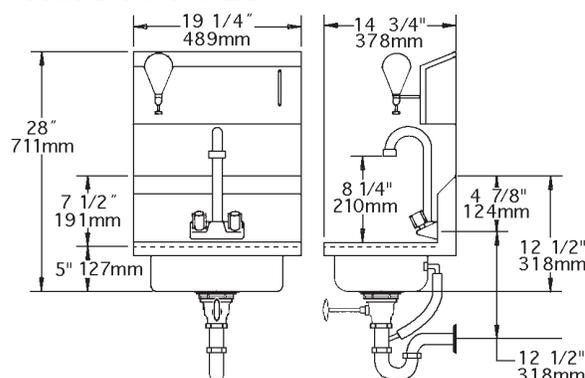
HSA-10-FDPS



HSA-10-FLDP / HSA-10-FWLDP-LRS



HSA-10-FODP



model #	includes towel dispenser, soap dispenser, and...	bowl size		overall size		weight	
		width in.	length x depth mm	width in.	length x height mm	lbs.	kg
HSA-10-FDP	faucet, basket drain	9 3/4"	13 1/2" x 6 3/4"	248 x 343 x 173	14 3/4" x 19 1/4" x 28 1/4"	376 x 489 x 718	29 13.2
HSA-10-FDPS	faucet, skirt, basket drain	9 3/4"	13 1/2" x 6 3/4"	248 x 343 x 173	14 3/4" x 19 1/4" x 30"	376 x 489 x 762	29 13.2
HSA-10-FLDP	faucet, polymer lever drain	10"	14" x 5"	254 x 256 x 127	14 3/4" x 19 1/4" x 28"	376 x 489 x 711	32 14.5
HSA-10-FODP	faucet, polymer lever drain w/overflow	10"	14" x 5"	254 x 256 x 127	14 3/4" x 19 1/4" x 28"	376 x 489 x 711	30 13.6
HSA-10-FWLDP-LRS	faucet w/wrist handles, poly lever drain, end splashes	10"	14" x 5"	254 x 256 x 127	14 3/4" x 19 1/4" x 28"	376 x 489 x 711	30 13.6

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Item # _____

We put space to work.

Job _____

MetroMax Q® Polymer / Wire Shelving

Quick-to-adjust, corrosion resistant shelving constructed of removable polymer open grid shelf mats, wire shelf frames, and corner releases. Shelf frames and steel posts have an epoxy coating over an electroplated substrate. Shelves offer a 20 year warranty against rust and corrosion. Polymer posts are rust proof. Microban® antimicrobial product protection is built into the shelf mats and posts. Shelf has a rigid four-sided frame with center truss(es). Robust corner provides complete 360° capture of the wedge and post for added stability. Stationary units have maximum capacity of 2,000 lbs. (907kg) evenly distributed. Mobile units (with stem casters) offer a maximum total unit load of 900 lbs. (408kg). Units assemble easily — shelves mount on four one-piece wedges along grooved, numbered posts and adjust on 1" (25mm) increments.

- **Forever Strong:** Proven corner connection and four-sided shelf frame with center truss(es) assures stability and strength in stationary, mobile, and high-density track shelving configurations.
800 lbs. (363kg) per shelf for lengths of 24" to 48" (610 to 1219mm)
600 lbs. (272kg) per shelf for lengths of 54" (1372mm) or longer
Stationary unit: 2000lbs (907kg) evenly distributed.
Mobile unit (with stem casters): Up to 900lbs. (408kg).
Multiply the caster load rating by 3 to determine actual rating.
- **Long life Rust Resistance:** Shelves offer a 20 year limited corrosion warranty and are combined with rust proof polymer posts.
- **Easy to Clean and Maintain:** Polymer mats can be easily removed and cleaned in a sink or commercial washer / dish machine.
- **Microban® Antimicrobial Product Protection** is built into the shelf mats and posts to inhibit the growth of bacteria, mold, mildew, and fungus that cause odors and product degradation. Microban product protection keeps the product "cleaner between cleanings".
- **Quick-to-Adjust:** Patented corner release allows shelves to be adjusted without tools. Simply flip each corner release, relocate the wedge connectors on the posts, and reposition the shelf. Quickly adjust shelves to reclaim wasted vertical space.
- **Efficient Use of Space:** Shelves adjust on 1" (25mm) increments along the post to maximize the use of available vertical space.
- **Fast, Easy Assembly:** Shelves are ready to use right out of the box. One-piece wedges securely attach to the posts. Raised beads on the back of each wedge snap into grooves on the post. Window on wedge aligns with numbers on the post to locate the desired shelf position. Shelf mounts on four wedges. A unit can be assembled without tools in minutes.
- **Interchangeable:** Part of the MetroMax platform, MetroMax Q shelves are compatible on the same shelving units with MetroMax i and MetroMax 4 shelves.
- **Open Grid and Solid Mat Options:** MetroMax Q is available with open grid mats. Open grid shelves promote air circulation and light penetration. If a solid shelf is required, MetroMax i or MetroMax 4 solid shelves may be added to the MetroMax Q unit.
- **NSF Listed** for all environments.
- **Optional Accessories** are on spec sheet 9.25.

Material Specifications:

- **Shelf Mats:** Injection-molded polypropylene with exclusive built-in Microban® antimicrobial product protection.
- **Shelf frames:** Steel with electroplated substrate and highly durable, abrasion-resistant epoxy finish.
- **Epoxy-coated posts:** Steel with electroplated substrate and highly durable, abrasion-resistant epoxy finish. Epoxy finish has built-in Microban antimicrobial product protection. The adjustable foot is reinforced nylon.
- **Temperature range:** -20°F (-29°C) to 125°F (52°C) continuous use, with intermittent exposure to 200°F (93°C) for cleaning.



Quick-to-Adjust

Removable shelf mats

*MICROBAN® and the MICROBAN® symbol are registered trademarks of the Microban® Products Company, Huntersville, NC. Microban® product protection does not by itself protect a user from food borne illness. Product must be routinely cleaned.



Supports good
HACCP
processes

All Metro Catalog Sheets are available on our website: www.metro.com



InterMetro Industries Corporation
North Washington Street, Wilkes-Barre, PA 18705
Product Information. U.S. and Canada: 1.800.992.1776
Outside U.S. and Canada: www.metro.com/contactus

L02-178
Printed in U.S.A. 6/22

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MetroMax Q® Polymer / Wire Shelving

9.21

Job _____

MetroMax Q[®] POLYMER / WIRE SHELVING



We put space to work.™

Standard Interchangeable Shelves

Part number includes shelf with removable mats and one bag of wedges

Nominal Width/Length (in.) (mm)		Cat. No. Shelf w/ grid Mats	Nominal Width/Length (in.) (mm)		Cat. No. Shelf w/ grid Mats
14x24	355x610	MQ1424G	21x24	530x610	MQ2124G
14x30	355x760	MQ1430G	21x30	530x760	MQ2130G
14x36	355x914	MQ1436G	21x36	530x914	MQ2136G
14x42	355x1060	MQ1442G	21x42	530x1060	MQ2142G
14x48	355x1219	MQ1448G	21x48	530x1219	MQ2148G
-	-	-	21x54	530x1372	MQ2154G
14x60	355x1524	MQ1460G	21x60	530x1524	MQ2160G
14x72	355x1829	MQ1472G	21x60	530x1829	MQ2172G
18x24	457x610	MQ1824G	24x24	610x610	MQ2424G
18x30	457x760	MQ1830G	24x30	610x760	MQ2430G
18x36	457x914	MQ1836G	24x36	610x914	MQ2436G
18x42	457x1060	MQ1842G	24x42	610x1060	MQ2442G
18x48	457x1219	MQ1848G	24x48	610x1219	MQ2448G
18x54	457x1372	MQ1854G	24x54	610x1372	MQ2454G
18x60	457x1524	MQ1860G	24x60	610x1524	MQ2460G
18x72	457x1829	MQ1872G	24x60	610x1829	MQ2472G

Heavy-Duty Dunnage Shelves

- Weight capacity per shelf evenly distributed: 1,200 lbs. (544kg) on shelves up to and including 48" (1219mm) long; 900 lbs. (408kg) for shelves 54" (1370mm) and longer.
- Dunnage shelves must be used on shelving units with four posts.

Grid Mat Model No.	Nominal Width (mm)		Nominal Length (mm)		Approx. Pkd. Wt. (lbs./kg)	
	(in.)	(mm)	(in.)	(mm)	(lbs.)	(kg)
MHP2436G	24	610	36	914	21	9.5
MHP2448G	24	610	48	1220	27	12.2
MHP2454G	24	610	54	1370	29	13.2
MHP2460G	24	610	60	1524	33	15.0

Shelving Height Guidelines – MetroMax

Shelf Depth	14" (356mm)	18" (457mm)	21" (533mm)	24" (610mm)
Maximum Post Height Allowable	▼	▼	▼	▼
Stationary	63" (1600mm)	86" (2184mm)	86" (2184mm)	86" (2184mm)
Mobile	54" (1372mm)	74" (1880mm)	74" (1880mm)	86" (2184mm)

Note: 14" deep stationary shelving taller than 63" must be properly fastened to floor or the wall. Reference spec sheet 9.25, page 2 for options.

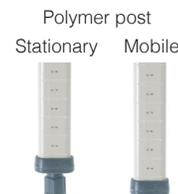
Rust Proof Polymer Posts - Lifetime warranty against rust.

Stationary - with leveling foot

Epoxy-Coated Steel Model No.	Approx. Pkd. Wt. (lbs.) (kg)	Nominal Height (in.) (mm)	Actual Height (in.) (mm)
MX13P	0.5 0.2	13 370	14 ³ / ₁₆ 360
MX27P	0.9 0.4	27 685	28 ³ / ₁₆ 716
MX33P	1.0 0.5	33 875	34 ³ / ₁₆ 868
MX54P	1.6 0.7	54 1370	54 ³ / ₁₆ 1376
MX63P	1.8 0.8	63 1585	62 ³ / ₁₆ 1580
MX74P	2.3 1.0	74 1690	74 ³ / ₁₆ 1884
MX86P	2.5 1.4	86 2195	86 ³ / ₁₆ 2189

Mobile - for stem casters

Polymer Model No.	Approx. Pkd. Wt. (lbs.) (kg)	Nominal Height (in.) (mm)	Actual Height (in.) (mm)
MX13UP	0.5 0.2	13 370	14 ³ / ₁₆ 360
MX27PE	2.0 0.9	27 685	28 ³ / ₁₆ 716
MX33UP	1.0 0.5	33 875	34 ³ / ₁₆ 868
MX54UP	1.6 0.7	54 1370	54 ³ / ₁₆ 1376
MX63UP	1.8 0.8	63 1585	62 ³ / ₁₆ 1580
MX70UP	2.0 0.9	70 1778	69 ³ / ₁₆ 1757
MX74UP	2.3 1.0	74 1690	74 ³ / ₁₆ 1884
MX86UP	3.0 1.4	86 2195	86 ³ / ₁₆ 2189



Shelf Wedge Connector:
Reinforced nylon. Replacement MetroMax Q Wedges Cat. No. MQ9985 (Bag of 4)

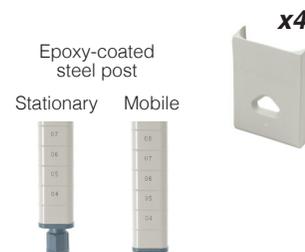
Epoxy Coated Steel Posts - For heavy-duty mobile applications. 15 year limited rust warranty.

Stationary - with leveling foot

Polymer Model No.	Approx. Pkd. Wt. (lbs.) (kg)	Nominal Height (in.) (mm)	Actual Height (in.) (mm)
MQ13PE	1.0 0.5	13 370	14 ³ / ₁₆ 360
MQ27PE	2.0 0.9	27 685	28 ³ / ₁₆ 716
MQ33PE	2.5 1.1	33 875	34 ³ / ₁₆ 868
MQ54PE	4.0 1.8	54 1370	54 ³ / ₁₆ 1376
MQ63PE	4.5 2.0	63 1585	62 ³ / ₁₆ 1580
MQ74PE	5.5 2.5	74 1690	74 ³ / ₁₆ 1884
MQ86PE	6.5 2.9	86 2195	86 ³ / ₁₆ 2189

Mobile - for stem casters

Epoxy-Coated Steel Model No.	Approx. Pkd. Wt. (lbs.) (kg)	Nominal Height (in.) (mm)	Actual Height (in.) (mm)
MQ13UPE	1.0 0.5	13 370	14 ³ / ₁₆ 360
MQ27UPE	2.0 0.9	27 685	28 ³ / ₁₆ 716
MQ33UPE	2.5 1.1	33 875	34 ³ / ₁₆ 868
MQ54UPE	4.0 1.8	54 1370	54 ³ / ₁₆ 1376
MQ63UPE	4.5 2.0	63 1585	62 ³ / ₁₆ 1580
MQ70UPE	2.0 0.9	70 1778	69 ³ / ₁₆ 1757
MQ74UPE	5.5 2.5	74 1690	74 ³ / ₁₆ 1884
MQ86UPE	6.5 2.9	86 2195	86 ³ / ₁₆ 2189



MetroMax Q[®] Polymer / Wire Shelving



an Ali Group Company



The Spirit of Excellence

N.I.C. (Not in Contract)

This item is not in the Foodservice Equipment Contract

Item to be provided by:

- Vendor
- Owner
- General Contractor
- Millwork
- Other

Notes:

Kitchen Equipment Contractor (KEC) to coordinate the final location of this item

KEC to verify final equipment selection with the Owner and coordinate the utility requirements with the MEP Engineer

Refer to the foodservice and architectural plans for item location

N.I.C. (Not in Contract)

This item is not in the Foodservice Equipment Contract

Item to be provided by:

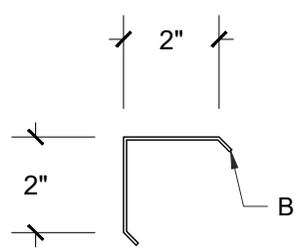
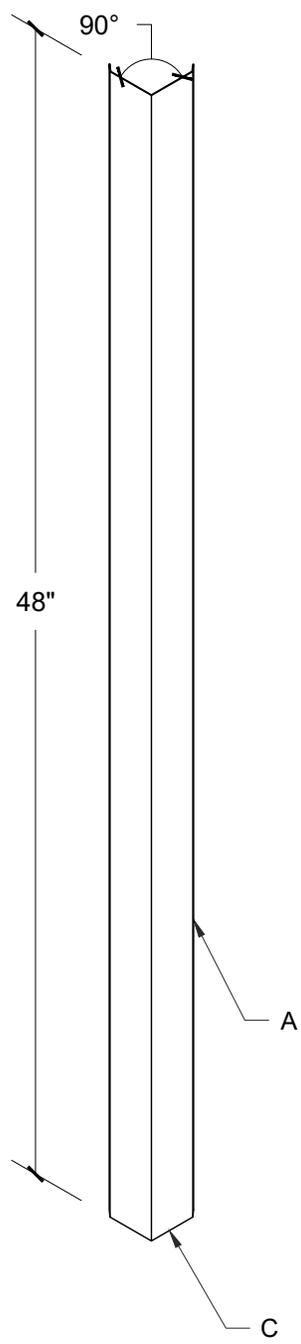
- Vendor
- Owner
- General Contractor
- Millwork
- Other

Notes:

Kitchen Equipment Contractor (KEC) to coordinate the final location of this item

KEC to verify final equipment selection with the Owner and coordinate the utility requirements with the MEP Engineer

Refer to the foodservice and architectural plans for item location



PLAN
 3" = 1'-0"

- A. 18 GAUGE TYPE 304 S/S
- B. ANGLED ENDS
- C. BOTTOM OF CORNER GUARD TO ALIGN WITH TOP OF COVED FLOOR BASE
- D. SEALED TO WALL WITH NO VISIBLE FASTENERS

ISOMETRIC
 1-1/2" = 1'-0"

Description: ***Front of House***

Notes:

 <p>REFRIGERATOR MANUFACTURER Turbo air more durable, efficient, beautiful</p>	4184 E. Conant St. Long Beach, CA 90808 Tel. 310-900-1000 Fax. 310-900-1077 www.turboairinc.com	
	Project:	
	Model #:	
	Item #:	
	Available W/H:	Qty:
	Approval:	
	AIA #:	SIS #:
CSI Section 11400		

Glass Door Refrigerator

*Reach-In Bottom Mount
Super Deluxe Series*

Model : TSR-49GSD-N

FEATURES & BENEFITS

- **Self-Cleaning Condenser**
The accumulation of dust in the condenser can cause the failure or breakdown of refrigerators. Refrigerators run normally until they reach a certain level of accumulation. At some point, when they are over the limit, their performance drops quickly resulting in damage to, or disposal of the stored products inside. The Self-Cleaning Condenser device keeps the condenser clean and prevents system failure by automatically brushing daily.
- **Digital temperature control & monitor system**

 - Keeps food products safe by maintaining constant temperatures
 - Alarms that sound when doors are not sealed shut; protect against food spoilage that originates from cold air leaks
 - Early warning alarm program detects issues before malfunction occurs
 - Digital display allows for easy monitoring
 - Programs interpret the condition of refrigeration systems by self-diagnosis
 - Rapid cool-down functions (Turbo cooling)
 - Automatic evaporator fan motor delays
- **Hydrocarbon refrigerants (R-290)**
With innovative and eco-friendly technology, Turbo Air brings you hydrocarbon refrigerators designed to meet DOE's Energy Conservation Standards in 2017 and to use EPA's SNAP Program approved HC refrigerants. Hydrocarbon refrigerants do not deplete the ozone layer and have very low contribution to global warming (ODP-0, GWP-3).
- **Stainless steel interior & exterior**
The Turbo Air Super Deluxe glass door model is constructed with stainless steel exterior. The door is glass with AL frame. The interior is stainless steel that guarantees the utmost in cleanliness and long product life. The Super Deluxe adds a touch of style to the most refined setting.
- **Double pane glass doors with Low-E glass**
Energy saving double pane glass doors are equipped with Low-emissivity glass, which reduces outer heat gain and decreases energy consumption. It enhances energy efficiency and minimizes condensation. Lightweight door construction also reduces door maintenance and bushing wear, which in turn facilitates smoother door opening.
- **High-density polyurethane insulation**
The entire cabinet structure and solid doors are foamed-in-place using high density, HCFC free polyurethane insulation.
- **Ergonomically designed doors**
Customers' fatigue fades away with easy grip handles and doors that open effortlessly. Self-closing features make this the ultimate choice in customer convenience.
- **Adjustable, heavy duty, PE (polyethylene) coated wire shelves**
- **LED interior lighting**
- **Bottom mount compressor**



Refrigerator holds 33°F ~ 38°F for the best in food preservation

Patented Self-Cleaning Condenser



This product is equipped with a fine mesh filter to the front of the condenser to catch dust, and a rotating brush that moves up and down daily to remove excess buildup outward and away.



Model	Swing Door	CU./FT.	#of Shelves	HP	AMPS	Crated Weight (lbs.)	L x D'x H† (inches)
TSR-49GSD-N	2	44.14	6	1/3	3.1	480	543/8 x 303/8 x 781/4

Glass Door Refrigerator

Reach-In Bottom Mount
Super Deluxe Series

Model : TSR-49GSD-N

ELECTRICAL DATA	
Voltage	115/60/1
Plug Type	 NEMA-5-15P
Full Load Amperes	3.1
Compressor HP	1/3
Feed Wires with Ground	3
Cord Length (ft.)	7
Refrigerant	R-290
DIMENSIONAL DATA	
# of Doors	2
Net Capacity (cu. ft.)	44.14
Ext. Length Overall (in.)	54 ³ / ₈ (1381mm)
Ext. Depth Overall (in.)	30 ³ / ₈ (772mm)
Ext. Height Overall (in.)*	78 ¹ / ₄ (1987mm)
Int. Length Overall (in.) †	50 ¹ / ₂ (1282mm)
Int. Depth Overall (in.)	26 ¹ / ₄ (666mm)
Int. Height Overall (in.)	60 (1524mm)
# of Shelves	6
Shelf Size (L x D) (in.)	24 ⁵ / ₈ x 23 ¹ / ₂
Gross Weight (lbs.)	480

Design and specifications subject to change without notice.

Actual shipping weight may differ due to extra packing materials for product protection.

* Depth does not include 1-1/2" for glass door handles.

† Height does not include 5" caster height or 6" optional legs.

■ WARRANTY : 5 Year Parts and Labor Warranty 7 Year Compressor Warranty

■ STANDARD FEATURES

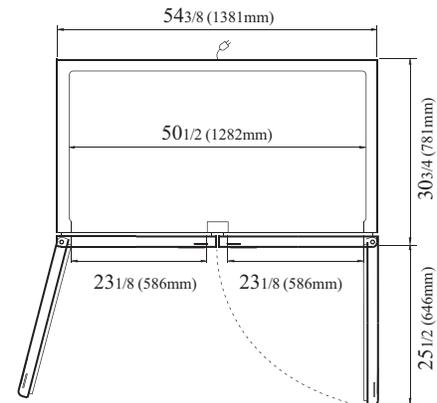
- Anti-corrosion coated evaporator
- Easy replaceable one piece magnetic door gaskets
- Self-contained system
- Solid and sturdy grille design
- Door locks
- 4" dia. swivel casters with locks on the front set

■ OPTIONAL ACCESSORIES

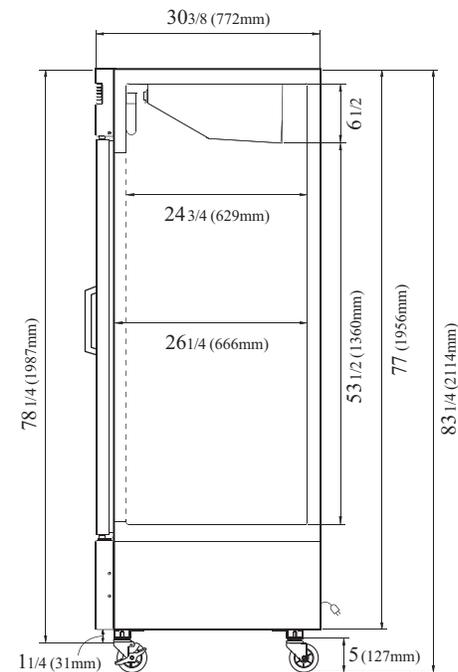
- 5" caster, 1/2" diameter & 13 TPI: M726500100 (non-brake), M726500200 (w/ brake)
- 6" stainless steel leg: 30221M0600
- Additional PE coated wire shelf: 30278L0400 (Left), 30278L0500 (Right)

PLAN VIEW

(unit : inch)



TOP VIEW



SIDE VIEW

Ver.20230112



- Turbo Air : 800-627-0032
- GK : 800-500-3519
- Warranty : 800-381-7770
- AC : 888-900-1002

REFRIGERATOR MANUFACTURER
Turbo air

GERMAN
KNIFE

RADIANCE

REFRIGERATION SYSTEM
Turbo air **Texaking**

Continued product development may necessitate specification changes without notice.

Counter

Custom Fabricated Millwork

Notes:

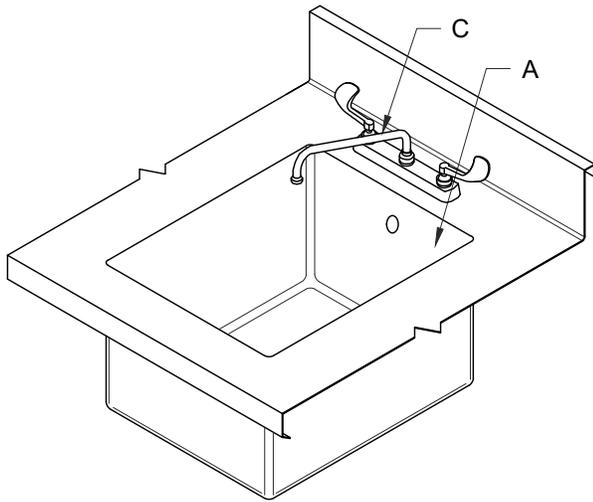
Refer to the foodservice plans and specifications for details

Counter

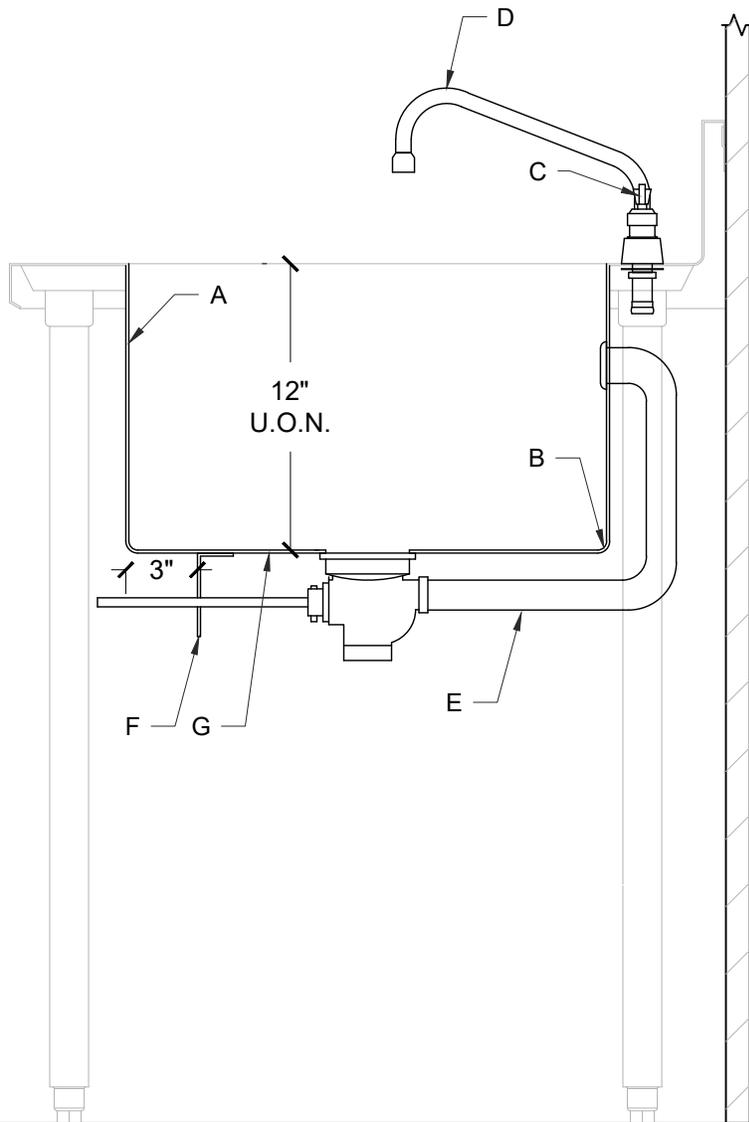
Custom Fabricated Millwork

Notes:

Refer to the foodservice plans and specifications for details

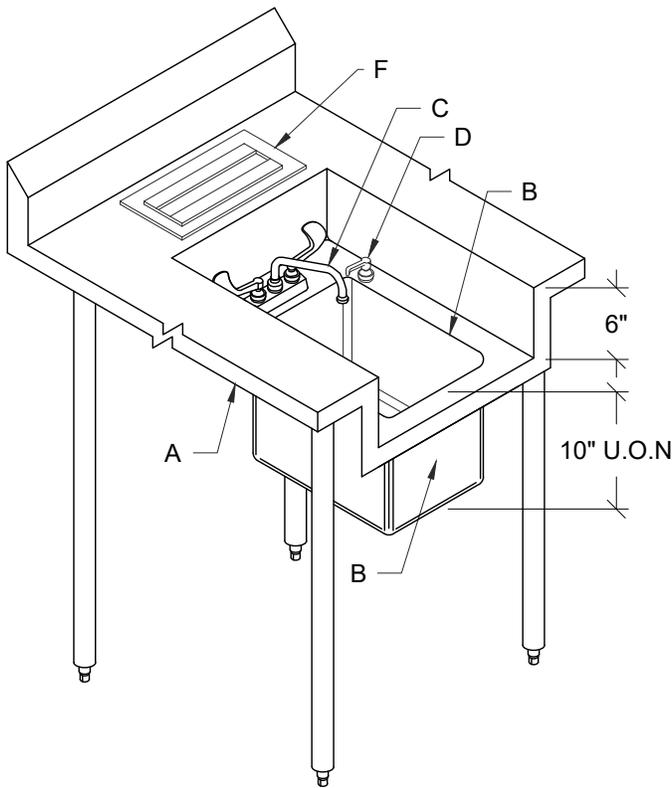


ISOMETRIC
3/4" = 1'-0"

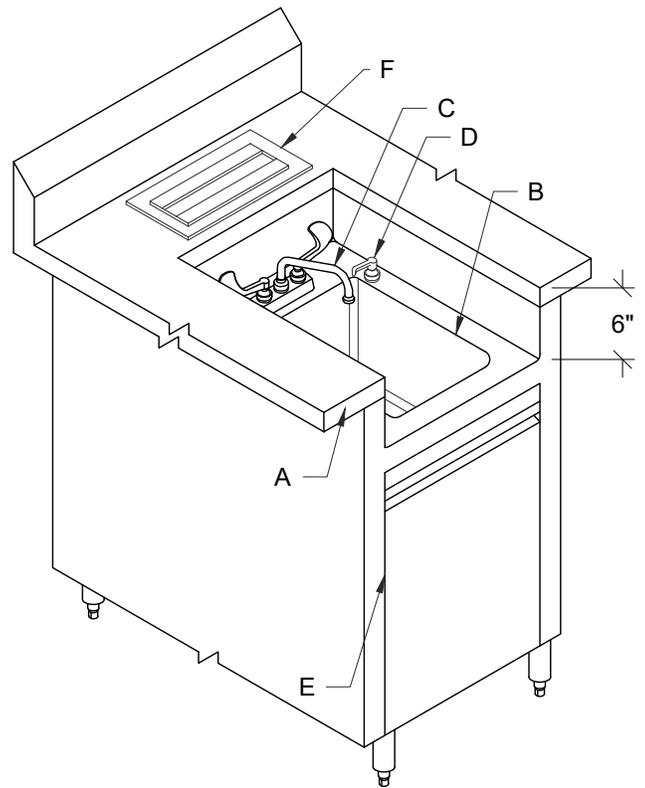


SECTION
1-1/2" = 1'-0"

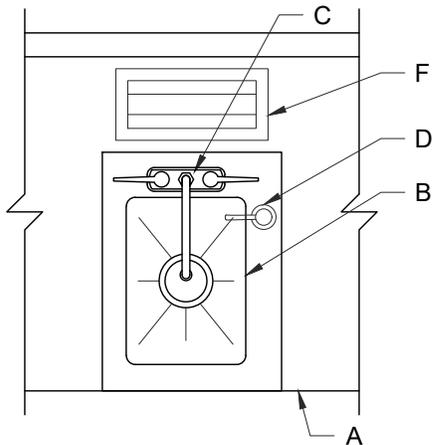
- A. 14 GA. S/S SINK, SIZED PER PLAN
- B. 3/8" RADIUS COVED CORNER CONSTRUCTION
- C. WRIST HANDLES ON FAUCET
- D. SIZE FAUCET TO ALIGN OVER THE DRAIN. PROVIDE A DECK-MOUNTED FAUCET U.O.N.
 - 8": FISHER MODEL 3511 OR T&S BRASS MODEL B-1111
 - 10": FISHER MODEL 3312 OR T&S BRASS MODEL B-1122
 - 12": FISHER MODEL 3313 OR T&S BRASS MODEL B-1123
- WHERE SPLASH-MOUNTED FAUCETS ARE SPECIFIED, PROVIDE:
 - 8": FISHER MODEL 3611 OR T&S BRASS MODEL B-1116
 - 10": FISHER MODEL 3252 OR T&S BRASS MODEL B-1127
 - 12": FISHER MODEL 13269 OR T&S BRASS MODEL B-0231
- E. DRAIN VALVE WITH OVERFLOW ASSEMBLY: FISHER MODEL 2232 OR T&S BRASS MODEL B-3992-01
- F. 14 GA S/S VALVE BRACKET
- G. SOUND DEADEN UNDER SINK



ISOMETRIC: SINK IN WORKTABLE
3/4"=1'-0"



ISOMETRIC: SINK IN COUNTER
3/4"=1'-0"



PLAN
3/4"=1'-0"

- A. COUNTER OR WORKTABLE, AS SPECIFIED
- B. HAND SINK PER DETAIL 3-1, WITHOUT ROTARY WASTE OR OVERFLOW ASSEMBLY ON HAND SINKS
- C. FAUCET WITH WRIST HANDLES AND 0.5 GPM AERATOR
 - 1. DECK-MOUNTED, 8" SWING NOZZLE
 - a. FISHER MODEL 3511
 - b. T&S BRASS MODEL B-1111
- D. PROVIDE SOAP DISPENSER BOBRICK MODEL B-822 OR EQUAL. LOCATE SOAP DISPENSER SO THAT IT DOES NOT CONFLICT WITH WRIST HANDLES
- E. HINGED DOOR PER DETAIL 5-3
- F. PROVIDE PAPER TOWEL DISPENSER BOBRICK MODEL B-526 OR EQUAL



Project _____
 Item # _____
 Quantity _____

Round Heated Wells

Models: RHW-1, -2, -1B

Hatco's Round Heated Well is a multi-purpose, insulated, dry well that offers the flexibility of being a foodwarmer, soup kettle, Bain-Marie heater, steamer and pasta cooker all in one.

Heat is evenly distributed throughout the unit to hold foods at desired temperatures, and the insulated, stainless steel design provides easy maintenance and durable performance. The heating element temperature is monitored by an electronic controller for optimum results.

Standard features

- Standard 11 quart (10 liters) well(s), available in free-standing or built-in, single or dual model
- Three temperature setpoints from 122° to 212 F° (50° to 100° C) for warming, steaming and boiling
- The insulated, stainless steel design offers easy maintenance and durable performance
- An energy saving low power mode during off-peak hours
- RHW-1 shipped with one food holding pan and one pan lid
- RHW-2 shipped with two food holding pans and two pan lids
- RHW-1B shipped with one food holding pan, one pan lid, and remote control
- Built-In recommended well cut-out size: 11.875 (300 mm) diameter



Accessories (available after purchase)

- Hinged Lid for 11-Quart (10 Liter) Round Pan
- 11-Quart (10 Liter) Round Pan

For operation, location and safety information, please refer to the Installation and Operating Manual.



HATCO CORPORATION | P.O. Box 340500 Milwaukee, WI 53234-0500 U.S.A. | (800) 558-0607 | (414) 671-6350

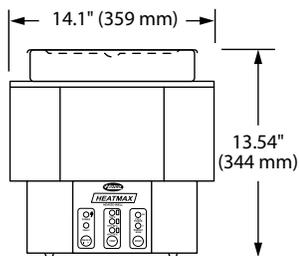
www.hatcocorp.com | support@hatcocorp.com | [Find a Hatco Rep](#) | [Image Library](#) | [Document Library](#) | [Patents](#) | [Chat](#)



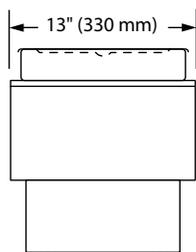
Round Heated Wells

Models: RHW-1, -2, -1B

RHW-1

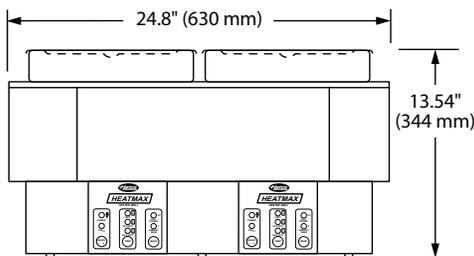


Front View

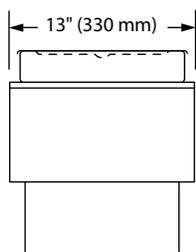


Side View

RHW-2

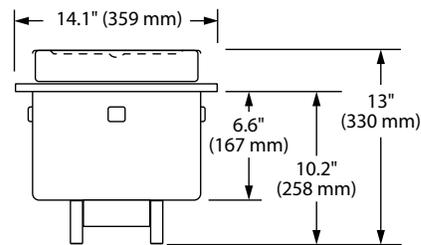


Front View

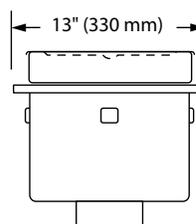


Side View

RHW-1B

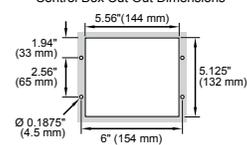


Front View



Side View

Control Box Cut Out Dimensions



The electrical cord between the unit and the control box is 56" (1420 mm) in length

Cutout Dimensions for Countertop

Model	Diameter
RHW-1B	Ø 12.01" (305 mm)

SPECIFICATIONS

Freestanding Round Heated Wells

Model	Dimensions (Width x Depth x Height)	Volts (single phase)	Watts	Amps	Plug	Cord Location	Ship Weight*
RHW-1	14.1" x 13" x 13.54" (359 x 330 x 344 mm)	120	1250	10.4	NEMA 5-15P	Lower back of unit	21 lbs. (10 kg)
RHW-2	24.8" x 13" x 13.54" (630 x 330 x 344 mm)	208	2045	9.8	NEMA 6-15P	Lower back of unit	38 lbs. (17 kg)
		240	2725	11.3			

Built-In Round Heated Well

Model	Dimensions (Width x Depth x Height)	Volts (single phase)	Watts	Amps	Plug	Cord Location	Ship Weight*
RHW-1B	14.1" x 13" x 13" (359 x 330 x 330 mm)	120	1250	10.4	NEMA 5-15P	56" (1422 mm) cable from well to control box and a 6' (1829 mm) cord and plug located at the back of the control box	21 lbs. (10 kg)

* Shipping weight includes packaging.

PLUG CONFIGURATIONS

NEMA 5-15P

NEMA 6-15P



PRODUCT SPECS

Round Heated Wells

The Round Heated Well shall be a Modelas manufactured by the Hatco Corporation, Milwaukee, WI 53234 U.S.A.

The Round Heated Well shall be rated atwatts,volts, and beinches (millimeters) in overall width and beinches (millimeters) in overall depth. It shall

consist of stainless steel housing that is insulated, a heated well, an electronic temperature control with three heat settings, and a 6' (1829 mm) cord with plug attached. Accessories include 11-quart pan and lid.

Warranty consists of 24/7 parts and service assistance (U.S. and Canada only).

HATCO CORPORATION | P.O. Box 340500 Milwaukee, WI 53234-0500 U.S.A. | (800) 558-0607 | (414) 671-6350



www.hatcocorp.com | support@hatcocorp.com | [Find a Hatco Rep](#) | [Image Library](#) | [Document Library](#) | [Patents](#) | [Chat](#)

Reveal®

Non-Refrigerated Service Case

Structural Concepts®

DELIVERING FRESH. ALWAYS.™

- **NR3647DSV** 35-3/4"L x 33"D x 47-1/8"H
- **NR4847DSV** 47-3/4"L x 33"D x 47-1/8"H

Included

- NOTE: Glass warranty only applicable to first point of delivery
- (2) Levels of clear glass shelving removable and adjustable on 1" centers
- LED top & shelf lights
- One piece formed ABS plastic tub
- One year parts & labor warranty
- Vertical, fixed front & side UV bonded frameless glass



NR4847DSV

Specify	Standard Features	Additional Options
FRAME EXTERIOR COLOR	• Powder coated Silversan Black	• Powder coated (stock/non-stock colors) • Stainless steel
INTERIOR COLOR	• Powder coated Silversan Black	• NOTE: Interior color must be FDA & NSF approved • Powder coated (stock colors, specify RAL#) • Stainless steel
LOWER FRONT PANEL COLOR	• Powder coated Silversan Black	• Powder coated (stock colors, specify RAL#) • Stainless steel
PANEL EXTERIOR	• Laminate (stock colors)	• Laminate (non-stock colors) • Stainless steel
BASE SUPPORT	• Adjustable, locking casters	• 6"H legs (self-cont.)
END PANELS	• Full end panel	• None (specify per line-up)
LOWER REAR PANEL	• Powder coated Silversan Black	• Powder coated (stock colors, specify RAL#) • Stainless steel
REAR DOORS	• Clear glass rear sliding doors	• Reflective glass rear sliding doors
LIGHTS	• LED 3500K w/ frosted lens	• LED 3000K w/ frosted lens • LED 4000K w/ frosted lens
ELECTRICAL CONNECTION	• 6' Straight blade power cord	• 6' Locking blade power cord • Electrical leads (non-refrigerated)
MISCELLANEOUS		[†] • 14.5" Base height extension • Rear door lock • Second year parts & labor warranty

Option Notes: 1 - Cannot be combined w/ 6"H legs

Reveal®

Non-Refrigerated Service Case

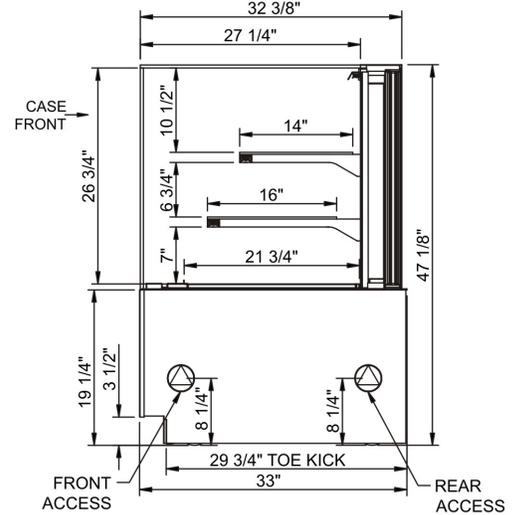
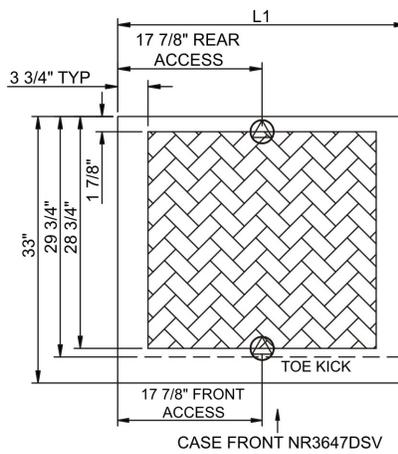
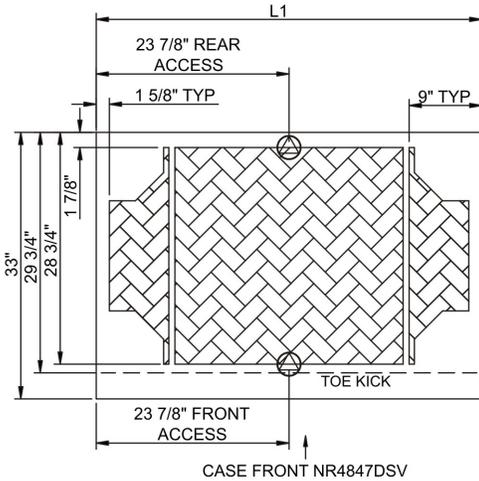
Structural Concepts®

DELIVERING FRESH. ALWAYS.™

Intended Environment: Type I - Designed to operate in ambient conditions of 75°F with 55% relative humidity unless noted otherwise in system information below.		
Zone	Intended Product To Be Displayed	Warmest Avg Prod Temp ° F
1	Unpackaged non-refrigerated products	Ambient

PLAN VIEW

SIDE VIEW



NOTE: ALL DIMENSIONS APPROXIMATE

- ELECTRICAL JUNCTION BOX (SUPPLIED WITH 6" LEADS OR POWER CORD).
- LOCATION OF DRAIN TUBE FOR REMOTE REF. ONLY (SUPPLIED WITH 3/4" OR 1 1/2" PVC TUBE).

- REFRIGERATION LINE CONNECTION.
- REMOTE FLOOR SINK & UTILITIES ACCESS AREA.

- SELF-CONTAINED CASE SERVICE ACCESS AREA.
- DRY CASE SERVICE ACCESS AREA.

Model Technical Specifications																	
Model	L"	L1"	L2"	System Circuit Volts			Phs	Freq	Amps ***	Watts	Wires	NEMA Plug	SST	Conv. Rack BTUH	Para. Rack BTUH	Est Wt	
NR3647DSV	N/A	35.75	.00	Ambient/Lights (N/A)			Circuit #1	110-120	1	60	0.70	11	2+G	5-15P or L5-15P	N/A	N/A	650
NR4847DSV	N/A	47.75	.00	Ambient/Lights (N/A)			Circuit #1	110-120	1	60	0.70	17	2+G	5-15P or L5-15P	N/A	N/A	750

*** Does not include electric defrost on freezer models.

Regulatory Approvals:	
All Models	ETL Listed to UL 65 ETL Sanitation to NSF/ANSI 2



Important Notes:

- ELECTRICAL NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
- Glass warranty only applicable to first point of delivery.

⚠ WARNING: This product can expose you to chemicals, including Urethane (Ethyl Carbamate), which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Reveal®

Refrigerated Service Case

Structural Concepts®

DELIVERING FRESH. ALWAYS.™

- **NR3647RSV** 35-3/4"L x 33"D x 47-1/4"H
- **NR4847RSV** 47-3/4"L x 33"D x 47-1/4"H
- **NR6047RSV** 59-3/4"L x 33"D x 47-1/4"H
- **NR7247RSV** 71-3/4"L x 33"D x 47-1/4"H

Included

- NOTE: Glass warranty only applicable to first point of delivery
- Breeze~E (Type-II) self-contained refrigeration
- (2) Levels of clear glass shelving removable and adjustable on 1" centers
- Condensate pan (self-contained refrig. only)
- LED top & shelf lights
- One piece formed ABS plastic tub
- One year parts & labor; 5 year compressor warranty
- Vertical, fixed front & side UV bonded frameless glass
- Warmest average product temperature of 40°F or less

**NR4847RSV**

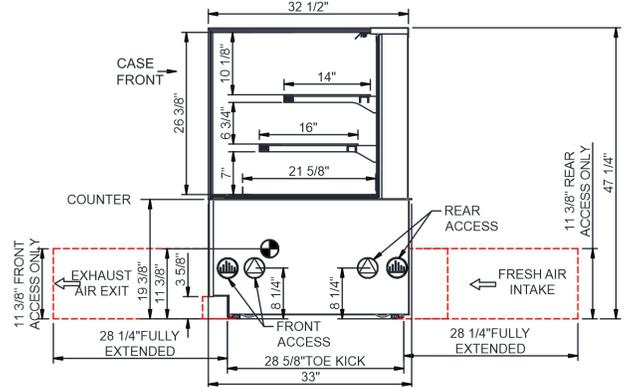
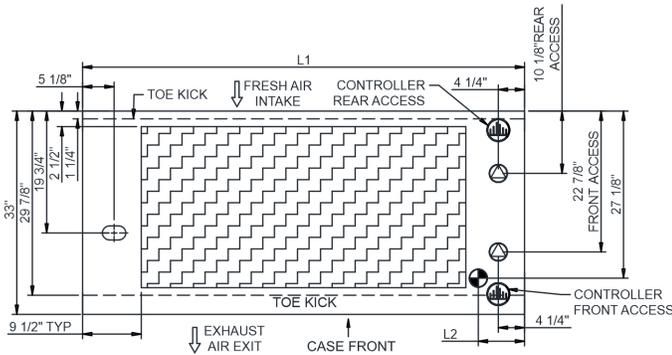
Specify	Standard Features	Additional Options
FRAME EXTERIOR COLOR	• Powder coated Silversan Black	• Powder coated (stock/non-stock colors) • Stainless steel
INTERIOR COLOR	• Powder coated Silversan Black	• NOTE: Interior color must be FDA & NSF approved • Powder coated (stock colors, specify RAL#) • Stainless steel
LOWER FRONT PANEL COLOR	• Powder coated Silversan Black	• Powder coated (stock colors, specify RAL#) • Stainless steel
PANEL EXTERIOR	• Laminate (stock colors)	• Laminate (non-stock colors) • Stainless steel
BASE SUPPORT	• Adjustable, locking casters (self-cont.)	• 6"H legs (self-cont.) • Shims (remote)
END PANELS	• Full end panel	• None (specify per line-up)
LOWER REAR PANEL	• Powder coated Silversan Black	• Powder coated (stock colors, specify RAL#) • Stainless steel
REAR DOORS	• Clear glass rear sliding doors	• Reflective glass rear sliding doors
LIGHTS	• LED 3500K w/ frosted lens	• LED 3000K w/ frosted lens • LED 4000K w/ frosted lens
ELECTRICAL CONNECTION	• 10' Straight blade power cord (self-cont.)	• 10' Locking power cord (self-cont.) • Electrical leads (remote)
REFRIGERATION	• Breeze~E (Type-II) self-contained refrigeration (rear access)	• Breeze~E (Type-II) self-contained refrigeration (front access) • Remote w/thermostat, solenoid & TXV (front access) • Remote w/thermostat, solenoid & TXV (rear access)
MISCELLANEOUS		¹ • 14.5" Base height extension • Rear door lock • Second year parts & labor warranty (excludes compressor)
ACCESSORIES		• Clean Sweep® coil cleaner (self-cont.)

Option Notes: 1 - Cannot be combined w/ 6"H legs

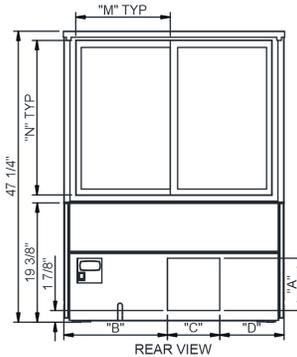
Intended Environment: Type II - Designed to operate in ambient conditions of 80°F and 55% relative humidity unless noted otherwise in system information below.		
Zone	Intended Product To Be Displayed	Warmest Avg Prod Temp ° F
1	Unpackaged refrigerated products	40

PLAN VIEW

SIDE VIEW



	"A"	"B"	"C"	"D"		"M"	"N"
NR3647RSV	8 1/2"	16 3/4"	8 1/2"	10 3/8"	NR3647RSV	15 3/8"	25 1/4"
NR4847RSV	8 1/2"	28 3/4"	8 1/2"	10 3/8"	NR4847RSV	21 3/8"	25 1/4"
NR6047RSV	8 1/2"	40 3/4"	8 1/2" x2	10 3/8"	NR6047RSV	27 3/8"	25 1/4"
NR7247RSV	8 1/2"	52 3/4"	8 1/2" x2	10 3/8"	NR7247RSV	33 3/8"	25 1/4"



- NOTES:**
- 11 3/8" TALL, FULL WIDTH OF CASE OPENING IN CABINET OR COUNTER IS REQUIRED TO PULL OUT REFRIGERATION SYSTEM.
 - BACK OF COUNTER / CABINET MUST BE VENTED PROPERLY FOR ADEQUATE AIRFLOW TO CONDENSER.
 - REPRESENTS REAR PULLOUT REFRIGERATION. AIR FLOW INTAKE AND EXIT DETAILS ARE REVERSED WITH FRONT PULLOUT REFRIGERATION OPTION.
 - SELF-CONTAINED ACCESS ONLY BY PULLING OUT CONDENSER UNIT.
 - 4" OPEN AREA CLEARANCE REQUIRED FOR AIR FLOW FRONT AND REAR OF CASE.

NOTE: ALL DIMENSIONS APPROXIMATE

- ELECTRICAL JUNCTION BOX (SUPPLIED WITH 6" LEADS OR POWER CORD).
- REFRIGERATION LINE CONNECTION.
- SELF-CONTAINED CASE SERVICE ACCESS AREA.
- LOCATION OF DRAIN TUBE FOR REMOTE REF. ONLY (SUPPLIED WITH 3/4" OR 1 1/2" PVC TUBE).
- REMOTE FLOOR SINK & UTILITIES ACCESS AREA.
- DRY CASE SERVICE ACCESS AREA.

Model Technical Specifications																
Model	L"	L1"	L2"	System Circuit Volts		Phs	Freq	Amps ***	Watts	Wires	NEMA Plug	SST	Conv. Rack BTUH	Para. Rack BTUH	Est Wt	
NR3647RSV	N/A	35.75	7.50	Remote (DX)	Circuit #1	110-120	1	60	1.08	35	2+G	Leads Single	24.00	1015	940	650
				Self-Contained (R290)	Circuit #1	110-120	1	60	10.73	965	2+G	5-15P or L5-15P	N/A	N/A	N/A	
NR4847RSV	N/A	47.75	7.50	Remote (DX)	Circuit #1	110-120	1	60	1.08	41	2+G	Leads Single	24.00	1318	1220	950
				Self-Contained (R290)	Circuit #1	110-120	1	60	11.18	996	2+G	5-15P or L5-15P	N/A	N/A	N/A	
NR6047RSV	N/A	59.75	7.50	Remote (DX)	Circuit #1	110-120	1	60	1.38	59	2+G	Leads Single	20.00	1620	1500	1,000
				Self-Contained (R290)	Circuit #1	110-120	1	60	11.18	1,006	2+G	5-15P or L5-15P	N/A	N/A	N/A	
NR7247RSV	N/A	71.75	7.50	Remote (DX)	Circuit #1	110-120	1	60	1.38	64	2+G	Leads Single	20.00	1922	1780	1,150
				Self-Contained (R290)	Circuit #1	110-120	1	60	15.48	1,543	2+G	5-20P or L5-20P	N/A	N/A	N/A	

*** Does not include electric defrost on freezer models.

Regulatory Approvals:	
All Models	Accordance with AHRI Std 1200 ETL Listed to UL 471 ETL Listed to CAN/CSA 22.2 No. 120 ENERGY STAR® ETL Sanitation to NSF/ANSI 7

Important Notes:

- 1) ELECTRICAL NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
- 2) Back side of counter must be open or vented the full length of the unit to allow proper ventilation for the refrigeration system.
- 3) Glass warranty only applicable to first point of delivery.
- 4) Compressor air intake from rear and out front panel at toe kick. Front panel cannot be blocked.

⚠ WARNING: This product can expose you to chemicals, including Urethane (Ethyl Carbamate), which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.



Kiosk Ordering System

N.I.C. (Not in Contract)

This item is not in the Foodservice Equipment Contract

Item to be provided by:

- Vendor
- Owner
- General Contractor
- Millwork
- Other

Notes:

Kitchen Equipment Contractor (KEC) to coordinate the final location of this item

KEC to verify final equipment selection with the Owner and coordinate the utility requirements with the MEP Engineer

Refer to the foodservice and architectural plans for item location



Slim Jim®

The Slim Jim® container delivers the durability needed for commercial environments combined with brand new innovation to increase worker productivity. New product features and accessories deliver the most efficient solution for collection, transportation, and disposal of multi-stream waste and recyclables.

Features and Benefits:

- Venting channels make removing liners up to 80% easier, improving productivity and reducing the risk of worker injury
- Four bag cinches secure liners around the rim of the container and allow for quick, knot-free liner changes
- Handles at the base and rim of the container improve grip and control while lifting and emptying full containers
- Rim with rib-strengthened design increases strength and resists crushing
- Build a recycling station with a variety of dolly and lid options to meet any facility need

COLORS AVAILABLE

Blue, Green, Black, Beige, Brown, Gray, Yellow*, Red*

* 23-gallon only

Material Composition:

Injection molded with a high-quality resin blend.

Accessories:

STAINLESS STEEL DOLLIES

- Slim Jim® Single Dolly
- Slim Jim® Double Dolly
- Slim Jim® Triple Dolly
- Slim Jim® Quadruple Dolly

RESIN DOLLY

- Slim Jim® Trainable Dolly

LIDS

- Bottles and Cans Lid
- Paper Lid
- Mixed Recycling Lid
- Hinged Lid
- Swing Lid

SLIM JIM® CONTAINERS



23-Gallon Slim Jim® Container



16-Gallon Slim Jim® Container

SLIM JIM® CONTAINERS

SKU #	DESCRIPTION	COLOR	CAPACITY		LENGTH		WIDTH		HEIGHT		PACK SIZE
			GAL	L	IN	CM	IN	CM	IN	CM	
1971258	SLIM JIM® CONTAINER	GRAY	16	61	22"	55.88	11"	27.94	25"	63.50	4
1955959	SLIM JIM® CONTAINER	BLACK	16	61	22"	55.88	11"	27.94	25"	63.50	4
1971259	SLIM JIM® CONTAINER	BEIGE	16	61	22"	55.88	11"	27.94	25"	63.50	4
1956181	SLIM JIM® CONTAINER	BROWN	16	61	22"	55.88	11"	27.94	25"	63.50	4
1971257	SLIM JIM® CONTAINER	BLUE	16	61	22"	55.88	11"	27.94	25"	63.50	4
1955960	SLIM JIM® CONTAINER	GREEN	16	61	22"	55.88	11"	27.94	25"	63.50	4
FG354060GRAY	SLIM JIM® CONTAINER	GRAY	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354060BLA	SLIM JIM® CONTAINER	BLACK	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354060BEIG	SLIM JIM® CONTAINER	BEIGE	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956187	SLIM JIM® CONTAINER	BROWN	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956185	SLIM JIM® CONTAINER	BLUE	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956186	SLIM JIM® CONTAINER	GREEN	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956188	SLIM JIM® CONTAINER	YELLOW	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956189	SLIM JIM® CONTAINER	RED	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354007BLUE	SLIM JIM® CONTAINER	BLUE (RECYCLING)	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354007GRN	SLIM JIM® CONTAINER	GREEN (RECYCLING)	23	87	22"	55.88	11"	27.94	30"	76.20	4





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N.I.C. (Not in Contract)

This item is not in the Foodservice Equipment Contract

Item to be provided by:

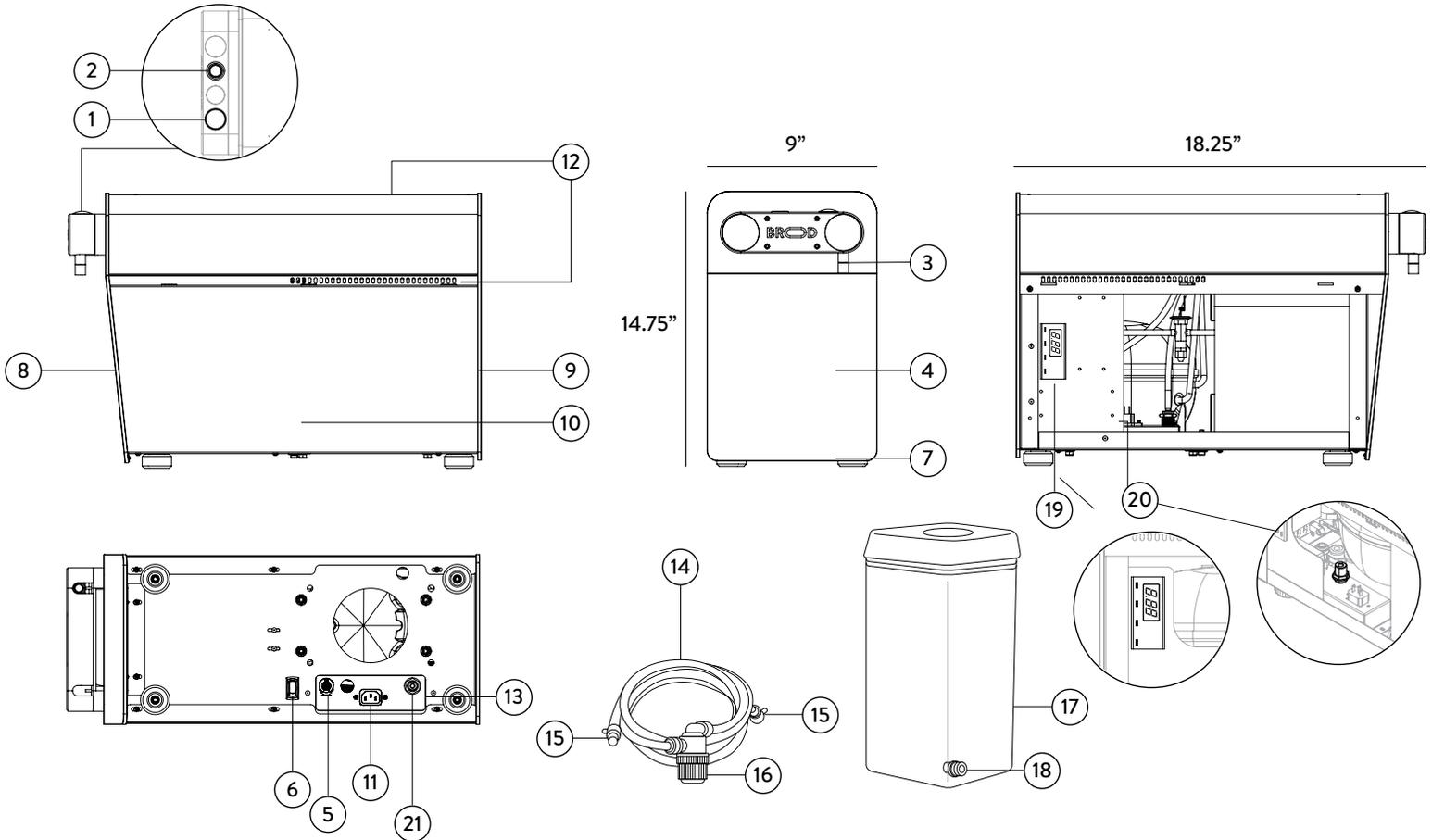
- Vendor
- Owner
- General Contractor
- Millwork
- Other

Notes:

Kitchen Equipment Contractor (KEC) to coordinate the final location of this item

KEC to verify final equipment selection with the Vendor and coordinate the utility requirements with the MEP Engineer

Refer to the foodservice and architectural plans for item location



- 1 – Tap Button
- 2 – Infusion Dial
- 3 – Nozzle
- 4 – Exterior
- 5 – Inlet Connector
- 6 – Main ON/OFF Switch
- 7 – Legs

- 8 – Forward Plate
- 9 – Rear Plate
- 10 – Side Panel(s)
- 11 – Power Cord
- 12 – Vents/Exhaust
- 13 – Control Panel
- 14 – Beverage Tube

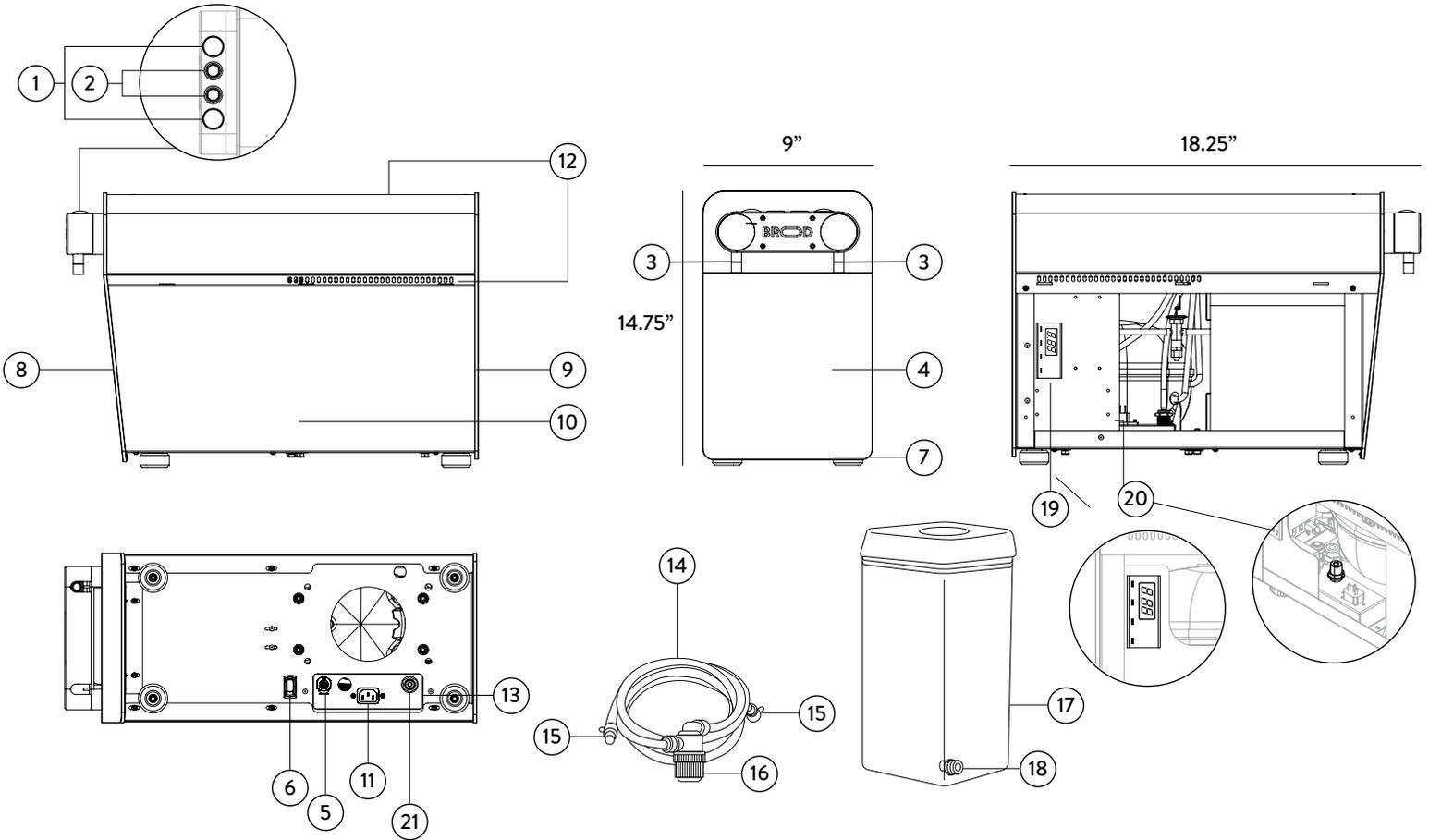
- 15 – Elbow Connectors
- 16 – Pre-Filter
- 17 – BROOD Beverage Container
- 18 – Inlet for Container
- 19 – Thermostat
- 20 – Calibration Knob
- 21 – Inlet Air...?

SPECIFICATIONS

SPECS	SINGLE	SINGLE (CONCENTRATE)
FUNCTION	COLD NITRO & COLD STILL	COLD NITRO & COLD STILL
TAPS	1	1
POWER SUPPLY	100-120V / 60HZ 200-240V / 50-60HZ	100-120V / 60HZ 200-240V / 50-60HZ
PHASE	SINGLE	SINGLE
AMPS	2.8A	2.8A
DIMENSIONS (W/H/D)	9.25/14.74/18.25IN	9.25/14.74/18.25IN
WEIGHT	75LBS	78LBS
DISPENSING CAPACITY	102 L/HOUR	102 L/HOUR
COFFEE TEMPERATURE AT TAP	36°F (+/- 3°F)	36°F (+/- 3°F)
INTERNAL TUBING CAPACITY	20 OZ	20 OZ
OPTIONAL ACCESSORIES	BIB BAGS BIB BOXES 1.5 GAL RESERVOIR 3.5 GAL RESERVOIR	BIB BAGS BIB BOXES 1.5 GAL RESERVOIR 3.5 GAL RESERVOIR
WARRANTY	1 YEAR	1 YEAR
PRESSURE AT TAP	34 PSI	34 PSI
INPUT BEVERAGE	READY-TO-DRINK (RTD)	CONCENTRATE
WATER ACCESS	NO	YES
WATER ACCESS INLET	N/A	¼IN BARB
DRAINAGE	NOT REQUIRED	NOT REQUIRED
RATIO RANGE	N/A	1:1 TO 13:1
DISPENSE OPTIONS	PUSH BUTTON	PUSH BUTTON

FEATURES

- Dispenses both nitro and still cold brew from the same tap
Extracts nitrogen from the air; no nitrogen tank necessary
- Pulls from any container, kegs are only one option
- Plug & play in 2 minutes
- Consistency with every pour
- Chills on demand to 36°F
- Works with any drink
- No need to deal with gas tanks or companies
- Compact design; can be placed over or under the counter
Customizable color, design and tap handle
- Patent Pending
- In-line dosing pump that works with all ratios of cold brew concentrates



- 1 – Tap Buttons
- 2 – Infusion Dials
- 3 – Nozzles
- 4 – Exterior
- 5 – Inlet Connector
- 6 – Main ON/OFF Switch
- 7 – Legs

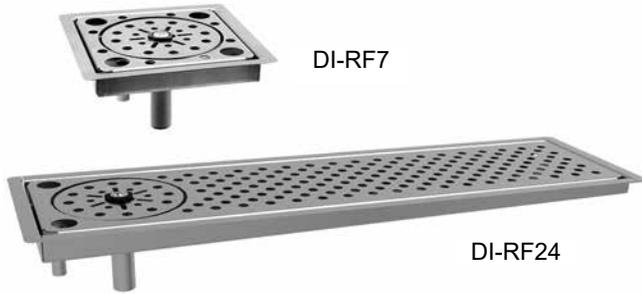
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 - 18 – Inlet for Container
- SPECIFICATIONS
- 19 –Thermostat
 - 20 – Calibration Knob
 - 21 – Inlet Air...?

SPECS	DUAL
FUNCTION	COLD NITRO & COLD STILL
TAPS	2
POWER SUPPLY	100-120V / 60HZ 200-240V / 50-60HZ
PHASE	SINGLE
AMPS	3.0A
DIMENSIONS (W/H/D)	9.25/14.74/18.25IN
WEIGHT	78LBS
DISPENSING CAPACITY	102 L/HOUR PER TAP
COFFEE TEMPERATURE AT TAP	36°F (+/- 3°F)
INTERNAL TUBING CAPACITY	20 OZ PER TAP
OPTIONAL ACCESSORIES	BIB BAGS BIB BOXES 1.5 GAL RESERVOIR 3.5 GAL RESERVOIR
WARRANTY	1 YEAR
PRESSURE AT TAP	34 PSI
INPUT BEVERAGE	READY-TO-DRINK (RTD)
WATER ACCESS	NO
WATER ACCESS INLET	N/A
DRAINAGE	NOT REQUIRED
RATIO RANGE	N/A
DISPENSE OPTIONS	PUSH BUTTON

FEATURES

- Dispenses both nitro and still cold brew from the same tap
Extracts nitrogen from the air; no nitrogen tank necessary
- Pulls from any container, kegs are only one option
- Plug & play in 2 minutes
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- No need to deal with gas tanks or companies
- Compact design; can be placed over or under the counter
Customizable color, design and tap handle
- Patent Pending
- In-line dosing pump that works with all ratios of cold brew concentrates



Project: _____	AIA# _____
Item #: _____ Qty: _____	SIS# _____
Model #: _____	

Drop-In Rinser Faucet

DI-RF	DI-RF7, DI-RF12, DI-RF18, DI-RF24
--------------	-----------------------------------

Standard Features

- All stainless steel construction
- Pan includes radius interior corners for easy cleaning
- Drain is a 1/2" welded tailpiece that exits from the bottom of the unit
- Drain pan includes 1/2" flange
- Installation kit includes: 10' of clear vinyl drain tube, five - 4" Ty-wraps, and two - 1/2" plastic elbows

Installation

- Notes:**
- Important: Unit must be installed in conformance with applicable federal, state, and local plumbing codes, including adequate backflow when required.
 - Must install backflow prevention device conforming to ANSI/ASSE 1022 or ANSI/ASSE 1024 to meet plumbing code (not included).
 - Install in-line water regulator (included).
 - A separate shut-off valve is recommended (not included).
- Instructions:**
1. Make a cut-out in work surface using cut-out dimensions (located under Specifications) for appropriate model.
 2. Make initial drain connections, especially if access to drain is limited once the unit is in place.
 3. Place unit into cut-out and finish plumbing the drain line.
 4. To establish proper sanitation operation and to comply with NSF & health codes, this unit must be sealed to the surface to which it is mounted using an NSF listed sealant. Place a bead of sealant along outer edges of the mounting flange and remove any excessive amount. Make sure there are no gaps in the sealant as the intent is to prevent liquid spillage from adjacent surfaces from passing under inaccessible portions of the equipment.

Specifications

- Drains**
- 1/2" welded tailpiece
- Cut-out Dimensions**
- Model DI-RF7 - 6-1/4" by 6-1/4"
 - Model DI-RF12 - 6-1/4" by 11-1/4"
 - Model DI-RF18 - 6-1/4" by 17-1/4"
 - Model DI-RF24 - 6-1/4" by 23-1/4"
- Materials**
- All stainless steel
- Faucet**
- Accepts 3/8" cold water lead
 - 30 psi water pressure regulator included
 - 1.2 gallons per minute

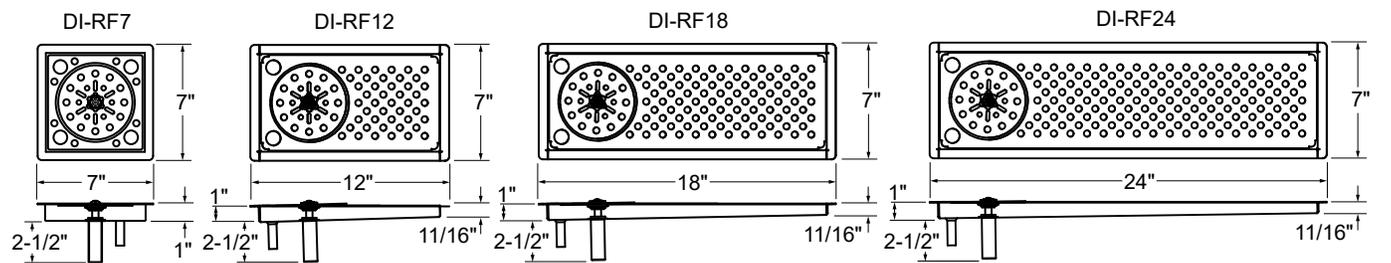
To view cleaning and care instructions, please visit:
https://www.glastender.com/PDF/F-423-011_ss_clean_care.pdf

03012383
Rinser Faucet
Assembly

4004503
Conforms to NSF/ANSI STD 372

ETL
INTERTAK LISTED
Intertek

Dimensional Information



<p>Glastender, Inc. • 5400 N Michigan Rd • Saginaw, MI • 48604-9780 989.752.4275 • 800.748.0423 • Fax 989.752.4444 www.glastender.com</p> <p>Specifications subject to change without notice. For current specifications please visit our website.</p>	<p>Approval/Notes:</p>
---	------------------------

Description: Spare No.

Notes:

1. Machine configuration and overall dimensions



E'4m/ST

Technical data	
Brew chamber	2 x 24 g
Grinder	2 x Ceramic burrs - 64 mm
User Interface	2 x Touch screen 256 mm (10.1")
Bean hopper	2 x 1.5 kg
Coffee outlet height*	190 mm max.
Hot water outlet height*	160 mm max. or 215 mm max. (option)
Interface	2 x USB, 1 x Ethernet, 1 x CCI/CSI/API
Cup heater surface	Up to 64 espresso cups
Coffee boiler size	2 x 1.5 L
Steam boiler size	5.4 L
Grounds drawer	1 x 700 g
Drip tray	Standard or Large without pitcher rinser (option)
Water Connection	
Water hose	Inox braided pipe G3/8" female x 2 m
Drain hose	Ø 22 mm x Ø 16 mm x 2 m

*measured from the drip tray



Super Traditional	E'4s	E'4m
Weight	100 kg	104 kg
Performance (up to)		
Espresso/h (23 s)	350	
Hot water/h (200 ml)	170	
Cappuccino/h (23 s)	-	350
Adjustable hot water temperature (Manual)	Yes	
Adjustable hot water temperature (Automatic)	Option	
e'Foam Micro Air Dosing (MAD) system (controlled electronically)	Yes	
Milk system with EMT (Electronic Milk Texturing)	-	Yes
Voltage/Power		
Asia		
200 V~, 50/60 Hz, 12A - JP	2100 W	
200 V~, 50/60 Hz, 30A - JP	6000 W	
1/N/PE, 220 V~, 60 Hz, 25A - KR	5100 W	
3/N/PE, 380 V~, 60 Hz, 16A - KR	7200 W	
Europe		
1/N/PE, 220-240 V~, 50/60 Hz, 16A	2800 W	
2 x 1/N/PE, 220-240 V~, 50/60 Hz, 16A	5600 W	
1/N/PE, 220-240 V~, 50/60 Hz, 25A	5600 W	
2 x 1/N/PE, 220-240 V~, 50/60 Hz, 25A	10200 W	
3/N/PE, 380-415 V~, 50/60 Hz, 16 A	7900 W	
3/PE, Δ 220-230 V~, 50/60 Hz, 20A	5600 W	
North America		
2/PE, 208 V~, 60 Hz, 15A	2300 W	
2/PE, 208 V~, 60 Hz, 30A	4600 W	
2 x 2/PE, 208 V~, 60 Hz, 30A	8400 W	
Frequency	50/60 Hz	
Power consumption (machine on)	Up to 10200 W	
Power consumption (standby mode)	Less than 2 W	
Water pressure and flow		
2.5 - 4 bars (36.3 - 58 psi) If the pressure exceeds 4.5 bars (65.3 psi), it is necessary to install a pressure valve reducer.		
If the main flow rate is under 200 L/h, there is a risk of damaging the water pump.		

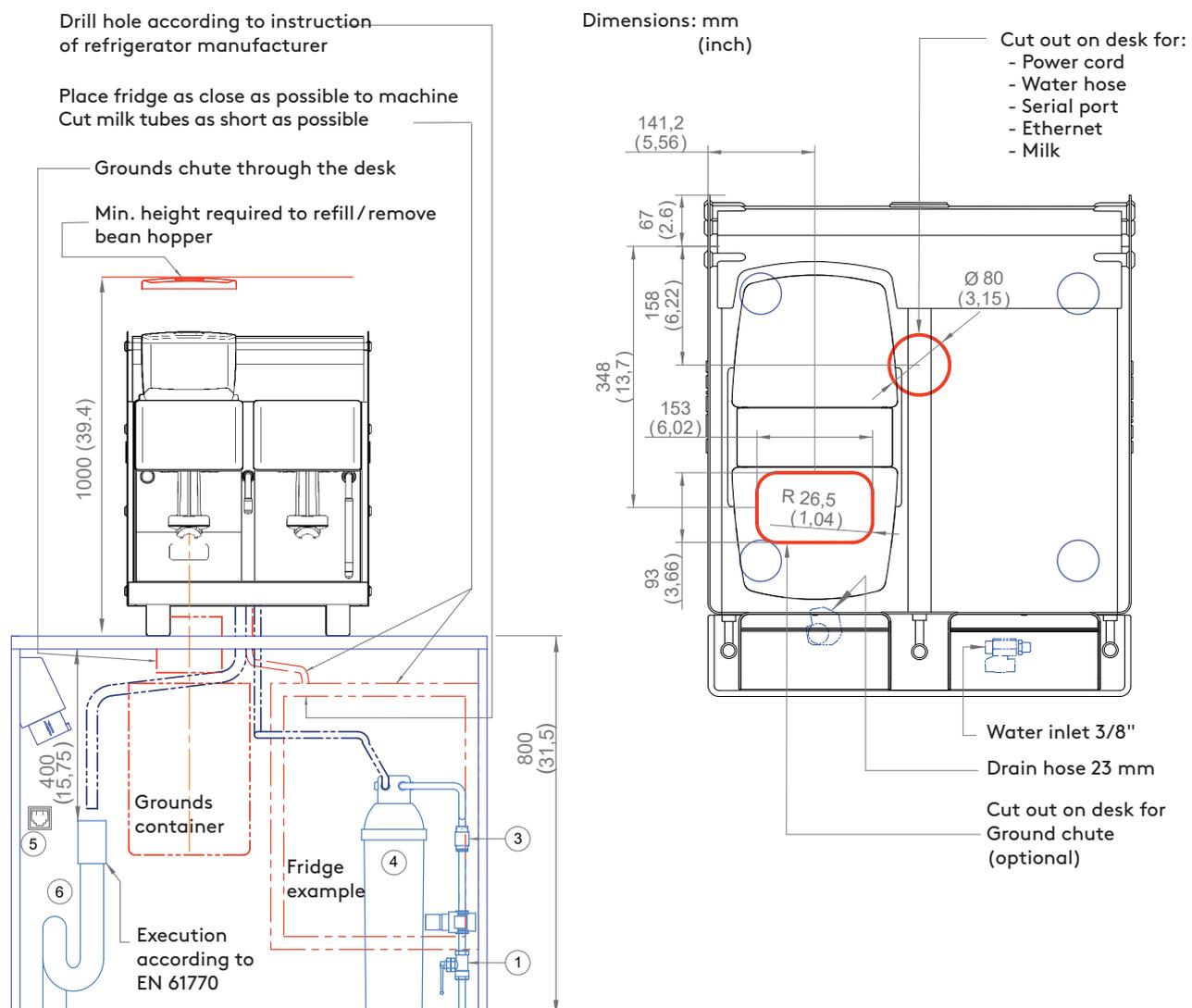
2. Prior to the installation READ SAFETY INSTRUCTIONS

- Check water quality and pressure
- Define filter type and size and check space inside counter
- If no descaling cartridge is used, install carbon filter as minimum
- Check that the machine is on flat and stable surface
- Check counter cut out
- Check water supply installation
- Check that power supply conforms to local standards
- Check that power supply conforms to the machine settings
- Check that the machine is the only device on this power line
- Check all with customer on site
- Make sure original coffee is available
- Make sure cold milk is available (option)
- Check drink recipes and cup sizes
- Check that a milk pitcher is available.

3. After installation

- Explain cleaning and instruct staff using Quick Reference Card
- Fill in and sign the installation form and send it back to Eversys -> orders@eversys.com

4. Desk preparation and countertop cut out dimensions



1. Main water inlet
2. Pressure reducer output 3 bar (43,5 psi)
3. Check valve
4. Descaling cartridge or carbon filter as minimum
5. Electrical socket according to local regulation and RJ-45 connection (e'Connect)
6. Drain with syphon, top end min. 56 mm diameter

Water quality recommendation

Total hardness: 5 - 8° dGH (89-142 ppm)
Carbonate hardness: Max. 6° dKH (107 ppm)
pH value: ideal 7.0 - 7.2



MILK REFRIGERATORS

The Perfect Complement to
Automatic Espresso Machines



FG10IBP1

Holds One (1) Gallon container of Milk

Black Finish with Polished Steel Door

Three (3) Tube holes

Dimensions: 14"H x 9"W x 19"D

Weight: 25 LBS

Power: 110V-120V 50Hz-60Hz



FG14IXP1

Holds Two (2) one Gallon Containers of Milk

Finished Completely in Stainless Steel

Six (6) Tube Holes

Dimensions: 17" H x 9" W x 23" D

Weight: 37 LBS

Power: 110V-120V 50Hz-60Hz

Front loading refrigerator with compressor based cooling units. Magnetic seal door.

Tube holes on top and both sides for convenience. Internal thermometer.

NSF and UL certified.

1.5step

TOUCH

TRUE
LATTE
ART

CREATE

WITH
A
TOUCH



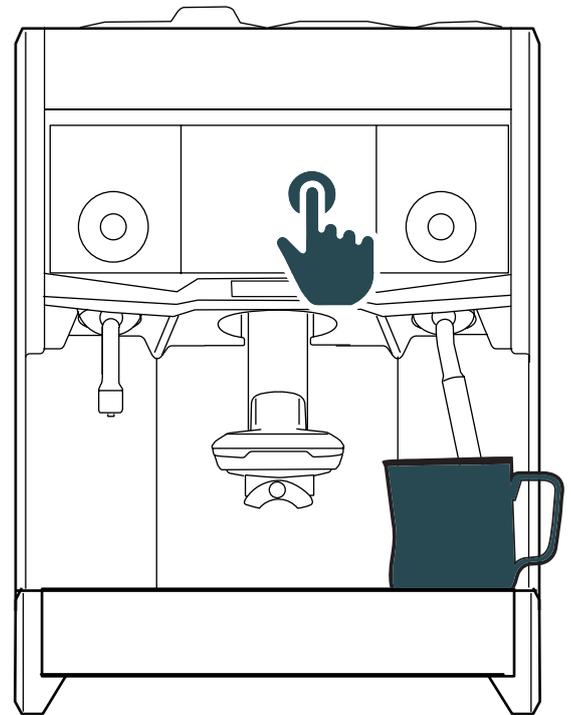


TOUCH

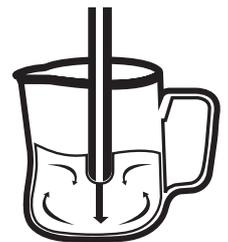
SELECT YOUR
COFFEE PRODUCT.

CREATE

THE BARISTA
CONCENTRATES
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LATTE ART
CREATION WITH
NO EFFORT.



THE PERFECT
FOAM AT THE
SAME TIME OF
AN ESPRESSO
IS DISPENSED IN
A MILK ARM.



STAND OUT

Stand out from the competition by using technology that allows you to create the perfect texture for Latte Art without any knowledge.

SAVE

Save time and money by automizing repetitive tasks where no technical background is required anymore to create your Latte Art.

CUSTOMIZE

Provide a customized experience to your customers at all times.

WASTELESSNESS

No longer waste milk as the machine dispenses automatically the right quantity.

CARELESS

No longer care about cleaning with the automatic cleaning system.



Best-In-Class Quiet Blending Technology

The ultimate blender with unparalleled sound reduction, exceptional beverage blends, and improved speed of service.

Smart Product Design

- Twist Lock sound enclosure is easier to remove and clean
- 48-ounce Advance® container creates faster, smoother pours resulting in time and cost savings along with improved customer experience
- Larger centering pad allows for simple, one-step cleaning
- Advanced vibration dampening technology results in a more enjoyable atmosphere
- 6 program buttons with 34 optimized settings for easier, consistent blending
- Air management and powerful 3-peak output HP motor reduces noise, improves reliability, and minimizes downtime

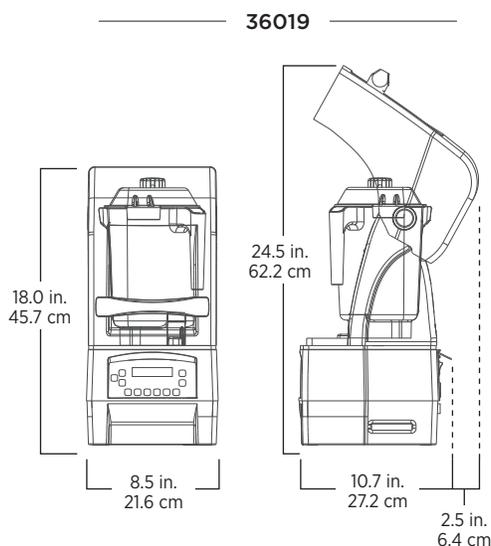
La Mejor Tecnología de Licuado Silencioso en su Clase

La mejor licuadora, con una reducción de ruido incomparable, mezcla de bebidas excepcionales y una mejor velocidad de servicio.

Diseño Inteligente del Producto

- Su cubierta antiruido con mecanismo de cierre por torsión es más fácil de remover y limpiar
- Su vaso Advance de 48 onzas mezcla mas rapida y fácilmente, permitiendole ahorrar tiempo y dinero mejorando así la experiencia del cliente
- Su almohadilla centrante mas grande permite una limpieza más sencilla en un solo paso
- Su avanzada tecnología de amortiguación de vibraciones permite mantener una atmósfera más agradable
- 6 botones con 34 programas optimizados para un licuado más fácil y consistente
- Su sistema de enfriamiento y potente motor de 3 HP de potencia de salida máxima reducen el ruido, mejoran la confiabilidad y minimizan el tiempo improductivo

vitamix.com/commercial



Includes The Quiet One® with 48-ounce high-impact, clear/stackable Advance container complete with Advance blade assembly and lid, and removable compact enclosure.

The Quiet One is backed by a three-year warranty on motor base parts and a one-year warranty on labor. For more complete warranty terms and conditions, please visit vitamix.com/commercial.

**Standard 64 oz. container cannot be used with the compact cover.*

La The Quiet One viene con un vaso Advance de alto impacto, transparente y apilable de 48 onzas, un ensamble de cuchillas y tapa Advance, y una cubierta compacta removible.

La The Quiet One está respaldada por una garantía de 3 años en las partes de la base y un año de garantía en la mano de obra. Para obtener información completa sobre los términos y condiciones de la garantía, visite vitamix.com/commercial.

**El vaso estándar de 64 onzas no se puede utilizar con la cubierta compacta.*

Product Specifications

Item Number	36019
Motor	≈3 peak output horsepower motor
Electrical	120 V, 50-60 Hz, 15.0 A
Net Weight	19.2 lbs, (23.1 lbs. with box)
Dimensions	18.0 x 8.5 x 10.7 in. (HxWxD) Height with lid open: 24.5 in.

Also Available

62947	32 oz. Aerating container (complete with aerating blade assembly, lid, and mini tamper)		
15978	48 oz. Clear Advance container*		
58988	48 oz. Blue Advance container*	58990	48 oz. Orange Advance container*
58989	48 oz. Yellow Advance container*	58991	48 oz. Purple Advance container*

**Complete with Advance blade assembly and lid*

Contact Information

U.S.A.

800.4DRINK4 or 800.437.4654
commercial@vitamix.com

Información de Contacto

Latin America

+1.440.782.2450
international@vitamix.com

vitamix.com/commercial

For more information, contact your local foodservice distributor.

Para más información, póngase en contacto con su distribuidor local de equipos para food service.

Especificaciones del Producto

Número de Artículo	36019
Motor	≈3 HP de potencia de salida máxima
Especificaciones Eléctricas	120 V, 50-60 Hz, 15.0 A
Peso Neto	19.2 lb (23.1 lb con la caja)
Dimensiones	18.0 x 8.5 x 10.7 pulg (Al x An x Pr) Altura con la tapa abierta: 24.5 pulg

También Disponible

62947	Vaso para aireación de 32 onzas (viene con ensamble de disco para aireación, tapa y mini tamper)		
15978	Vaso Advance Transparente de 48 onzas*		
58988	Vaso Advance Azul de 48 onzas*	58990	Vaso Advance Anaranjado de 48 onzas*
58989	Vaso Advance Amarillo de 48 onzas*	58991	Vaso Advance Morado de 48 onzas*

**Incluye ensamble de cuchillas y tapa Advance*





RESOURCES



Mobile Ice Bins

Stainless Steel Ice Bins



Use your smart phone to scan the above QR code to visit our website: www.bk-resources.com



BK-MIB-2422



BK-MIB-2411

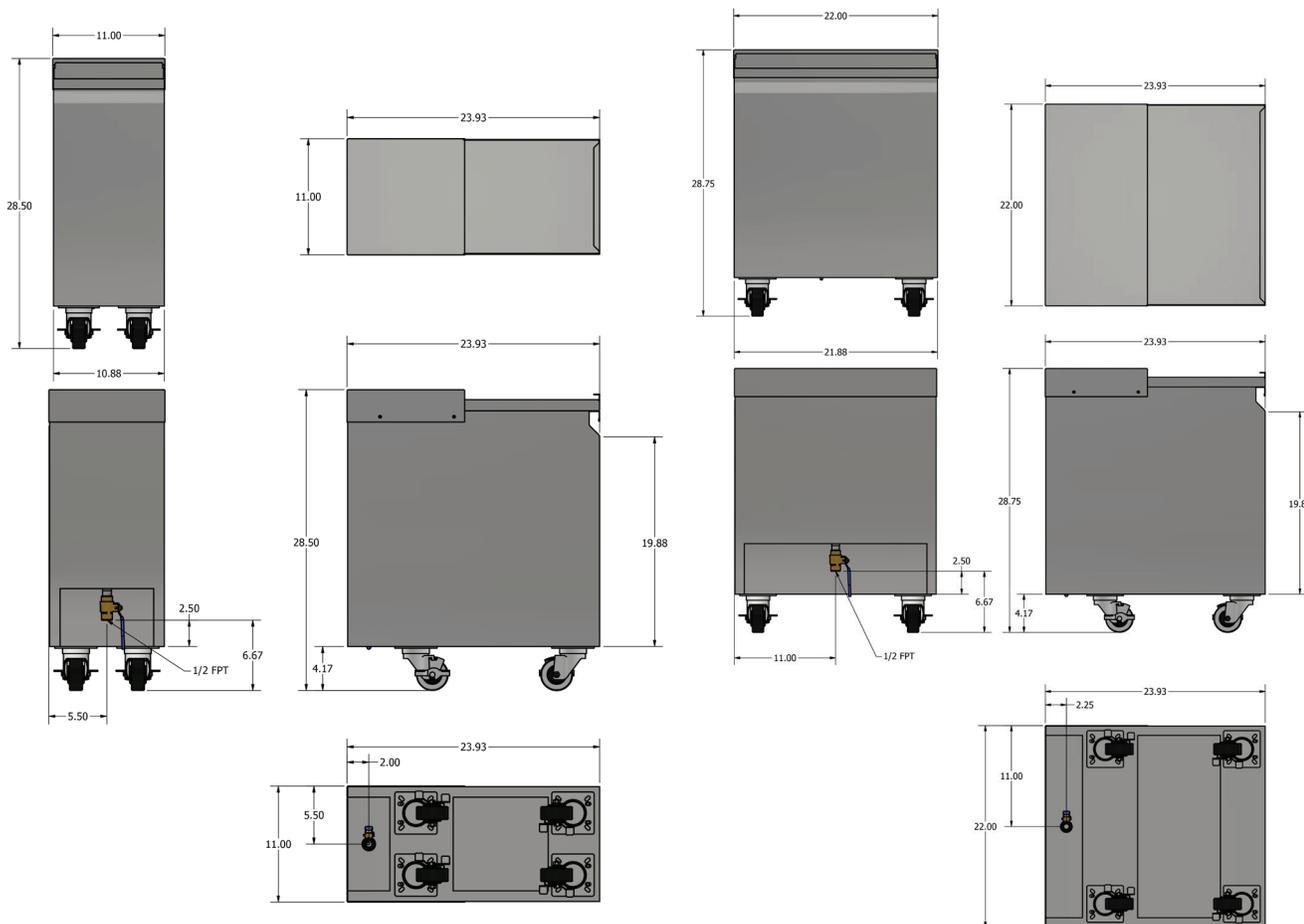
Features:

- 3" Casters With Toe Activated Brake
- Removable Bottom Tray
- Ball Valve Drain In Rear of Unit
- Foamed In Insulation

Material:

- T-304 18 ga Stainless Steel

Part Number	Unit Size (l x w x h)	Ice Bin Dim. (l x w x d)	Ice Bin Capacity	Product Weight (lbs)
BK-MIB-2422	24" x 22" x 29"	21 ^{7/8} " x 19 ^{11/16} " x 15 ^{15/16} "	117 lbs.	92.00
BK-MIB-2411	24" x 11" x 29"	21 ^{7/8} " x 8 ^{11/16} " x 15 ^{15/16} "	53 lbs.	66.00



PRODUCT DATA SHEET

BK RESOURCES



Mobile Ice Bins - Lids - Speed Rails - Bottle Wells

BK-MIB - Stainless Steel Mobile Ice Bin

- 18 ga Stainless Steel
- 3" Casters With Toe Activated Brake
- Removable Bottom Tray
- Drain Ball Valve In Rear of Unit



BK-MIB-2422

BK-MIB-2411

Part Number	Unit Size (l x w x h)	Ice Bin Dim. (l x w x d)	Ice Bin Capacity
BK-MIB-2422	24" x 22" x 29"	21 ^{7/8"} x 19 ^{11/16"} x 15 ^{15/16"}	117 lbs.
BK-MIB-2411	24" x 11" x 29"	21 ^{7/8"} x 8 ^{11/16"} x 15 ^{15/16"}	53 lbs.

ACCESSORIES

BKIB-L - Stainless Steel Ice Bin Lid

- T-304 18 ga Stainless Steel
- Designed To Fit BKIB Insulated SS Ice Bins



BKIB-L-3018

ONLY 18" DEEP	Fits
BKIB-L-2418	BKIB-2412-18
BKIB-L-3018	BKIB-3012-18
BKIB-L-3618	BKIB-3612-18
BKIB-L-4818	BKIB-4812-18

21" DEEP	Fits
BKIB-L-2421	BKIB-2412-21
BKIB-L-3021	BKIB-3012-21
BKIB-L-3621	BKIB-3612-21
BKIB-L-4821	BKIB-4812-21



BKUBSR-30

BKUBSR-2-30

BKUBSR - Stainless Steel Speed Rail

- Keyhole Mounting
- T-304 18 ga Stainless Steel
- Single or Double

Single Part #	Length	Double Part #	Length
BKUBSR-24	24"	BKUBSR-2-24	24"
BKUBSR-30	30"	BKUBSR-2-30	30"
BKUBSR-36	36"	BKUBSR-2-36	36"
BKUBSR-48	48"	BKUBSR-2-48	48"

BK-IBBH / BK-IBBH-18 Bottle Well Holder

- Keeps Bottles Cold w/o Contacting Ice
- Fits Ice Bins with & without Cold Plate

Part Number	Front to Back
BK-IBBH-18	18"
BK-IBBH	21"



BK-IBBH



BK-IBBH-18

AOBS - Add-On Blender Station

- T-304 18 ga Stainless Steel
- 8" Deep Platform

Part #	Shelf Width
AOBS-12	12"
AOBS-18	18"





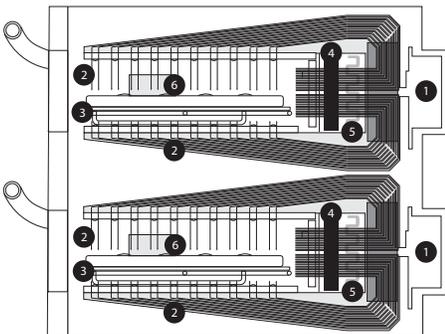
THE Double Batch™



PERFORMANCE
 The TurboChef® Double Batch™ oven has two independent cavities that circulate impinged air at speeds of up to 50 mph to create high heat transfer rates and reduced cook time. The oven utilizes variable speed blowers, oscillating racks, and catalytic converter, resulting in minimal energy input, high food quality, and ventless operation.

VENTILATION

- UL (KNLZ) listed for ventless operation.†
- EPA 202 test (8 hr):
 - Product: Pepperoni Pizzas
 - Results: 1.04 mg/m³
 - Ventless Requirement: <5.00 mg/m³
- Internal catalytic filtration to limit smoke, grease, and odor emissions.



1. Blower Motor
2. Impinged Air
3. Oscillating Rack
4. Catalytic Converter
5. Impingement Heater
6. Xenon Lights

Project _____

Item No. _____

Quantity _____

EXTERIOR CONSTRUCTION

- Stainless steel front, top and sides
- Rubber seal for surface mounting
- 7-inch capacitive touch screen with tempered glass cover

INTERIOR CONSTRUCTION

- 304 stainless steel
- Two fully insulated cook chambers
- Top and bottom jetplates

STANDARD FEATURES

- Simple and intuitive one-touch controls
- Multi-language user interface
- Integral recirculating catalytic converter for UL (KNLZ) listed ventless operation
- Variable-speed High h recirculating air impingement system
- Oscillating rack for high heat transfer without spotting
- Half-sheet pan/16-inch pizza capacity
- Stackable design (requires stacking kit)
- Smart menu system capable of storing unlimited recipes
- Built-in self diagnostics for monitoring oven components and performance
- USB compatible
- Smart Voltage Sensor Technology* (N.A. only)
- Includes plug and cord (6 ft. nominal)
- Warranty – 1 year parts and labor
- Open Kitchen™ ready

CONNECTIVITY PART NUMBERS

- MDD-1001: Initial Equipment
- MDD-1002: Additional Equipment
- MDD-1005: Additional Year (PhD SAAS)



STANDARD ACCESSORIES

- 1 Aluminum Paddle (NGC-1478)
- 1 Bottle Oven Cleaner (105704)
- 1 Bottle Oven Guard (105703)
- 2 Trigger Sprayers (103182)
- 4 Oven Legs (HHB-3205) – Optional



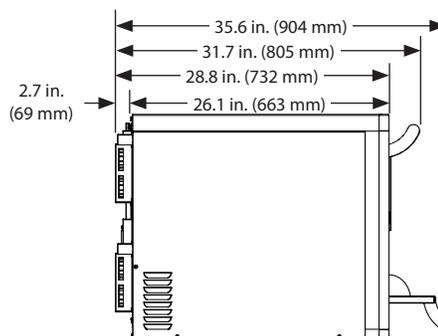
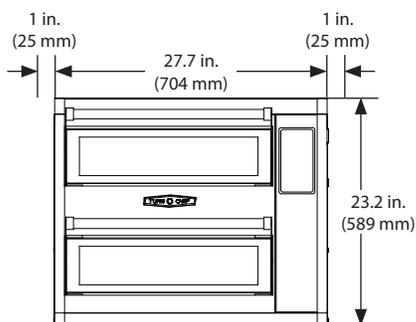
This product conforms to the ventilation recommendations set forth by NFPA96 using EPA202 test method.

* Smart Voltage Sensor Technology does not compensate for lack of or over voltage situations. It is the responsibility of the owner to supply voltage to the unit according to the specifications on the back of this sheet.

† Ventless certification is for all food items except for foods classified as “fatty raw proteins.” Such foods include bone-in, skin-on chicken, raw hamburger meat, raw bacon, raw sausage, steaks, etc. If cooking these types of foods, consult local HVAC codes and authorities to ensure compliance with ventilation requirements.

TurboChef reserves the right to make substitutions of components or change specifications without prior notice.

Double Batch™



DIMENSIONS		
Single Units		
Height	23.2"	589 mm
Width	27.7"	704 mm
Depth (Door Open/Closed)	35.6" / 31.7"	903 mm / 806 mm
Weight	262 lb.	119 kg
Stacked Units		
Height	46.4"	1,179 mm
Width	27.7"	704 mm
Depth (Door Open/Closed)	31.7" / 35.6"	806 mm / 903 mm
Weight	524 lb.	238 kg
Cook Chamber		
Height	3.3"	84 mm
Width	18.1"	318 mm
Depth	17.07"	434 mm
Volume	0.59 cu.ft.	16.7 liters
Wall Clearance (Oven not intended for built-in installation)		
Top	2"	51 mm
Sides	2"	51 mm

ELECTRICAL SPECIFICATIONS-SINGLE PHASE		
Double Batch US Model (HHD-9500-801) - United States		
Voltage	208/240 VAC	
Frequency	60 Hz	
Current	50 amps	
Max Input	8,320/9,600 watts	
Double Batch UK Model (HHD-9500-802-UK) - International		
Voltage	230 VAC	
Frequency	50 Hz or 60 Hz	
Current	50 amps	
Max Input	8,700 watts	
Double Batch BK Model (HHD-9500-828-BK) - Brazil		
Voltage	220 VAC	
Frequency	60 Hz	
Current	50 amps	
Max Input	8,700 watts	
Double Batch LA Model (HHD-9500-829-LA) - Latin America		
Voltage	220 VAC	
Frequency	60 Hz	
Current	50 amps	
Max Input	8,700 watts	
Double Batch JK Model (HHD-9500-823-JK) - Japan		
Voltage	200 VAC	
Frequency	50 Hz or 60 Hz	
Current	50 amps	
Max Input	8,700 watts	

ELECTRICAL SPECIFICATIONS-3-PHASE		
Double Batch US Model (HHD-9500-814-DL) - United States		
Voltage	208/240 VAC	
Frequency	60 Hz	
Current	30 amps	
Max Input	8,320/9,600 watts	
Double Batch ED Model (HHD-9500-803-ED) - International		
Voltage	230 VAC	
Frequency	50 Hz or 60 Hz	
Current	29 amps	
Max Input	8,700 watts	
Double Batch EW Model (HHD-9500-804-EW) - International		
Voltage	400 VAC	
Frequency	50 Hz or 60 Hz	
Current	20 amps	
Max Input	8,700 watts	
Double Batch AU Model (HHD-9500-811-AU) - International		
Voltage	400 VAC	
Frequency	50 Hz	
Current	20 amps	
Max Input	8,700 watts	
Double Batch JD Model (HHD-9500-824-JD) - Japan		
Voltage	200 VAC	
Frequency	50 Hz or 60 Hz	
Current	29 amps	
Max Input	7,900 watts	
Double Batch LD Model (HHD-9500-831-LD) - Latin America		
Voltage	220 VAC	
Frequency	60 Hz	
Current	29 amps	
Max Input	8,700 watts	
Double Batch BD Model (HHD-9500-832-BD) - Brazil		
Voltage	220 VAC	
Frequency	60 Hz	
Current	29 amps	
Max Input	8,700 watts	

SHIPPING INFORMATION	
U.S.: All ovens shipped within the U.S. are packaged in a double-wall corrugated box banded to a wooden skid. International: All International ovens shipped via Air or Less than Container Loads are packaged in wooden crates.	
Box size: 37" x 36" x 35" (940 mm x 914 mm x 889 mm) Crate size: 39" x 40" x 36" (991 mm x 1016 mm x 914 mm) Item class: 110 NMFC #26710 HS code 8419.81	
Appx. boxed weight: 322 lb. (146 kg) Appx. crated weight: 405 lb. (184 kg)	
Minimum entry clearance required for box: 35.5" Minimum entry clearance required for crate: 39.5"	

TurboChef Global Operations
 2801 Trade Center Drive / Carrollton, Texas 75007 USA
 US: 800.90TURBO (800.908.8726) / International: +1 214.379.6000
 Fax: +1 214.379.6073 / turbochef.com

TurboChef recommends installing a type D circuit breaker for European installations.
 TurboChef reserves the right to substitute components or change specifications without notice.

El Bandido Panini Press

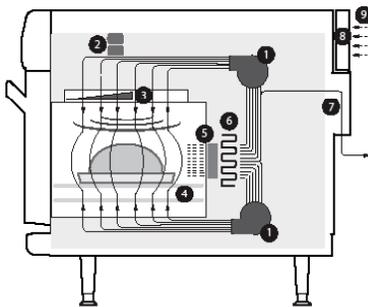


PERFORMANCE

Using patented technology, the TurboChef El Bandido is the first rapid cook oven that can operate as a high-speed/high-quality panini press with the flexibility to rapidly cook non-pressed foods. The panini press is externally actuated so the operator can choose to press a product.

VENTILATION

- UL (KNLZ) listed for ventless operation.†
- EPA 202 test (8 hr):
 - Product: Pepperoni Pizzas
 - Results: 0.64 mg/m³
 - Ventless Requirement: <5.00 mg/m³
- Internal catalytic filtration to limit smoke, grease, and odor emissions.



1. Blower Motors
2. Microwave System
3. Stirred Impinged Air (Top) and Microwave
4. Impinged Air (Bottom)
5. Catalytic Converter
6. Impingement Heater
7. Vent Tube Catalyst
8. Air Filter
9. Inlet Air for Cooling Electronic Components

EXTERIOR CONSTRUCTION

- High-temperature, powder coated, corrosion-resistant steel outer wrap and door
- Die-cast aluminum front panels with matte-nickel accents
- Cool-to-touch exterior; all surfaces below 50°C
- Ergonomic matte-nickel door handle
- 4-inch adjustable legs
- 7-inch capacitive touch screen with tempered glass cover (CON-7168)

INTERIOR CONSTRUCTION

- 201/304 stainless steel
- Fully welded and insulated cook chamber
- Fully removable panini press mechanism

STANDARD FEATURES

- Panini press mechanism with anodized aluminum upper and lower griddle press plates
- Simple and intuitive one-touch controls with icons
- Independently-controlled dual motors for vertically-recirculated air impingement
- Top launched microwave system
- Stirrer to help ensure even distribution of air and microwave
- Integral recirculating catalytic converter for UL® (KNLZ) listed ventless operation
- External cooling air filtration
- Vent catalyst to further limit emissions and odors
- Smart menu system capable of storing unlimited recipes
- Programmable via USB
- Flash firmware updates via USB
- Single or dual-temperature interface
- Self-diagnostics for monitoring oven components and performance
- Smart voltage sensor technology* (U.S. only)
- Includes plug and cord (6 ft. nominal)
- Oven Warranty – 1-year parts and labor (NOTE: panini press assembly has separate limited warranty)
- Open Kitchen™ ready

CONNECTIVITY PART NUMBERS

- MDD-1001 - Initial equipment, two-way connectivity bundle
- MDD-1002 - Additional equipment, two-way connectivity bundle
- MDD-1003 - Additional year of subscription (PhD SAAS)

**OPEN
KITCHEN**

STANDARD ACCESSORIES

- 1 Oven Cleaner and Guard Kit (105701)
- 1 Cooking Basket (i1-9166)
- 1 Aluminum Paddle (i1-9716)

CERTIFICATIONS



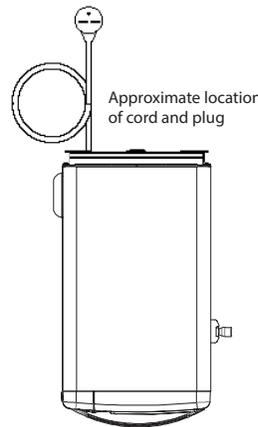
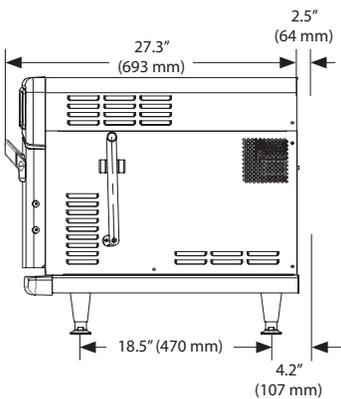
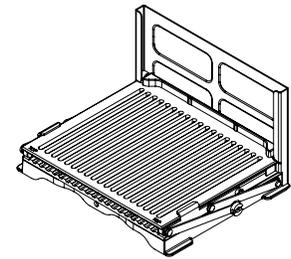
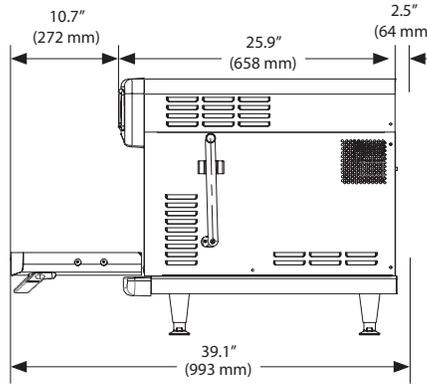
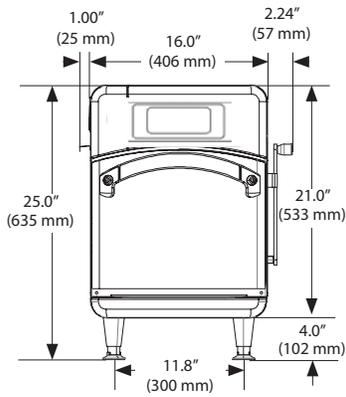
This product conforms to the ventilation recommendations set forth by NFPA96 using EPA202 test method.

* Smart voltage sensor technology does not compensate for lack of or over voltage situations. It is the responsibility of the owner to supply voltage to the unit according to the specifications on the back of this sheet.

† Ventless certification is for all food items except for foods classified as "fatty raw proteins." Such foods include bone-in, skin-on chicken, raw hamburger meat, raw bacon, raw sausage, steaks, etc. If cooking these types of foods, consult local HVAC codes and authorities to ensure compliance with ventilation requirements.

TurboChef reserves the right to make substitutions of components or change specifications without prior notice.

DOC-1722 / Revision H / January 2024



- US, CAN, LA (NEMA 6-30P)
- UK, BK (IEC 309, 3-pin)
- JK (NEMA L6-50, PSE, 3-blade)
- JD (NEMA L6-50, PSE, 4-blade)
- ED, BD, SD (IEC 309, 4-pin)
- EW, KW (IEC 309, 5-pin)
- AU (Clipsal, 5-pin)

DIMENSIONS

Single Units		
Height	25.0"	635 mm
Width	16.0"	406 mm
Overall Width	19.24"	489 mm
Depth	29.8"	757 mm
Weight	170 lb.	77.1 kg
Cook Chamber		
Height	7.2"	183 mm
Width	12.5"	318 mm
Depth	10.5"	267 mm
Volume	0.54 cu.ft.	15.4 liters
Wall Clearance (Oven not intended for built-in installation)		
Top	5"	127 mm
Side without Handle	1"	25 mm
Side with Handle	6"	152 mm

SHIPPING INFORMATION

U.S.: All ovens shipped within the U.S. are packaged in a double-wall corrugated box banded to a wooden skid.
 International: All International ovens shipped via Air or Less than Container Loads are packaged in wooden crates.

Box size: 37" x 24" x 37" (940 mm x 610 mm x 940 mm)
 Crate size: 38" x 26" x 38" (965 mm x 660 mm x 965 mm)
 Item class: 110 NMFC #26710 HS code 8419.81

Approximate boxed weight (standard/single mag): 205 lb. (93 kg) / 170 lb. (77.1 kg)
 Approximate crated weight (standard/single mag): 275 lb. (125 kg) / 240 lb. (109 kg)

Minimum entry clearance required for box: 24.5" (622 mm)
 Minimum entry clearance required for crate: 26.5" (673 mm)

ELECTRICAL SPECIFICATIONS

SINGLE PHASE		
US/Canada	i1-9500-938	208/240 VAC, 60 Hz, 30 amps Max Input: 6.2 kW, MW: 3.2 kW, HTR: 6.0 kW
Europe (UK)	i1-9500-939-UK	230 VAC, 50 Hz, 27 amps Max Input: 6.2 kW, MW: 3.2 kW, HTR: 6.0 kW
Brazil (BK)	i1-9500-943-BK	220 VAC, 60 Hz, 28 amps Max Input: 6.2 kW, MW: 3.2 kW, HTR: 6.0 kW
Latin America (LA)	i1-9500-944-LA	220 VAC, 60 Hz, 28 amps Max Input: 6.2 kW, MW: 3.2 kW, HTR: 6.0 kW
Japan (JK)	i1-9500-945-JK	200 VAC, 50 Hz, 30 amps Max Input: 6.2 kW, MW: 3.2 kW, HTR: 6.0 kW
Japan (JK)	i1-9500-947-JK	200 VAC, 60 Hz, 30 amps Max Input: 6.2 kW, MW: 3.2 kW, HTR: 6.0 kW
MULTIPHASE		
Europe Delta (ED)	i1-9500-540-ED	230 VAC, 50 Hz, 20 amps Max Input: 6.2 kW, MW: 3.2 kW, HTR: 6.0 kW
Europe Wye (EW)	i1-9500-941-EW	400 VAC, 50 Hz, 16 amps Max Input: 6.2 kW, MW: 3.2 kW, HTR: 6.0 kW
Australia Wye (AU)	i1-9500-942-AU	400 VAC, 50 Hz, 16 amps Max Input: 6.2 kW, MW: 3.2 kW, HTR: 6.0 kW
Japan Delta (JD)	i1-9500-946-JD	200 VAC, 50 Hz, 20 amps Max Input: 6.2 kW, MW: 3.2 kW, HTR: 6.0 kW
Japan Delta (JD)	i1-9500-948-JD	200 VAC, 60 Hz, 20 amps Max Input: 6.2 kW, MW: 3.2 kW, HTR: 6.0 kW
Korea/Middle East Wye (KW)	i1-9500-949-KW	400 VAC, 60 Hz, 16 amps Max Input: 6.2 kW, MW: 3.2 kW, HTR: 6.0 kW
Korea/Middle East Delta (SD)	i1-9500-950-SD	230 VAC, 60 Hz, 20 amps Max Input: 6.2 kW, MW: 3.2 kW, HTR: 6.0 kW

Point-of-Sale (POS) Printer

N.I.C. (Not in Contract)

This item is not in the Foodservice Equipment Contract

Item to be provided by:

- Vendor
- Owner
- General Contractor
- Millwork
- Other

Notes:

Kitchen Equipment Contractor (KEC) to coordinate the final location of this item

KEC to verify final equipment selection with the Owner and coordinate the utility requirements with the MEP Engineer

Refer to the foodservice and architectural plans for item location

EXISTING EQUIPMENT

This item is not in the Foodservice Equipment Contract

Item is existing:

- Where Shown
- Relocated
- Modified

Notes:

Refer to the foodservice and architectural plans for item location

Counter

N.I.C. (Not in Contract)

This item is not in the Foodservice Equipment Contract

Item to be provided by:

- Vendor
- Owner
- General Contractor
- Millwork
- Other

Notes:

Refer to the foodservice and architectural plans for item location, sizing, and integration with foodservice equipment

Refer to the architectural plans and specifications for details and finishes

LUXUS[®]

1.0 / 1.5 / 2.0 GALLON THERMAL DISPENSERS AND SERVERS

L4 SERIES



2.0 Gallon

1.5 Gallon

1.0 Gallon

L4D Thermal
Dispensers



2.0 Gallon

1.5 Gallon

1.0 Gallon

L4S Thermal
Servers

The L4 Series Thermal Dispenser and Servers are designed to keep your coffee service hot, fresh and portable. With the legendary thermal retention properties you'd expect from FETCO, the L4 is equipped with enhanced features that now make it even easier for operators to manage their daily coffee service. Digital liquid-level monitoring and rugged stainless construction make the L4 the perfect self-serve choice for any foodservice segment - Hotels, OCS, C-Stores, Restaurants, Coffee Shops, Cafes, etc.

* Shown with #A147
Server Stand
(sold separately)

L4D Series LUXUS® Thermal Dispensers & Servers

The LUXUS® L4D Thermal Dispensers and Servers are designed to retain all the heat generated during the brewing process with very little dissipation. In fact, FETCO thermal dispensers maintain the suggested 180-185°F holding temperature for at least 4 hours and meet or exceed industry standards. This patented technology eliminates the need for an additional heat source, thus saving energy and equipment costs.



L4D Dispenser

With integrated stand and removable drip tray.



L4S Server

Shown with Serving Station with removable drip tray (sold separately).

Key Features and Benefits

Integrated Lid Design with Improved Functionality

The integrated lid design features a removable funnel system, pivoting brew cap and front-positioned handle.

- ▶ Precision Fit Funnel Assembly keeps moisture and heat from escaping to lock in freshness and aroma
- ▶ Brew Cap mounted on lid exterior for easy access
- ▶ Forward positioned handle for better maneuverability

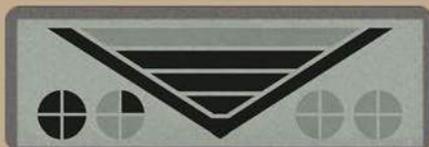


Digital Freshness Timer

Four pie-shaped visual indicators that represent how much time (in 15 minute increments) has elapsed since filling.



- ▶ Example #1
1 hour 15 mins. elapsed / 80% liquid remaining (represented by 4 filled bars)



*NOTE: Time is reset when dispenser is emptied, removing funnel or when enough liquid is added to increase volume by one level.

Digital Volume Indicator

Digital visual indicator shows how much liquid remains with a series of "V" shape bars representing 20% increments.



- ▶ Example #2
2 hours 30 mins. elapsed / 20% liquid remaining (represented by 1 filled bar)



*NOTE: Time is reset when dispenser is emptied, removing funnel or when enough liquid is added to increase volume by one level.

Funnel Construction

Funnel enclosure helps provide additional protection to circuit board, internal battery and display window. Features built-in handle for quick cleaning and maintenance.



Traditional Pull Faucet

Precise control of beverage container filling. Transparent polycarbonate faucet guard keeps containers and cups away from the spout to help prevent cross contamination.



Wrap Stabilizer

Pronounced ledge in molded plastic cover helps prevent graphic "wraps" from sliding up the dispenser body during handling.



Multi-Face Serving Stations (L4 Servers)

Modular multi-station design in 1, 2 or 3 increments can create a permanent or temporary beverage service on any countertop, meeting room, lobby or food line.



L4D Dispenser / L4S Server

Technical Specifications

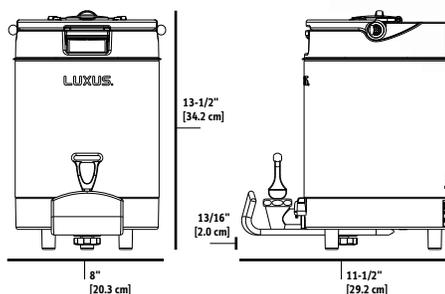
Measurements

D448	L4D-10 1.0 Gallon LUXUS® Thermal Dispenser				
Product	Height 21 3/4" [55.2 cm]	Width 8" [20.3 cm]	Depth 12 1/2" [31.7 cm]	Empty Weight 8.0 lbs [3.6 kg]	Filled Weight 15.9 lbs [7.2 kg]
Shipping	23"	16"	13"	12.0 lbs	-
D449	L4D-15 1.5 Gallon LUXUS® Thermal Dispenser				
Product	Height 23" [58.4 cm]	Width 9" [22.9 cm]	Depth 13 1/4" [33.6 cm]	Empty Weight 10.5 lbs [4.8 kg]	Filled Weight 22.4 lbs [10.2 kg]
Shipping	25"	17"	13"	14.0 lbs	-
D450	L4D-20 2.0 Gallon LUXUS® Thermal Dispenser				
Product	Height 24 1/2" [62.2 cm]	Width 9" [22.9 cm]	Depth 13 1/4" [33.6 cm]	Empty Weight 11.5 lbs [4.8 kg]	Filled Weight 27.5 lbs [10.2 kg]
Shipping	27"	17"	13"	16.0 lbs	-

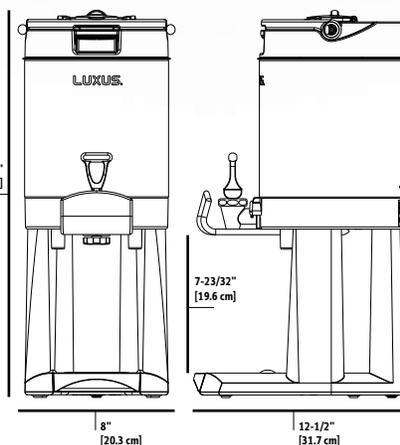
D451	L4S-10 1.0 Gallon LUXUS® Thermal Server*				
Product	Height 13 1/2" [34.2 cm]	Width 8" [20.3 cm]	Depth 11 1/2" [29.2 cm]	Empty Weight 5.6 lbs [2.5 kg]	Filled Weight 12.4 lbs [5.6 kg]
Shipping	15"	16"	12"	9.0 lbs	-
D452	L4S-15 1.5 Gallon LUXUS® Thermal Server*				
Product	Height 14 3/4" [37.4 cm]	Width 9" [22.9 cm]	Depth 12 1/2" [31.7 cm]	Empty Weight 7.2 lbs [3.3 kg]	Filled Weight 17.6 lbs [8.0 kg]
Shipping	16"	17"	13"	10.0 lbs	-
D453	L4S-20 2.0 Gallon LUXUS® Thermal Server*				
Product	Height 16 1/16" [40.8 cm]	Width 9" [22.9 cm]	Depth 12 1/2" [31.7 cm]	Empty Weight 8.3 lbs [3.3 kg]	Filled Weight 25.0 lbs [8.0 kg]
Shipping	21"	17"	13"	12.0 lbs	-

* Must be used with with "A" series Serving Stations.

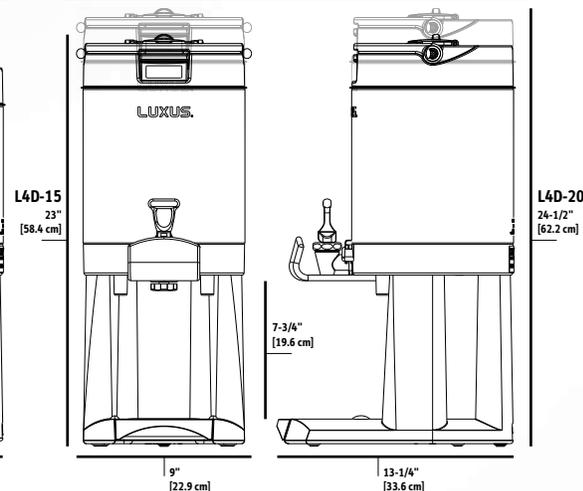
L4S-10



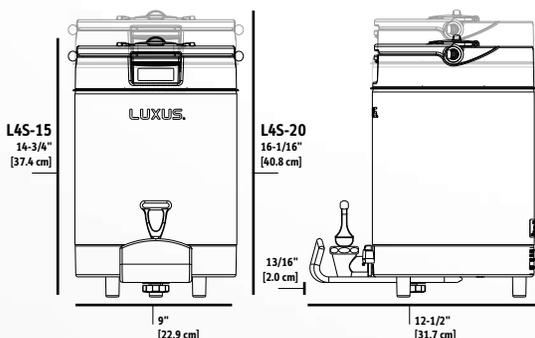
L4D-10



L4D-15/20



L4S-15/20



Customize Your Dispenser

- #1071.00030.00 Orange Dispenser Faucet Replacement Handle*
- #1071.00031.00 Green Dispenser Faucet Replacement Handle*
- #1071.00032.00 Blue Dispenser Faucet Replacement Handle*
- #1071.00040.00 Red Dispenser Faucet Replacement Handle*
- #Z053 Rear Facing Positioned Digital Display

* Color choice must be specified at time of purchase for no charge

Serving Stations

- Serving Stations for L4S-10 Server
 - #A147 Single Face
 - #A148 Double Facing
 - #A149 Triple Facing
- Serving Stations for L4S-15/L4S-20 Servers
 - #A150 Single Face
 - #A151 Double Facing
 - #A152 Triple Facing



NOTE: Serving stations work for both L3 and L4 series servers.

Information

fetco.com

info@fetco.com

847.719.3000
1.800.338.2699 USA
847.719.3001

Food Equipment Technologies Co.
600 Rose Road
Lake Zurich, IL 60047
USA

WARING COMMERCIAL



Electronic browning controls



WCT850 Bread/Bagel selector switch toasts only one side of bagel



Wide toasting slots



4 | HEAVY-DUTY SLICE | TOASTERS



WCT800



WCT850

- Uniformly toast regular bread, Texas toast, frozen waffles and many other foods
- Easily replaceable industrial heating plates
- Electronic browning controls and carriage control lift levers
- **WCT800** – Four 1 $\frac{1}{8}$ "-wide, regular toast slots
– 120V, 2200W, 300 slices/hr., cETLus, NSF, 5-20P Ⓢ
- **WCT850** – Switchable bread/bagel controls
– Four 1 $\frac{1}{2}$ " extra-wide slots; 360 slices/hr.
– 208V, 2800W, ETL, NSF, 6-20P Ⓢ
- Dishwasher-safe crumb tray
- Limited One Year Warranty

WCT800 Series



4 SLICE | HEAVY-DUTY TOASTERS



*Dimensions are the same for all models.
(10.5" L x 11.875" W x 9" H)



ITEM	ELECTRICAL	WATTS	LISTINGS	SLOT WIDTH	PLUG	OUTPUT (SLICES/HR)	OUT OF BOX WEIGHT (LB.)	OUT OF BOX DIMENSIONS L x W x H	CORD LENGTH	WARRANTY
WCT800RC	120 Volt, 50/60 Hz	1800	cETLus, NSF	(4) 1 1/8"	NEMA 5-15P Ⓢ	300	16.55	10.5" x 11.875" x 9"	5 Feet	Limited 1 Year Motor
WCT800RCND	120 Volt, 60 Hz	1440	cETLus, NSF	(4) 1 1/8"	NEMA 5-15P Ⓢ	160	16.55	10.5" x 11.875" x 9"	5 Feet	Limited 1 Year Motor
WCT800	120 Volt, 50/60 Hz	2200	cETLus, NSF	(4) 1 1/8"	NEMA 5-20P Ⓢ	300	16.55	10.5" x 11.875" x 9"	5 Feet	Limited 1 Year Motor
WCT805B	208 Volt, 50/60 Hz	2700	cETLus, NSF	(4) 1 1/8"	NEMA 6-20P Ⓢ	380	16.55	10.5" x 11.875" x 9"	5 Feet	Limited 1 Year Motor
WCT805	240 Volt, 50/60 Hz	2700	cETLus, NSF	(4) 1 1/8"	NEMA 6-15P Ⓢ	380	16.55	10.5" x 11.875" x 9"	5 Feet	Limited 1 Year Motor
WCT810	120 Volt, 50/60 Hz	2025	cETLus, NSF	(2) 1 1/8", (2) 1 1/2"	NEMA 5-20P Ⓢ	380	16.55	10.5" x 11.875" x 9"	5 Feet	Limited 1 Year Motor
WCT850RC	120 Volt, 50/60 Hz	1800	cETLus, NSF	(4) 1 1/2"	NEMA 5-15P Ⓢ	360	16.55	10.5" x 11.875" x 9"	5 Feet	Limited 1 Year Motor
WCT850RCND	120 Volt, 60 Hz	1440	cETLus, NSF	(4) 1 1/2"	NEMA 5-15P Ⓢ	360	16.55	10.5" x 11.875" x 9"	5 Feet	Limited 1 Year Motor
WCT850	208 Volt, 50/60 Hz	2800	cETLus, NSF	(4) 1 1/2"	NEMA 6-20P Ⓢ	360	16.55	10.5" x 11.875" x 9"	5 Feet	Limited 1 Year Motor
WCT855	240 Volt, 50/60 Hz	2700	cETLus, NSF	(4) 1 1/2"	NEMA 6-20P Ⓢ	360	16.55	10.5" x 11.875" x 9"	5 Feet	Limited 1 Year Motor

ORDERING INFORMATION	#STD. PKG.	GIFTBOX WEIGHT (LB.)	CUBIC FEET	MC DIMENSIONS L x W x H	UPC	CASE PKG.	MC WEIGHT (LB.)	BOX DIMENSIONS L x W x H	MBC
WCT800RC – Heavy-Duty Standard Toaster	1	18.5	1.3	15.6" x 14.1" x 11"	040072002915	1	19.8	16" x 14.5" x 11.625"	10040072002912
WCT800RCND – Heavy-Duty Standard Toaster	1	18.6	1.3	15.5" x 14.1" x 11"	040072028533	1	19.9	15.75" x 14.625" x 11.75"	10040072028530
WCT800 – Heavy-Duty Standard Toaster	1	19.1	1.3	15.5" x 14.1" x 11"	040072001451	1	20.5	15.875" x 14.375" x 11.875"	10040072001458
WCT805B – Heavy-Duty Standard Toaster	1	18.6	1.3	15.375" x 14.125" x 11.25"	040072003196	1	19.9	15.875" x 14.625" x 11.875"	10040072003913
WCT805 – Heavy-Duty Standard Toaster	1	18.7	1.3	15.375" x 14" x 11"	040072001468	1	20.0	15.875" x 14.5" x 11.75"	10040072001465
WCT810 – Heavy-Duty Combination Toaster	1	20.4	1.3	15.5" x 14" x 11.125"	040072001475	1	20.4	15.875" x 14.625" x 11.75"	10040072001472
WCT850RC – Heavy-Duty Switchable Bread/Bagel Toaster	1	20.4	1.3	15.25" x 14.125" x 11"	040072031243	1	20.4	15.875" x 14.5" x 11.75"	10040072031240
WCT850RCND – Heavy-Duty Switchable Bread/Bagel Toaster	1	17.9	1.3	15.25" x 14.125" x 11"	040072031236	1	19.4	15.875" x 14.5" x 11.75"	10040072031233
WCT850 – Heavy-Duty Switchable Bread/Bagel Toaster	1	18.1	1.3	15.5" x 14.125" x 11"	040072014314	1	19.5	15.875" x 14.5" x 11.625"	10040072014311
WCT855 – Heavy-Duty Switchable Bread/Bagel Toaster	1	17.9	1.3	15.375" x 14.125" x 11.25"	040072031229	1	19.2	15.875" x 14.5" x 11.625"	10040072031226



@waringcommercial

waringcommercialproducts.com



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314 Ella T. Grasso Avenue, Torrington, CT 06790
Tel. 800-492-7464 • Fax 860-496-9008
18WC051794

Heavy-Duty Conveyor Toasters CTS1000 Series

- Heavy-duty, brushed stainless steel construction
- Power ON and Toaster Ready indicator lights
- Cool-touch side panels
- Large, 2" opening accommodates thick breads and bagels
- Energy-saving Standby function

Limited One-Year Warranty



CTS1000B



CTS1000/CTS1000CND

MODEL	LISTING	ELECTRICAL POWER
CTS1000	UL, NSF	120V, 1800W, 5-15P Ⓢ
CTS1000CND	cULus, NSF	120V, 1500W, 5-15P Ⓢ
CTS1000B	cULus, NSF	208V, 2700W, 6-20P Ⓢ

4-Slice Heavy-Duty Toasters/ Combination Toasters & Bagel Toasters WCT800/850 Series

- Uniformly toast regular bread, Texas toast, frozen waffles and many other foods
- Easily replaceable industrial heating plates
- Electronic browning controls and carriage control lift levers
- Dishwasher-safe crumb tray

Limited One-Year Warranty



WCT800 Series



WCT850 Series

MODEL	LISTING	CONFIGURATION	SLOT SIZE	SLICES	ELECTRICAL POWER
WCT800	ETLus, NSF	4-slice standard	1 1/8" wide	300 per hr.	120V, 2200W, 5-20P Ⓢ
WCT800RC					120V, 1800W, 5-15P Ⓢ
WCT805	cETLus, NSF	4-slice standard	1 1/2" wide	380 per hr.	208/240V, 2028/2700W, 6-15P Ⓢ
WCT805B					208/240V, 2028/2700W, 6-20P Ⓢ
WCT850	cETLus, NSF	4-slice switchable bread/bagel controls	1 1/2" wide	360 per hr.	208V, 2800W, 6-20P Ⓢ
WCT850RC					120V, 1800W, 5-15P Ⓢ
WCT855					240V, 2700W, 6-15P Ⓢ

Project: _____

Item #: _____

Panasonic**NE-1054F****1000 WATT* COMMERCIAL MICROWAVE OVEN****FOOD SERVICE
EQUIPMENT****PRO**www.panasonic.com/CMO**PERFECT FOR**

- Vending
- Break Rooms
- Waitress Stations
- Front of House
- Schools
- Concessions
- Convenience Stores

PERFORMANCE

- 1000 Watt Power
- 10 Programmable memory pads
- 20 Memory capability
- 6 Power Levels
- 2- and 3-stage cooking
- Programmable and Manual operations
- Bottom energy feed

BOTTOM ENERGY FEED

Energy travels less distance to reach the food, compared to side or top energy feed, for increased efficiency.

“GRAB & GO” DOOR HANDLE

Without moving parts like those found in trigger-activated or push-button handles, the “Grab & Go” door handle is fast, reliable and durable.

ADDITIONAL FEATURES

- Stainless steel front
- 0.8 cubic feet cavity
- Grab & Go door handle
- Fits 1 half-size, 6-inch deep steam table pan/cover
- Braille keypad
- Program list/cycle counter
- Self diagnostics
- 99:99-minute capacity
- Interior oven light
- See-through oven door
- Touch control keypad
- Anti-theft equipped
- Program lock
- Tone control
- Will ship via UPS

SPECIFICATIONS	NE-1054F
Power Source:	120V, 60Hz, Single Phase
Receptacle Required:	NEMA 5-15
Frequency:	2,450MHz
Required Power:	13.4A
Output:	1000 Watts*
Outer Dimensions: (w x d x h)	20-1/8" x 16-1/2" x 12"
Cavity Dimensions: (w x d x h)	13" x 13" x 8-1/16"
Net Weight:	34 lbs.
Shipping Weight:	40 lbs.
Shipping Box Size: (w x d x h)	24" x 18-3/4" x 14-3/4" - 3.8 cu. ft.
Timer:	99 Minutes, 99 Seconds
Memory Capability:	20 Programs
Door / Cabinet / Cavity:	Stainless / Grey / White

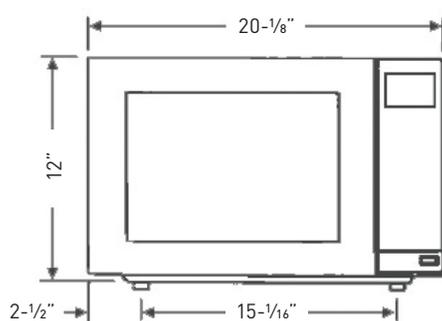
The NE-1054F commercial microwave meets or exceeds all safety performance and sanitation standards set for commercial food service microwave ovens by UL, HHS, FCC and NSF.



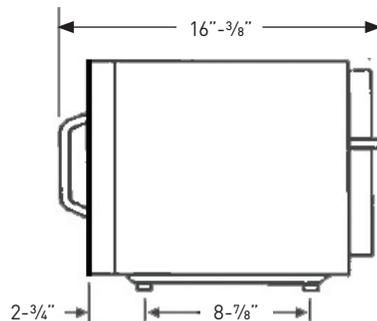
Panasonic Commercial Food Service
Division of Panasonic Corporation of North America
2 Riverfront Plaza | Newark, NJ 07102
(201) 348-7000
www.panasonic.com/cmo

MAINTENANCE

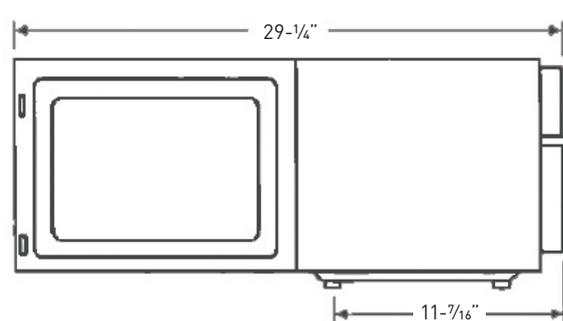
- Self-diagnostics
- Easy to change interior oven light
- Warranty: 1 year parts/labor or 18,000 cycles
- Warranty: 3 years parts/labor or 54,000 cycles for magnetron



Cornell King Shaw



Jacobs Doland Beer, LLC



Page: 115

Description: Spare No.

Notes:

Counter

N.I.C. (Not in Contract)

This item is not in the Foodservice Equipment Contract

Item to be provided by:

- Vendor
- Owner
- General Contractor
- Millwork
- Other

Notes:

Refer to the foodservice and architectural plans for item location, sizing, and integration with foodservice equipment

Refer to the architectural plans and specifications for details and finishes



Slim Jim®

The Slim Jim® container delivers the durability needed for commercial environments combined with brand new innovation to increase worker productivity. New product features and accessories deliver the most efficient solution for collection, transportation, and disposal of multi-stream waste and recyclables.

Features and Benefits:

- Venting channels make removing liners up to 80% easier, improving productivity and reducing the risk of worker injury
- Four bag cinches secure liners around the rim of the container and allow for quick, knot-free liner changes
- Handles at the base and rim of the container improve grip and control while lifting and emptying full containers
- Rim with rib-strengthened design increases strength and resists crushing
- Build a recycling station with a variety of dolly and lid options to meet any facility need

COLORS AVAILABLE

Blue, Green, Black, Beige, Brown, Gray, Yellow*, Red*

* 23-gallon only

Material Composition:

Injection molded with a high-quality resin blend.

Accessories:

STAINLESS STEEL DOLLIES

- Slim Jim® Single Dolly
- Slim Jim® Double Dolly
- Slim Jim® Triple Dolly
- Slim Jim® Quadruple Dolly

RESIN DOLLY

- Slim Jim® Trainable Dolly

LIDS

- Bottles and Cans Lid
- Paper Lid
- Mixed Recycling Lid
- Hinged Lid
- Swing Lid

SLIM JIM® CONTAINERS



23-Gallon Slim Jim® Container



16-Gallon Slim Jim® Container

SLIM JIM® CONTAINERS

SKU #	DESCRIPTION	COLOR	CAPACITY		LENGTH		WIDTH		HEIGHT		PACK SIZE
			GAL	L	IN	CM	IN	CM	IN	CM	
1971258	SLIM JIM® CONTAINER	GRAY	16	61	22"	55.88	11"	27.94	25"	63.50	4
1955959	SLIM JIM® CONTAINER	BLACK	16	61	22"	55.88	11"	27.94	25"	63.50	4
1971259	SLIM JIM® CONTAINER	BEIGE	16	61	22"	55.88	11"	27.94	25"	63.50	4
1956181	SLIM JIM® CONTAINER	BROWN	16	61	22"	55.88	11"	27.94	25"	63.50	4
1971257	SLIM JIM® CONTAINER	BLUE	16	61	22"	55.88	11"	27.94	25"	63.50	4
1955960	SLIM JIM® CONTAINER	GREEN	16	61	22"	55.88	11"	27.94	25"	63.50	4
FG354060GRAY	SLIM JIM® CONTAINER	GRAY	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354060BLA	SLIM JIM® CONTAINER	BLACK	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354060BEIG	SLIM JIM® CONTAINER	BEIGE	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956187	SLIM JIM® CONTAINER	BROWN	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956185	SLIM JIM® CONTAINER	BLUE	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956186	SLIM JIM® CONTAINER	GREEN	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956188	SLIM JIM® CONTAINER	YELLOW	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956189	SLIM JIM® CONTAINER	RED	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354007BLUE	SLIM JIM® CONTAINER	BLUE (RECYCLING)	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354007GRN	SLIM JIM® CONTAINER	GREEN (RECYCLING)	23	87	22"	55.88	11"	27.94	30"	76.20	4





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COLORS AVAILABLE

Blue, Green, Black, Beige, Brown, Gray, Yellow*, Red*

* 23-gallon only

Material Composition:

Injection molded with a high-quality resin blend.

Accessories:

STAINLESS STEEL DOLLIES

- Slim Jim® Single Dolly
- Slim Jim® Double Dolly
- Slim Jim® Triple Dolly
- Slim Jim® Quadruple Dolly

RESIN DOLLY

- Slim Jim® Trainable Dolly

LIDS

- Bottles and Cans Lid
- Paper Lid
- Mixed Recycling Lid
- Hinged Lid
- Swing Lid

SLIM JIM® CONTAINERS



23-Gallon Slim Jim® Container



16-Gallon Slim Jim® Container

SLIM JIM® CONTAINERS

SKU #	DESCRIPTION	COLOR	CAPACITY		LENGTH		WIDTH		HEIGHT		PACK SIZE
			GAL	L	IN	CM	IN	CM	IN	CM	
1971258	SLIM JIM® CONTAINER	GRAY	16	61	22"	55.88	11"	27.94	25"	63.50	4
1955959	SLIM JIM® CONTAINER	BLACK	16	61	22"	55.88	11"	27.94	25"	63.50	4
1971259	SLIM JIM® CONTAINER	BEIGE	16	61	22"	55.88	11"	27.94	25"	63.50	4
1956181	SLIM JIM® CONTAINER	BROWN	16	61	22"	55.88	11"	27.94	25"	63.50	4
1971257	SLIM JIM® CONTAINER	BLUE	16	61	22"	55.88	11"	27.94	25"	63.50	4
1955960	SLIM JIM® CONTAINER	GREEN	16	61	22"	55.88	11"	27.94	25"	63.50	4
FG354060GRAY	SLIM JIM® CONTAINER	GRAY	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354060BLA	SLIM JIM® CONTAINER	BLACK	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354060BEIG	SLIM JIM® CONTAINER	BEIGE	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956187	SLIM JIM® CONTAINER	BROWN	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956185	SLIM JIM® CONTAINER	BLUE	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956186	SLIM JIM® CONTAINER	GREEN	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956188	SLIM JIM® CONTAINER	YELLOW	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956189	SLIM JIM® CONTAINER	RED	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354007BLUE	SLIM JIM® CONTAINER	BLUE (RECYCLING)	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354007GRN	SLIM JIM® CONTAINER	GREEN (RECYCLING)	23	87	22"	55.88	11"	27.94	30"	76.20	4



Convenience Receptacle

N.I.C. (Not in Contract)

This item is not in the Foodservice Equipment Contract

Item to be provided by:

- Vendor
- Owner
- General Contractor
- Millwork
- Other

Notes:

Kitchen Equipment Contractor (KEC) to coordinate the final location of this item

KEC to verify final equipment selection with the Owner and coordinate the utility requirements with the MEP Engineer

Refer to the foodservice and architectural plans for item location

Convenience Receptacle

N.I.C. (Not in Contract)

This item is not in the Foodservice Equipment Contract

Item to be provided by:

- Vendor
- Owner
- General Contractor
- Millwork
- Other

Notes:

Kitchen Equipment Contractor (KEC) to coordinate the final location of this item

KEC to verify final equipment selection with the Owner and coordinate the utility requirements with the MEP Engineer

Refer to the foodservice and architectural plans for item location

APPENDIX B

AUDIOVISUAL EQUIPMENT

Audiovisual Systems Summary										March 10, 2025	
Project Name: Cornell King Shaw											
Project Location: Cornell University, Ithaca, NY 14853											
BID PREPARED BY: CONTRACTOR TO INSERT LOGO/NAME HERE											
Notes: 1. This equipment list specifies major systems components and equipment, and should not be interpreted as a "bill of materials". This list may not detail all equipment required for complete, working systems. It is the AV Systems Contractor's responsibility to provide complete, working systems regardless of the completeness of this list. When other bid documents identify the need for additional equipment, the AV Systems Contractor shall be responsible for identifying such equipment either as separate line items or as part of the miscellaneous line item. 2. No formulas are being provided with this workbook. It is the AV Systems Contractor's responsibility to create and confirm any formulas in the excel workbook prior to submitting bid documents. Cost discrepancies as a result of excel formula errors or omissions will be the responsibility of the AV Systems Contractor. 3. All device colors, accessory options and display/screen sizes and projector lenses are to be confirmed with Consultant and Architect prior to ordering.											
System	Room Number	Equipment	Non-Equipment Cost	Taxes	Cost per Room	Qty	Total System Cost	Contractor System Notes or Exclusions			
Meeting Rm 221	221	\$0	\$0	\$0	\$0	1	\$0				
Café	231	\$0	\$0	\$0	\$0	1	\$0				
Huddle Room	323A	\$0	\$0	\$0	\$0	1	\$0				
Digital Signage	225J,223, 30044	\$0	\$0	\$0	\$0	3	\$0				
Large Conference Room	425	\$0	\$0	\$0	\$0	1	\$0				
Multipurpose Room	525	\$0	\$0	\$0	\$0	1	\$0				
Small Conference Room	225H,423A	\$0	\$0	\$0	\$0	2	\$0				
Medium Conference Room	321A, 325B, 421B	\$0	\$0	\$0	\$0	3	\$0				
Dean's Office	421A	\$0	\$0	\$0	\$0	1	\$0				
							Equipment Total	\$0.00			
							Non Equipment Total	\$0.00			
							System Total	\$0.00			
							Taxes Total	\$0.00			
							AV Project Total	\$0.00			
										SERVICE CONTRACT FOR YEAR 2	\$0.00
										SERVICE CONTRACT FOR YEAR 3	\$0.00
										EMERGENCY SERVICE HOURLY RATE	\$0.00
										IN SHOP REPAIR HOURLY RATE	\$0.00



Meeting Rm 221								17-Mar-25
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
Video Displays								\$0.00
1	Flat Panel Display - 55"	Samsung	QB55C		1	0.00	\$ -	
2	Flat Panel Display - 85"	Samsung	QB85C		2	0.00	\$ -	
3	Display Mount	Chief	LTM1U		1	0.00	\$ -	
4	Display Mount	Chief	XTM1U		2	0.00	\$ -	
5	In-Wall Back Box	Chief	PAC526		3	0.00	\$ -	
Video Projector								\$0.00
6	Projector - 7k lm, 3LCD 1920x1200x2 with 4k enhancement, Solid-State	Epson	Pro L1070UNL	Includes standard lens	1	0.00	\$ -	
7	Projector Mount	Chief	RPMAU		1	0.00	\$ -	
8	Projector Mount - Adjustable Extension	Chief	CMSxxxxx	Verify required extension length in field prior to ordering.	1	0.00	\$ -	
9	Projector Mount - Ceiling Plate	Chief	CMA110x	Confirm finish with Architect prior to ordering.	1	0.00	\$ -	
Projection Screen								\$0.00
10	Projection Screen - 16:10 Surface Tnsd.65 X104", 123" Diag	Da-Lite	20843	10" Black drop	1	\$ -	\$ -	
Video Sources								\$0.00
11	AV Bridge	Vaddio	999-8210-000		1	0.00	\$ -	
12	PTZ camera	Panasonic	AW-HE38HKPJ		3	0.00	\$ -	
13	Blu-Ray Player	Denon	DN-500BD MKII		1	0.00	\$ -	
Video Distribution								\$0.00
14	DM NUX USB Over Network Wall Plate with Routing, Local, White	Crestron	USB-NUX-L2-1G-W		2	0.00	\$ -	
15	DM NUX USB Over Network Wall Plate with Routing, Remote, White	Crestron	USB-NUX-R2-1G-W		2	0.00	\$ -	
16	AV-Over-IP Wall Plate Encoder, 4k60, 4:2:0	Crestron	DM-NVX-E20-2G-W-T		3	0.00	\$ -	
17	DigitalMedia™ 4K60 4:4:4 HDR Network AV Encoder	Crestron	DM-NVX-E30		1	0.00	\$ -	
18	DigitalMedia™ 4K60 4:4:4 HDR Network AV Encoder Card	Crestron	DM-NVX-E30C		3	0.00	\$ -	
19	DigitalMedia™ 4K60 4:4:4 HDR Network AV Decoder	Crestron	DM-NVX-D30		6	0.00	\$ -	
20	DigitalMedia™ 4K60 4:4:4 HDR Network AV Decoder Card	Crestron	DM-NVX-D30C		1	0.00	\$ -	
21	DigitalMedia™ 4K60 4:4:4 HDR Network AV Encoder/Decoder Card	Crestron	DM-NVX-360C		1	0.00	\$ -	
22	DigitalMedia™ Card Chassis for DM-NVX-C & DMCF, 8 Slots	Crestron	DMF-CI-8		1	0.00	\$ -	
Audio System								\$0.00
23	Audio DSP - Chassis	Biamp	Server		1	0.00	\$ -	
24	Audio DSP - Dante Network Card	Biamp	DAN-1		1	0.00	\$ -	
25	Audio DSP - Input Card Analog 4ch. AEC	Biamp	SEC-4		5	0.00	\$ -	
26	Audio DSP - Output Card Analog 4ch.	Biamp	SOC-4		4	0.00	\$ -	
27	Audio DSP - POTS Interface	Biamp	STC-2		1	0.00	\$ -	
28	Audio DSP - Network Controller Card	Biamp	SNC-2		1	0.00	\$ -	



Meeting Rm 221								17-Mar-25
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
29	Audio Amplifier - 8ch. 90wpc/8ohms, 130wpc/4ohms	QSC	CX168		1	\$ -	\$ -	
30	Loudspeaker - Ceiling, Recessed	Crestron	SAROS IC6T-W-T-EACH	Must be ordered in multiples of 2	8	\$ -	\$ -	
Wired Microphones							\$0.00	
31	Ceiling mounted digitally steerable microphone array	Shure	MXA920		2	0.00	\$ -	
Assistive Listening							\$0.00	
32	Listen IR 2-Channel Transmitter / Radiator Combo unit	Listen	LT-84-01	Color selection by Architect, Wall or ceiling mount per contract documents	1	0.00	\$ -	
Control Systems							\$0.00	
33	Network Switch Gigabit 48- Port, PoE+	Cisco	CBS350-48FP-4G-NA		1	0.00	\$ -	
34	Control Processor	Crestron	CP4N		1	0.00	\$ -	
35	Touchpanel - Wired 10"	Crestron	TSW-1070		1	0.00	\$ -	
36	Touchpanel - Wired, 10", Tabletop Kit	Crestron	TSW-1070-TTK		1	0.00	\$ -	
Racks/Misc							\$0.00	
37	Equipment Rack and Accessories Per Spec	Middle Atlantic	BGR-4527	Rack is 6'-10" Tall, cannot be used on smaller spaces	1	0.00	\$ -	
38	Rack internal power management	Middle Atlantic	PD-915R-PL		1	0.00	\$ -	
39	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor		1	0.00	\$ -	
EQUIPMENT SUB-TOTAL							\$0.00	
PROJECT MANAGEMENT							\$0.00	
ENGINEERING/CAD							\$0.00	
SHOP ASSEMBLY/TESTING							\$0.00	
PROGRAMMING							\$0.00	
INSTALLATION SUPERVISION							\$0.00	
INSTALLATION (ELECTRICAL SUB-CONTRACTOR)							\$0.00	
G&A							\$0.00	
NON-EQUIPMENT SUB-TOTAL							\$0.00	
SYSTEM TOTAL							\$0.00	
Taxes							\$0.00	



Café								17-Mar-25
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
Video Displays								\$0.00
1	Flat Panel Display - 55"	Samsung	QB55C		2	0.00	\$ -	
2	Flat Panel Display - 75"	Samsung	QB75C		1	0.00	\$ -	
3	Display Mount	Chief	LTM1U		2	0.00	\$ -	
4	Display Mount	Chief	XTM1U		1	0.00	\$ -	
5	In-Wall Back Box	Chief	PAC526		3	0.00	\$ -	
Video Sources								\$0.00
6	Data Network/Channel Player	Brightsign	HD224		2	0.00	\$ -	
7	IP TV Decoder/Tuner	OFE			1	0.00	\$ -	
EQUIPMENT SUB-TOTAL								\$0.00
PROJECT MANAGEMENT								\$0.00
ENGINEERING/CAD								\$0.00
SHOP ASSEMBLY/TESTING								\$0.00
PROGRAMMING								\$0.00
INSTALLATION SUPERVISION								\$0.00
INSTALLATION (ELECTRICAL SUB-CONTRACTOR)								\$0.00
G&A								\$0.00
NON-EQUIPMENT SUB-TOTAL								\$0.00
SYSTEM TOTAL								\$0.00
Taxes								\$0.00



Huddle Room								17-Mar-25
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
Video Displays								\$0.00
1	Flat Panel Display - 43" 4K	Samsung	QB43C		1	0.00	\$ -	
2	Display Mount	Chief	MTM1U		1	0.00	\$ -	
3	In-Wall Back Box	Chief	PAC526		1	0.00	\$ -	
Video Conferencing Systems								\$0.00
4	All-In-One Video Bar	Logitech	Rally Bar Huddle		1	0.00	\$ -	
Video Distribution								\$0.00
5	4X2 Matrix Switcher with SUB Hub	Attona	AT-OME-MS42		1	0.00	\$ -	
6	HABaseT Receiver	Attona	AT-OME-ER-RX		1	0.00	\$ -	
Control Systems								\$0.00
7	PoE Injector	Cisco	SB-PWR-INJ1-NA		1	0.00	\$ -	
8	Touch Controller	Logitech	Logitech Tap		1	0.00	\$ -	
Racks/Misc								\$0.00
9	Cable Cubby 700	Extron	70-1046-08	Brushed Aluminum	1	0.00	\$ -	
10	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor		1	0.00	\$ -	
EQUIPMENT SUB-TOTAL								\$0.00
PROJECT MANAGEMENT								\$0.00
ENGINEERING/CAD								\$0.00
SHOP ASSEMBLY/TESTING								\$0.00
PROGRAMMING								\$0.00
INSTALLATION SUPERVISION								\$0.00
INSTALLATION (ELECTRICAL SUB-CONTRACTOR)								\$0.00
G&A								\$0.00
NON-EQUIPMENT SUB-TOTAL								\$0.00
SYSTEM TOTAL								\$0.00
Taxes								\$0.00



Digital Signage								17-Mar-25
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
Video Displays								\$0.00
1	Flat Panel Display - 55"	Samsung	QB55C		1	0.00	\$ -	
2	Display Mount	Chief	LTM1U		1	0.00	\$ -	
3	In-Wall Back Box	Chief	PAC526		1	0.00	\$ -	
Video Sources								\$0.00
4	Data Network/Channel Player	Brightsign	HD224		1	0.00	\$ -	
EQUIPMENT SUB-TOTAL								\$0.00
PROJECT MANAGEMENT								\$0.00
ENGINEERING/CAD								\$0.00
SHOP ASSEMBLY/TESTING								\$0.00
PROGRAMMING								\$0.00
INSTALLATION SUPERVISION								\$0.00
INSTALLATION (ELECTRICAL SUB-CONTRACTOR)								\$0.00
G&A								\$0.00
NON-EQUIPMENT SUB-TOTAL								\$0.00
SYSTEM TOTAL								\$0.00
Taxes								\$0.00



Large Conference Room								17-Mar-25
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
Video Displays								\$0.00
1	Flat Panel Display - 85"	Samsung	QB85C		1	0.00	\$ -	
2	Display Mount	Chief	XTM1U		1	0.00	\$ -	
3	In-Wall Back Box	Chief	PAC526		1	0.00	\$ -	
Video Conferencing Systems								\$0.00
4	All-In-One Video Bar	Logitech	Rally Bar		1	0.00	\$ -	
Video Distribution								\$0.00
5	4X2 Matrix Switcher with SUB Hub	Attona	AT-OME-MS42-HDBT		1	0.00	\$ -	
6	Table Hub	Logitech	Rally Table Hub		1	0.00	\$ -	
7	Display Hub	Logitech	Rally Display Hub		1	0.00	\$ -	
Audio System								\$0.00
8	Microphone Preamplifier	Extron	MP 101		1	\$ -	\$ -	
9	Modular Microphone	Logitech	Rally Mic Pod		2	0.00	\$ -	
10	Mic Pod Hub	Logitech	Rally Mic Pod Hub		1	0.00	\$ -	
11	Boundary Microphone	Shure	MX391/O		1	0.00	\$ -	
Assistive Listening								\$0.00
12	Listen IR 2-Channel Transmitter / Radiator Combo unit	Listen	LT-84-01	Color selection by Architect, Wall or ceiling mount per contract documents	1	0.00	\$ -	
Control Systems								\$0.00
13	PoE Injector	Cisco	SB-PWR-INJ1-NA		1	0.00	\$ -	
14	Touch Controller	Logitech	Logitech Tap		1	0.00	\$ -	
Racks/Misc								\$0.00
15	Cable Cubby 700	Extron	70-1046-08	Brushed Aluminum	1	0.00	\$ -	
16	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor		1	0.00	\$ -	
EQUIPMENT SUB-TOTAL								\$0.00
PROJECT MANAGEMENT								\$0.00
ENGINEERING/CAD								\$0.00
SHOP ASSEMBLY/TESTING								\$0.00
PROGRAMMING								\$0.00
INSTALLATION SUPERVISION								\$0.00
INSTALLATION (ELECTRICAL SUB-CONTRACTOR)								\$0.00
G&A								\$0.00
NON-EQUIPMENT SUB-TOTAL								\$0.00
SYSTEM TOTAL								\$0.00
Taxes								\$0.00



Multipurpose Room								17-Mar-25
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
Video Displays								\$0.00
1	Flat Panel Display - 43"	Samsung	QB43C		2	0.00	\$ -	
2	Flat Panel Display - 55"	Samsung	QB55C		1	0.00	\$ -	
3	Display Mount	Chief	MTM1U		2	0.00	\$ -	
4	Display Mount	Chief	LTM1U		1	0.00	\$ -	
5	In-Wall Back Box	Chief	PAC526		2	0.00	\$ -	
Video Projector								\$0.00
6	Projector - 7k lm, 3LCD 1920x1200x2 with 4K enhancement, Solid-State	Epson	Pro L1070UNL	Includes standard lens	2	0.00	\$ -	
7	Projector Mount	Chief	RPMAU		2	0.00	\$ -	
8	Projector Mount - Adjustable Extension	Chief	CMSxxxxx	Verify required extension length in field prior to ordering.	2	0.00	\$ -	
9	Projector Mount - Ceiling Plate	Chief	CMA110x	Confirm finish with Architect prior to ordering.	2	0.00	\$ -	
Projection Screen								\$0.00
10	Projection Screen - 16:10 Surface Tnsd.57.5" X92", 109" Diag	Da-Lite	70095	1'6-3/4" Black drop	1	0.00	\$ -	
11	Projection Screen - 16:10 Surface Tnsd.72" X116", 137" Diag	Da-Lite	70099	10" Black drop	1	0.00	\$ -	
Video Sources								\$0.00
12	AV Bridge	Vaddio	999-8210-000		1	0.00	\$ -	
13	PTZ camera	Panasonic	AW-HE38HKPJ		4	0.00	\$ -	
14	Blu-Ray Player	Denon	DN-500BD MKII		1	0.00	\$ -	
Video Distribution								\$0.00
15	AV-Over-IP Wall Plate Encoder, 4K60, 4:2:0	Crestron	DM-NVX-E20-2G-W-T		4	0.00	\$ -	
16	DigitalMedia™ 4K60 4:4:4 HDR Network AV Encoder	Crestron	DM-NVX-E30		1	0.00	\$ -	
17	DigitalMedia™ 4K60 4:4:4 HDR Network AV Encoder Card	Crestron	DM-NVX-E30C		3	0.00	\$ -	
18	DigitalMedia™ 4K60 4:4:4 HDR Network AV Decoder	Crestron	DM-NVX-D30		6	0.00	\$ -	
19	DigitalMedia™ 4K60 4:4:4 HDR Network AV Decoder Card	Crestron	DM-NVX-D30C		1	0.00	\$ -	
20	DigitalMedia™ 4K60 4:4:4 HDR Network AV Encoder/Decoder Card	Crestron	DM-NVX-360C		1	0.00	\$ -	
21	DigitalMedia™ Card Chassis for DM-NVX-C & DMCF, 8 Slots	Crestron	DMF-CI-8		1	0.00	\$ -	
Audio System								\$0.00
22	Audio DSP - Chassis	Biamp	Server		1	0.00	\$ -	
23	Audio DSP - Dante Network Card	Biamp	DAN-1		1	0.00	\$ -	
24	Audio DSP - Input Card Analog 4ch. AEC	Biamp	SEC-4		6	0.00	\$ -	
25	Audio DSP - Output Card Analog 4ch.	Biamp	SOC-4		4	0.00	\$ -	
26	Audio DSP - POTS Interface	Biamp	STC-2		1	0.00	\$ -	
27	Audio DSP - Network Controller card	Biamp	SNC-2		1	0.00	\$ -	
28	Audio Amplifier - 2ch. 70v 200wpc	QSC	CX302V		1	\$ -	\$ -	
29	Audio Amplifier - 8ch. 90wpc/8ohms, 130wpc/4ohms	QSC	CX168		1	\$ -	\$ -	



Multipurpose Room								17-Mar-25
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
30	Loudspeaker - Ceiling, Recessed, Low Profile	QSC	AC-C4T-LP		8	0.00	\$ -	
Wired Microphones							\$0.00	
31	Microphone - ceiling	Biamp	Parle TCM-X		3	0.00	\$ -	
32	Microphone - ceiling	Biamp	Parle TCM-XEX		2	0.00	\$ -	
Wireless Microphones							\$0.00	
33	Quad Channel wireless microphone receiver	Shure	ULXD4Q		2	0.00	\$ -	
34	Wireless bodypack transmitter	Shure	ULXD1		4	0.00	\$ -	
35	Handheld Wireless Microphone Transmitter	Shure	ULXD2/B58		4	0.00	\$ -	
36	Laveliere microphone for bodpack transmitter	Shure	WL183	Provide model with correct connector for bodypack transmitter	4	0.00	\$ -	
37	In-Line Antenna Amplifier for remote mounting	Shure	US834	provide model with appropriate frequency spectrum	2	0.00	\$ -	
38	2-Bay Networked Docking Charger	Shure	SBC220		4	0.00	\$ -	
Assistive Listening							\$0.00	
39	Listen IR 2-Channel Transmitter / Radiator Combo unit	Listen	LT-84-01	Color selection by Architect, Wall or ceiling mount per contract documents	2	0.00	\$ -	
Control Systems							\$0.00	
40	Network Switch Gigabit 48-Port, PoE+	Cisco	CBS350-48FP-4G-NA		1	0.00	\$ -	
41	Network Switch Gigabit 5-Port, PoE+	Biamp	TESIRACONNECT TC-5		1	0.00	\$ -	
42	Control Processor	Crestron	CP4N		1	0.00	\$ -	
43	Touchpanel - Wired 10"	Crestron	TSW-1070		1	0.00	\$ -	
44	Touchpanel - Wired, 10", Tabletop Kit	Crestron	TSW-1070-TTK		1	0.00	\$ -	
45	Camera Controller	PTZOptics	PT-Joy-G4		1	0.00	\$ -	
Racks/Misc							\$0.00	
46	Equipment Rack and Accessories Per Spec	Middle Atlantic	BGR-4527	Rack is 6'-10" Tall, cannot be used on smaller spaces	1	0.00	\$ -	
47	Rack internal power management	Middle Atlantic	PD-915R-PL		1	0.00	\$ -	
48	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor		1	0.00	\$ -	
EQUIPMENT SUB-TOTAL							\$0.00	
PROJECT MANAGEMENT							\$0.00	
ENGINEERING/CAD							\$0.00	
SHOP ASSEMBLY/TESTING							\$0.00	
PROGRAMMING							\$0.00	
INSTALLATION SUPERVISION							\$0.00	
INSTALLATION (ELECTRICAL SUB-CONTRACTOR)							\$0.00	
G&A							\$0.00	
NON-EQUIPMENT SUB-TOTAL							\$0.00	
SYSTEM TOTAL							\$0.00	
Taxes							\$0.00	



Small Conference Room								17-Mar-25
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
Video Displays								\$0.00
1	Flat Panel Display - 55" 4K	Samsung	QB55C		1	0.00	\$ -	
2	Display Mount	Chief	LTM1U		1	0.00	\$ -	
3	In-Wall Back Box	Chief	PAC526		1	0.00	\$ -	
Video Conferencing Systems								\$0.00
4	All-In-One Video Bar	Logitech	Rally Bar Huddle		1	0.00	\$ -	
Video Distribution								\$0.00
5	4X2 Matrix Switcher with SUB Hub	Attona	AT-OME-MS42-HDBT		1	0.00	\$ -	
6	HABaseT Receiver	Attona	AT-OME-ER-RX		1	0.00	\$ -	
Control Systems								\$0.00
7	PoE Injector	Cisco	SB-PWR-INJ1-NA		1	0.00	\$ -	
8	Touch Controller	Logitech	Logitech Tap		1	0.00	\$ -	
Racks/Misc								\$0.00
9	Cable Cubby 700	Extron	70-1046-08	Brushed Aluminum	1	0.00	\$ -	
10	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor		1	0.00	\$ -	
EQUIPMENT SUB-TOTAL								\$0.00
PROJECT MANAGEMENT								\$0.00
ENGINEERING/CAD								\$0.00
SHOP ASSEMBLY/TESTING								\$0.00
PROGRAMMING								\$0.00
INSTALLATION SUPERVISION								\$0.00
INSTALLATION (ELECTRICAL SUB-CONTRACTOR)								\$0.00
G&A								\$0.00
NON-EQUIPMENT SUB-TOTAL								\$0.00
SYSTEM TOTAL								\$0.00
Taxes								\$0.00



Medium Conference Room								17-Mar-25
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
Video Displays								\$0.00
1	Flat Panel Display - 55" 4K	Samsung	QB55C		1	0.00	\$ -	
2	Display Mount	Chief	LTM1U		1	0.00	\$ -	
3	In-Wall Back Box	Chief	PAC526		1	0.00	\$ -	
Video Conferencing Systems								\$0.00
4	All-In-One Video Bar	Logitech	Rally Bar Mini		1	0.00	\$ -	
Video Distribution								\$0.00
5	4X2 Matrix Switcher with SUB Hub	Attona	AT-OME-MS42-HDMT		1	0.00	\$ -	
6	HDBaseT Receiver	Attona	AT-OME-ER-RX		1	0.00	\$ -	
Control Systems								\$0.00
7	PoE Injector	Cisco	SB-PWR-INJ1-NA		1	0.00	\$ -	
8	Touch Controller	Logitech	Logitech Tap		1	0.00	\$ -	
Racks/Misc								\$0.00
9	Cable Cubby 700	Extron	70-1046-08	Brushed Aluminum	1	0.00	\$ -	
10	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor		1	0.00	\$ -	
EQUIPMENT SUB-TOTAL								\$0.00
PROJECT MANAGEMENT								\$0.00
ENGINEERING/CAD								\$0.00
SHOP ASSEMBLY/TESTING								\$0.00
PROGRAMMING								\$0.00
INSTALLATION SUPERVISION								\$0.00
INSTALLATION (ELECTRICAL SUB-CONTRACTOR)								\$0.00
G&A								\$0.00
NON-EQUIPMENT SUB-TOTAL								\$0.00
SYSTEM TOTAL								\$0.00
Taxes								\$0.00

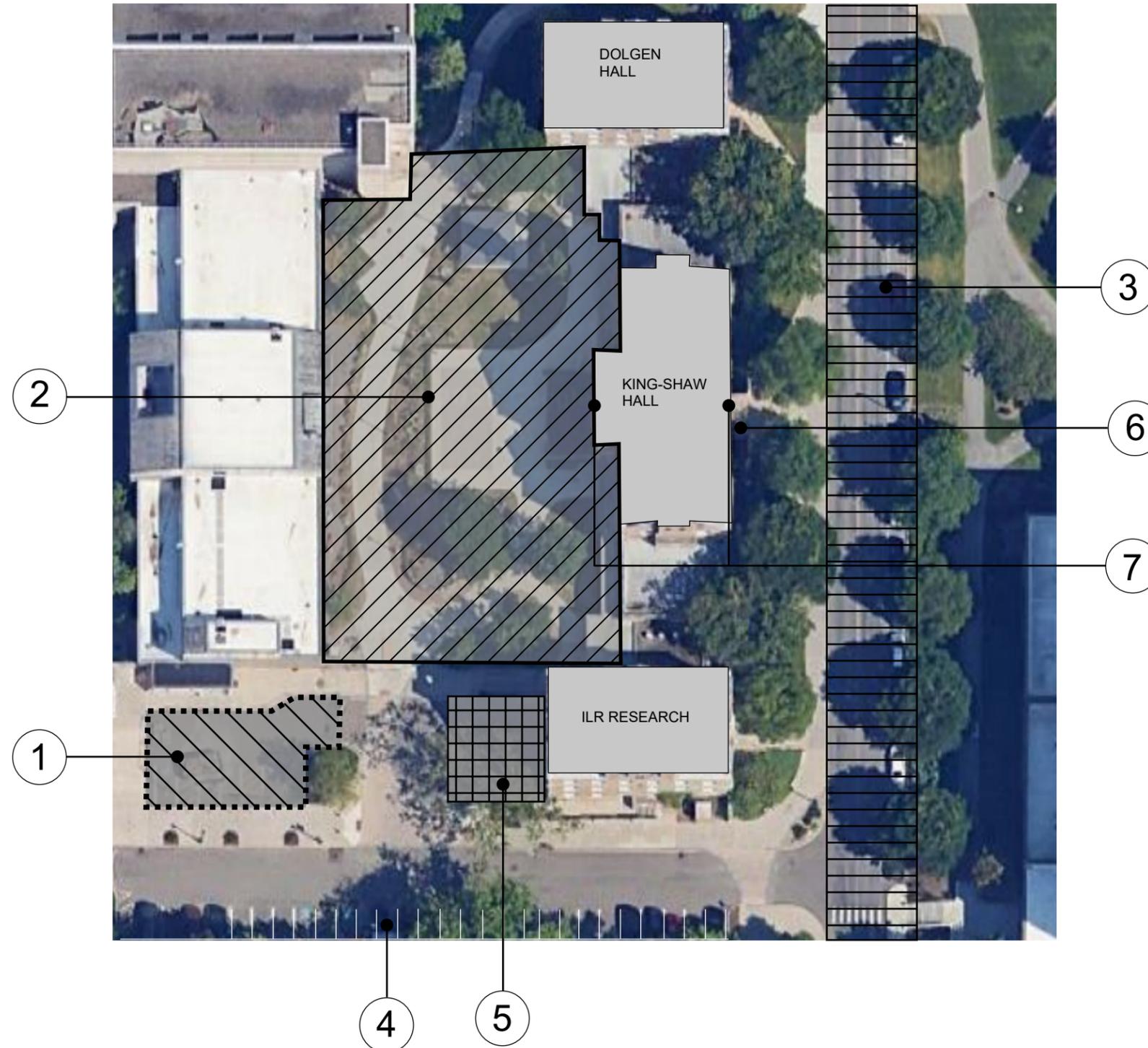


Dean's Office								17-Mar-25
ITEM	DESCRIPTION	MFR	MODEL	Notes	QTY	UNIT COST	EXT. COST	
Video Displays								\$0.00
1	Flat Panel Display - 55" 4K	Samsung	QB55C		1	0.00	\$ -	
2	Display Mount	Chief	LTM1U		1	0.00	\$ -	
3	In-Wall Back Box	Chief	PAC526		1	0.00	\$ -	
Video Conferencing Systems								\$0.00
4	All-In-One Video Bar	Logitech	Rally Bar Mini		1	0.00	\$ -	
Video Distribution								\$0.00
5	4X2 Matrix Switcher with SUB Hub	Attona	AT-OME-MS42-HDMT		1	0.00	\$ -	
6	HDBaseT Transmitter	Attona	AT-OME-ER-TX		1	0.00	\$ -	
7	HDBaseT Receiver	Attona	AT-OME-ER-RX		1	0.00	\$ -	
Control Systems								\$0.00
8	PoE Injector	Cisco	SB-PWR-INJ1-NA		1	0.00	\$ -	
9	Touch Controller	Logitech	Logitech Tap		1	0.00	\$ -	
Racks/Misc								\$0.00
10	Cable Cubby 700	Extron	70-1046-08	Brushed Aluminum	1	0.00	\$ -	
11	Misc. Plates, Panels, Cables, Connectors, Terminations, etc..	By AV Contractor	By AV Contractor		1	0.00	\$ -	
EQUIPMENT SUB-TOTAL								\$0.00
PROJECT MANAGEMENT								\$0.00
ENGINEERING/CAD								\$0.00
SHOP ASSEMBLY/TESTING								\$0.00
PROGRAMMING								\$0.00
INSTALLATION SUPERVISION								\$0.00
INSTALLATION (ELECTRICAL SUB-CONTRACTOR)								\$0.00
G&A								\$0.00
NON-EQUIPMENT SUB-TOTAL								\$0.00
SYSTEM TOTAL								\$0.00
Taxes								\$0.00

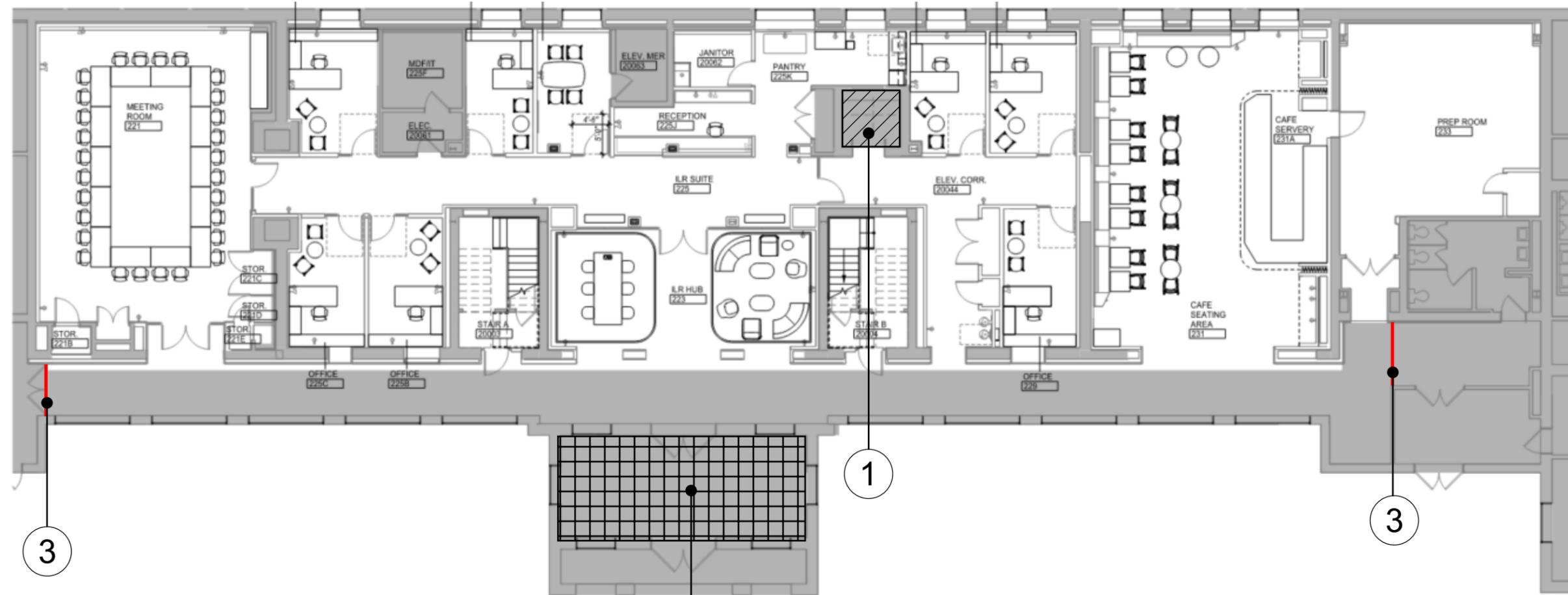
RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL

NOTES:

- 1 MATERIAL LAY DOWN**
 THE EXISTING PAVED LOT, IS DESIGNATED FOR MATERIAL LAY DOWN, EQUIPMENT PARKING AND DUMPSTERS. THE AREA SHALL BE ENCLOSED BY A 6-FOOT-TALL FENCE COVERED WITH FABRIC TO OBSTRUCT DIRECT VIEW INSIDE. FENCING SHALL NOT OBSTRUCT SIDEWALKS. THIS SHALL NOT BE USED FOR CONTRACTOR PARKING.
- 2 HEAVY EQUIPMENT RESTRICTION**
 HEAVY EQUIPMENT IS PROHIBITED IN PATIO AREA. ANY MATERIAL AND EQUIPMENT OVER 1,000 LBS BEING DELIEVERED MUST BE COORDINATED WITH THE CORNELL REPRESENTATIVE AND THE BUILDING MANAGER. CONCRETE PATHWAY AND PATIO MUST BE PROTECTED WHEN MATERIAL ARE DELIEVERED TO THE WEST ENTRANCE. PATIO AREA SHALL NOT BE USED FOR ANY STAGING AND SHALL REMAIN OPEN TO THE PUBLIC.
- 3 FIRE TRUCK ACCESS**
 ACCESS ALONG GARDEN AVENUE SHALL REMAIN UNOBSTRUCTED ON THE EAST SIDE OF KING-SHAW HALL. THE UNOBSTRCTED LANE SHALL MAINTAIN A MINIMUM WIDTH OF 26 FEET.
- 4 EXISTING PARKING SPACES**
 THE EXISTING PARKING SPACES SHALL REMAIN ACCESSIBLE TO THE PUBLIC UNLESS OTHERWISE APPROVED BY THE CORNELL REPRESENTATIVE.
- 5 LOADING DOCK**
 ACCESS AT LOADING DOCK SHALL REMAIN UNOBSTRCTED. ENTRANCE AT LOADING DOCK IS NOT AVAILABLE FOR PROJECT SPECIFIC DELIVERIES
- 6 FDC**
 ACCESS TO ANY FIRE DEPARTMENT CONNECTIONS SHALL REMAIN ACCESSIBLE AT ALL TIME.
- 7 PROTECTION AT ENTRANCES**
 BOTH THE EAST AND WEST ENTRANCES SHALL HAVE PROPER SIGNAGE IDENTIFYING KING-SHAW AS A CONSTRUCTION ZONE. SIGNAGE SHALL BE VISIBLE FROM THE EXTERIOR OF THE BUILDING, PRIOR TO ENTERING THE WORK SPACE.



RENOVATE 2ND - 5TH FLOOR AT KING-SHAW HALL



NOTES:

- 1 ELEVATORS**
 USE OF THE ELEVATOR IS PROHIBITED. MATERIALS SHALL BE LOADED THROUGH THE ENTRANCE ON THE SECOND FLOOR, ENTRANCE ON THE THIRD FLOOR OR THROUGH AN EXTERIOR WINDOW. PRIOR TO THE START OF CONSTRUCTION, THE ELEVATOR SHALL BE LOCKED OUT FOR THE DURATION OF THE PROJECT.
- 2 CONTRACTOR OFFICE SPACE**
 THE VESTIBULE MAY BE USED AS A CONSTRUCTION OFFICE DURING THE CONSTRUCTION PHASE AND SHALL BE RETURNED TO ITS ORIGINAL CONDITION AT THE END OF THE PROJECT. FLOOR PROTECTION SHALL BE UTILIZED AND MAINTAINED THROUGHOUT THE DURATION OF THE PROJECT.
- 3 TEMPORARY WALLS**
 A FULL HEIGHT PARTITION SHALL BE INSTALLED TO SEPARATE THE AREA OF WORK FROM DOLGEN HALL AND ILR RESEARCH. ANY DAMAGE FROM TEMPORARY WALLS SHALL BE REPAIRED AND RETURNED TO ITS ORIGINAL CONDITION BY CONTRACTOR AT THE END OF THE PROJECT. ANY EXIT SIGNS DIRECTING TO THE AREA OF WORK FROM DOLGEN HALL AND ILR RESEARCH SHALL BE TEMPORARILY COVERED FOR THE DURATION OF THE PROJECT.

Appendix E – Owner Furnished Contractor Installed List

Interior Finishes

1. **UF-1** Upholstery Fabric Angles by Paul Smith in 02 Jasper with Food & Beverage repellent Finish – refer to specification section 06 40 23
2. **UF-2** Upholstery Fabric Lariat in 51 Requiem – refer to specification section 06 40 23
3. **3D-TP** Textured Wall Paneling MARE in Matte White – refer to specification section 06 83 00
4. **CT-1a** Ceramic Tile Enigma in Graphite – refer to specification section 09 30 00
5. **CT1a** Ceramic Tile Enigma in Light Gray – refer to specification section 09 30 00
6. **F1.1A** – Carpet Open Air 418 Stria in Natural with Red and Smoke Accents – refer to specification section 09 84 13
7. **F1.1B** – Carpet Open Air 418 Stria in Oat with Red and Smoke Accents – refer to specification section 09 84 13
8. **F1.2** – Carpet Open Air 418 Stria in Granite with Red and Smoke Accents – refer to specification section 09 84 13
9. **F1.3** – Carpet Open Air 418 Stria in Red – refer to specification section 09 84 13

Lighting Fixtures

1. **L8** – Decorative Pendant Light Fixture Louis Poulsen DOO-WOP – refer to specification section 26 51 10
2. **L9** – Decorative Pendant Light Fixture Louis Poulsen PH 6 ½ - 6 – refer to specification section 26 51 10
3. **L10** – Decorative Pendant Light Fixture Lightnet 1M-P1-A-XXX-D-9-35-M-D700-XXX-XXXX – refer to specification section 26 51 10
4. **L11** – Decorative Pendant Light Fixture Lightnet 1M-P1-A-XXX-D-9-35-M-D400-XXX-XXXX – refer to specification section 26 51 10
5. **L12** – Decorative Pendant Light Fixture Louis Poulsen PH 5 – refer to specification section 26 51 10
6. **L13** – Decorative Pendant Light Fixture Focal Point FSS2BS-DCFL-500DN-250UP-935K-2C-UNV-L22-XXX-WH-XXX-XXX-XXX – refer to specification section 26 51 10
7. **L14** – Surface Cove Uplight Light Fixture I2SYSTEMS CS-09W-35K-H-WF-V-STRAIGHT – refer to specification section 26 51 10
8. **L21** – Surface Asymmetric Uplight Light Fixture SPI Lighting CM2-SL-AD1-XXX-XXX-XXX-90S17A-35-25-CA-4-XXX – refer to specification section 26 51 10
9. **L23** – Surface Mounted Linear Uplight Light Fixture Boca Lighting NANOLUME HD-10W-3500K-XXX-A-FS-HD-N-SD – refer to specification section 26 51 10
10. **L23A** – Surface Mounted Linear Uplight Light Fixture Boca Lighting NANOLUME HD-10W-3500K-XXX-A-FS-HD-N-SD – refer to specification section 26 51 10
11. **L26** – Wall-Mounted Task Light Extant Lighting HTG-1W-TD-DT-8FT-DML-MEOGC-35-UV-D-XXX-SW – refer to specification section 26 51 10