

# **WARD CENTER RENOVATION NEW YORK CONSORTIUM FOR SPACE TECHNOLOGY (NYCST)**

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**Project Manual & Specifications**

**March 7, 2025**

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**Owner**

**Cornell University  
Ithaca, New York 14853**

**Architect**

**Richard McElhiney Architects LLC  
450 Seventh Avenue, Suite 2701  
New York, New York 10123**



Instructions to Bidders

Bid Proposal Certification Form

General Conditions and Exhibits

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|       |                                                             |
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END OF DOCUMENT



## INSTRUCTIONS TO BIDDERS

Project: Ward Center Renovation New York Consortium For Space Technology (NYCST)

Owner: Cornell University  
Ithaca, New York 14853

Architect: Richard McElhiney Architects LLC  
450 Seventh Avenue, Suite 2701  
New York, New York 10123

### 1. BID DOCUMENTS

The Bid Documents provided electronically by the Owner will consist of the following:

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

Bid Documents are available electronically in the Owner's electronic project management Bid Portal under the Bid Package Invitation – Invitation Documents Tab.

Dataflow, Inc. maintains the current set of Documents and all addenda and is the contracted supplier for printed plans and specifications for this project. Contact Dataflow at [CUProjects@goDataflow.com](mailto:CUProjects@goDataflow.com).

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## 2. EXAMINATION OF SITE AND CONTRACT DOCUMENTS

- a. Each Bidder shall acquaint themselves with location conditions as they exist, as well as the character of the necessary work to be carried out under the proposed Contract. A Pre-Bid Zoom meeting will be scheduled and include: a review of project related information, an opportunity to ask and receive responses to Bidder questions, and make such inquiries as are necessary to fully understand the subject facilities, physical conditions and/or restrictions attendant to the work under the Contract.
- b. 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.
- c. Each Bidder shall also thoroughly examine and become familiar with the Drawings, Specifications and associated Bid Documents.
- d. By submitting a Bid, the Bidder covenants and affirms that the Bidder has carefully examined all of the Bid Documents including Drawings, Specifications, and the Addenda and Bulletins, if any, as well as posed any questions associated with the Site, and that Bidder is satisfied 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.

## 3. DISCREPANCIES

- a. Should a Bidder find discrepancies in or omissions from the Drawings, Specifications and associated Bid Documents, or be in doubt as to their meaning, Bidder shall at once enter the item in the Q&A Board of the Owner's electronic management Bid Portal and an Addenda with written instructions will be sent to all bidders. Neither the Owner nor the Architect will be responsible for oral instructions. Every request for such interpretation should be in writing and entered into the electronic project management Bid Portal Q&A Board. Inquiries received in advance of the deadline established at the Pre-Bid conference will be given consideration.



#### 4. PRE-BID CONFERENCE

- a. A pre-bid conference has been scheduled for 10:00AM, January 20, 2026, in Room 133 of Humphreys Service Building or via Zoom at:

<https://cornell.zoom.us/j/99831638258?pwd=fqHZiCADAx8ATsit0Dgg3CdGFHscfj.1&from=addon>

A Pre-bid walkthrough will follow and will meet at Ward Center Lobby, 135 Hollister Drive, Ithaca.

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.

#### 5. ASSUMPTION OF RISK

Contractors/Subcontractors 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 walkthrough or similar activity constitutes acceptance of risk assumption.

#### 6. BID SUBMISSION

Bid Submissions must include the following:

- a. Base Bid entered into the electronic project management Portal broken down per the Bid Scope Tab Schedule of Values (Step 1: Bid Form of the Response Form tab).
- b. Additional Required Information:
1. Bid Proposal Certification Form
  2. Bid Bond
  3. Bond Surety Company
  4. Bonding Rate for Change Orders
  5. Proposed Project Team and Resumes
  6. Proposed Project Schedule
  7. Substitutions





- c. Bid Proposal Certification Form: The Bid Proposal Certification Form shall be signed by the Principal(s) or Officer(s) legally authorized to bind the Bidder, and to execute such documents on behalf of their respective firms or organizations, and the Certificates included in the Bid Proposal Certification Form shall be completed accordingly. Bidder's legal name should be fully and accurately stated. Completed form shall be without interlineation, alterations, or erasures unless initialed and dated by the signer; Owner expressly reserves the right to accept or reject any or all bids, and to waive irregularities or informalities in its sole and reasonable discretion.
  - d. Bid Bond: Each Bidder will be required to furnish a Bid Bond electronically via the electronic project management Bid Portal in the amount of 10% of the Bid Amount. Such Bid Bond 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 13 below.
7. SALES AND USE TAX EXEMPTION
- a. The Owner, Cornell University, a non-profit educational institution, is exempt from payment of certain Sales and Use Taxes.
8. FEDERAL EXCISE TAX
- a. The Owner, Cornell University, a non-profit educational institution, is exempt from payment of certain Federal Excise Taxes.
9. 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.
10. 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.
11. 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 electronic project management Bid Portal Bid Scope form, the Bidder shall list all portions of the work he proposes to perform directly with his 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 is required as part of the Proposal.
- d. In the Bid Scope Tab in the electronic project management Bid Portal, a list of 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.

## 12. UNIT PRICES

The Bidder agrees, if awarded the Contract, to perform work "In addition to" or "deducted from" the scope of the Contract Documents as directed by the Owner and/or Architect, computed in accordance with the unit prices, which prices include all overhead, profit and other expense items in connection therewith, subject to the terms of the Contract Documents.

- a. Certain Unit Prices may be requested. If requested, a form will be attached to these instructions and will need to be completed and uploaded to the electronic project management Bidding Portal Response Form – Step 3 – Additional Required Information Custom Fields. All Bidders are required to bid on all Unit Prices without exception.
- b. All unit prices include the installation or omission, complete for each item, together with all work in connection therewith and shall include all shoring, bracing, dewatering and other incidental work.
- c. Unit prices shall be the total compensation for the item and includes all overhead, profit and any other charges of the Contractor and/or subcontractor in connection therewith.
- d. Adjustments will be computed on net variation of total quantities of like items.
- e. The Owner reserves the right to accept or reject any or all of the unit prices listed below prior to the execution of the Contract.

## 13. 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, are to be entered into the electronic project management Bid Portal Response Form – Step 3 – Additional Required Information Custom Fields by listing each proposed substitution, together with the amount to be deducted from the Base Bid if the substitution is accepted on the form supplied with these instructions. However, the Bidder is cautioned to make his base proposal on the materials and items specified by name or other particular reference.

## 14. ALTERNATE PROPOSALS

- a. Certain Alternate Proposals may be requested by the Owner and are included in the General Requirements. They will be listed in the Bid Scope Tab in the electronic project management Bid Portal. All Bidders are required to bid on all Alternates without exception.



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

15. METHOD OF SUBMISSION

- a. Base Bid shall be prepared and electronically submitted via the electronic project management Bid Portal. All required fields and attachments in the electronic project management Bid Portal must be completed.
- b. Bid Proposal Certification Form shall be prepared electronically submitted as an attachment via the electronic project management Bid Portal Response Form – Step 3 – Additional Required Information Custom Fields.
- c. Completed and responsive Bid Proposals shall be submitted through the electronic project management Bid Portal no later than **2:00PM on February 5, 2026**.
- d. Bid Proposals shall not contain any recapitulation of the work to be done. No oral, written, electronic or telephonic proposals, or modifications will be considered.

16. BID OPENING

- a. Completed and responsive Bid Proposals will be opened electronically via the electronic project management Bid Portal. Responsive Bid results will be posted to the Facilities Contracts website at: <https://fcs.cornell.edu/awarded-projects..> 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.

17. 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 provided in accordance with the Contract.
- b. Award of the Contract shall be made to the bidder submitting the lowest responsive and responsible base bid who, in the opinion of the Owner, is qualified to perform the work. The competence and responsibility of the Bidders' proposed principal subcontractors will be considered in making the Award.
- c. The Owner reserves the right to reject any or all Proposals, and to waive any informalities in Bidding. Contract award shall be subject to approval of Cornell University's Contractors Qualification Statement.
- d. Bidder expressly warrants and commits that its Proposal shall remain unchanged and in full force and effect at the Owner's option for a period of not less than ninety (90) calendar days following the bid opening date.
- e. Bidders may submit, recall, modify, resubmit or withdraw their Bids through the electronic project management Bid Portal up until the Bid Due Date and Time.
- f. The Owner reserves the right to accept any of the Alternate Proposals listed within forty five (45) calendar days following the award of a construction contract or such other time as may be agreed to by the Owner and Contractor.

18. SCHEDULE OF VALUES



- a. 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.

19. PERFORMANCE AND LABOR AND MATERIALS PAYMENT BONDS

Prior to commencement of on-site construction activities, 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. Each of these Bonds are to be in a form with such sureties as the Owner may approve. The cost of such bonds shall be included in the Bidders Proposal.

20. START OF WORK

- a. Work at the site shall be started within fourteen (14) calendar days from the date of issuance of written authorization to proceed and shall achieve substantial completion of the project no later than August 31, 2026.
  - 1. NOTE: Prior to commencement of any on-site construction activities, the successful Bidder shall:
    - i. Furnish the Owner with fully executed and satisfactory Payment and Performance bonds. No on-site construction activities may commence until executed and satisfactory bonds are in place for the subject project.
    - ii. Furnish the Owner with safety plan related to COVID-19 pandemic.
- b. The construction schedule and completion are critical. The Contractor shall provide adequate labor and equipment in the Bid to ensure that no slippage of the schedule will occur.

21. ADDENDA AND BULLETINS

- a. Bidders must acknowledge in Step 3 of the Bid Response in the electronic project management Bid Portal each Addendum and/or Bulletin issued during the bidding period.

22. REQUIRED POST-AWARD SUBMISSIONS BY THE APPARENT LOW BIDDER

- a. Within fourteen days after bid opening:
  - (1) Six-Month Workforce Projection
- b. Upon Execution of Contract:
  - (1) Insurance Certificate
  - (2) Performance Bond
  - (3) Labor and Material Payment Bond
  - (4) Schedule of Work (bar chart)
  - (5) Federal Tax Identification Number

END OF SECTION





WARD CENTER RENOVATION NEW YORK CONSORTIUM FOR SPACE TECHNOLOGY  
(NYCST)

Cornell University, Ithaca, New York

BID PROPOSAL CERTIFICATION FORM

|                                                    |  |
|----------------------------------------------------|--|
| Vendor Name:                                       |  |
| Type of Firm, State of Incorporation if Applicable |  |
| Street Address, City, State, Zip                   |  |

Having carefully examined the Instructions to Bidders, the "Conditions of the Contract" (General, Division 1 - "General Requirements"), Supplemental Conditions, the Drawings, Specifications and associated Bid Documents dated March 7, 2025, as prepared by Richard McElhiney Architects LLC, 450 7<sup>th</sup> Avenue, Suite 2701, New York, New York 10123, 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.

1. Receipt of the Addenda to the Terms and Conditions, Drawings or Specifications has been acknowledged in the Owner's electronic project management Bid Portal.

2. Milestone Dates

a. The undersigned agrees, if awarded the Contract, to commence work at the site within fourteen (14) calendar days after date of issuance of written notice to proceed and to achieve substantial completion of the project no later than August 31, 2026.

b. The Contractor shall provide adequate labor and equipment in the Bid to ensure that no slippage of the schedule will occur. Contractor shall attach a Project Duration Schedule to this form that meets the duration established.

c. Following are additional Milestone Dates:

|  |
|--|
|  |
|--|



- d. The undersigned agrees, if awarded the Contract, to furnish a "Construction Progress Schedule" consistent with the agreed upon Construction Duration 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. Such schedule shall be in conformance with General Requirements, Section 01 32 16, 1.3, A.

### 3. Proposed Principal Subcontractors

- a. The undersigned agrees, if awarded the Contract, to employ subcontractors from the list submitted in the electronic project management Bid Portal Response Form – Step 3 – Additional Required Information Custom Fields subject to the following provisions:
  - i. The Owner and Architect reserve the right to review the list of "Proposed Principal Subcontractors" prior to the award of the Contract, 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.

### 4. Contractor Team:

- a. The Owner reserves the right to reject the names of any Project Manager or Superintendent provide in the electronic project management Bid Portal submission to whom they have a reasonable objection.

### 5. Bonds

- a. Bid Bond. A Bid Bond in the amount of a minimum of 10% of Bid Amount is attached to the electronic project management Bid Portal Response Form – Step 3 – Additional Required Information Custom Fields.
- b. Performance and Payment Bonds. Prior to commencement of any on-site construction activities, the undersigned expressly agrees if awarded the Contract, to deliver to Owner executed "Performance" and "Labor and Material Payment Bonds" in such forms as are acceptable to the Owner and in an amount equal to 100% of the Contract Sum.
- c. Such bonds will be furnished by the Surety entered into the electronic project management Bid Portal Response Form – Step 3 – Additional Required Information Custom Fields
- d. Bonding Rate for Change Orders has been entered into the electronic project management Bid Portal Response Form – Step 3 – Additional Required Information Custom Fields

### 6. Bid Scope - 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 to the total Contract Sum submitted in the electronic project management Bid Portal.



## 7. Substitutions

- a. The Base Bid is predicated on compliance with the Drawings and Specifications without substitutions.
- b. The Bidder may offer substitutions for any item noted in the Specifications, with the exception of Form of Contract, General Conditions and General Requirements - Division 1.
- c. Any Substitutions are to be entered into the electronic project management Bid Portal Response Form – Step 3 – Additional Required Information Custom Fields by listing each proposed substitution, together with the amount to be deducted from the Base Bid if the substitution is accepted.
- d. The Owner reserves the right to accept or reject any proposed substitution.
- e. The sum stated includes any modifications of work or additional work that may be required by reason of acceptance of substitution. Substitute materials must be approved and accepted by the Owner in writing before same may be used in lieu of those named in the Specifications.

## 8. Unit Price Schedule

- a. The undersigned agrees, if awarded the Contract, to perform work "In addition to" or "deducted from" the scope of the Contract Documents as directed by the Owner and/or Architect, computed in accordance with the unit prices form uploaded in the electronic project management Bid Portal Response Form – Step 3 – Additional Required Information Custom Fields, which prices include all overhead, profit and other expense items in connection therewith, subject to the terms of the Contract Documents.
- b. All unit prices include the installation or omission, complete for each item, together with all work in connection therewith and shall include all shoring, bracing, dewatering and other incidental work.
- c. Adjustments will be computed on net variation of total quantities of like items.
- d. The Owner reserves the right to accept or reject any or all of the unit prices entered into the electronic project management Bid Portal Response Form – Step 3 – Additional Required Information Custom Fields prior to the execution of the Contract.

## 9. Acceptance

- a. The undersigned agrees that the amount submitted for the Base Bid and any Alternates and Unit Pricing along with the required attachments in the Response Form – Step 3 – Additional Required Information Custom Fields submitted in the electronic project management Bid Portal have been reviewed and are accurate.
- b. It is understood and agreed that the Owner expressly reserves the right to accept or reject any or all bids, and to waive irregularities or informalities in its sole and reasonable discretion.



c. Upon acceptance of Bidder's Proposal, Bidder expressly agrees and affirms to hold its unchanged Bid Proposal for ninety (90) calendar days. The undersigned will execute an Agreement between Contractor and Owner, amended and/or supplemented, if required, in accordance with the Proposal as accepted. Nothing contained herein shall preclude Bidder and Owner from mutually agreeing upon a Contract based upon the unchanged Bid Proposal if the time elapsed from Award is in excess of ninety (90) calendar days.

d. The undersigned acknowledges the following Addendum(s) (if applicable):

Addendum No. \_\_\_ dated \_\_\_\_.

e. 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.

f. The undersigned agrees to furnish Owner satisfactory and executed Performance and Payment Bonds prior to the commencement of any Work on-site.

g. The undersigned acknowledges as Contractor to be and remain exclusively in control of the Project site and Work, as well as the Project's Health & Safety Plan, measures, and/or protocols, for the duration of construction activities.

h. Alternates:

1. 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 associated with the Base Bid in accordance with the 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.

2. It is understood that the Owner reserves the right to accept or reject any of the Alternate Proposals provided in the electronic project management Bid Portal within forty five (45) calendar days following the award of a construction contract or such other time as may be agreed to by the Owner and Contractor.





The following documentation is required to be submitted electronically in the electronic project management Bidding Portal Response Form – Step 3 – Additional Required Information Custom Fields

- ☐ This Form with Proposed Milestone Schedule – signed and executed
- ☐ Bid Bond
- ☐ Proposed Project Team Resumes

\_\_\_\_\_  
(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 its 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 that have been quoted in this bid have not been knowingly disclosed, directly or indirectly, by the bidder and will not knowingly be disclosed by the bidder to any other bidder or any competitor prior to opening.

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 and  
executed for and on behalf of said Corporation by authority of its governing body.

\_\_\_\_\_  
(Secretary-Clerk)

Dated: \_\_\_\_\_



**GENERAL CONDITIONS**

**FOR**

**WARD CENTER RENOVATION NEW YORK CONSORTIUM  
FOR SPACE TECHNOLOGY (NYCST)**

**CORNELL UNIVERSITY  
ITHACA, NEW YORK**





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## **EXHIBITS**

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|   |          | Construction Contract Change Order Request                             |
|   |          | Construction Contract Change Order Summary                             |
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| C |          | Guarantee                                                              |
| D | Form I   | MWBE Utilization Plan                                                  |
|   | Form II  | Summary of Bid Activity with MBE and WBE Subcontractors<br>and Vendors |
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| E |          | Labor Rate Breakdown                                                   |
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| G |          | Contractor Performance Evaluation                                      |
| H |          | Grant Information                                                      |

## **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 sounder technique or workmanship, or better quality or greater quantity of material shall govern, unless the Owner directs 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 which is normally under the jurisdiction of one of the local unions as covered in the contract between the Tompkins-Cortland Building Trades Council, Maintenance Division and Cornell University shall be performed by Union labor.

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 or alternatives 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(s) or redesign(s), and all new drawings and details required thereto 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 appropriate and adequate to account 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 Contractor 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 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 Project 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, sufficiently stable to secure the required payment and performance bonds, and is sufficiently experienced in and competent to perform the subject Work or retain qualified subcontractors to perform elements of the Work pursuant to the Project's plans and specifications;

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, accounted for weather days, 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 Contractor's failure 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 Contractor will have access to view and download the Bid Documents in the Owner's electronic project management system.

B. 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 with the exception of the signed Contract Set, are to be returned to the Owner along with the As-Builts 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

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.

### 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 Documents, 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 Documents. 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 and approve 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 and shall constitute a full payment for both the Work covered or arising from the order and for any damage or expense incurred by the Contractor by any delays, including any and all impacts, known or unknown, or delays to other Work to be done under the Contract resulting from said change order. The Contractor expressly 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 and processed via the electronic project management system.

### **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 dates 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 times 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 substantial and full completion within the time specified. It is expressly understood and agreed, that the times 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 the 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 - 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, known or unknown, including time extensions, 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, public health statistics or information, and injury requiring medical attention, pursuant to government authority, 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 (e.g., 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 on the part of the Contractor.

#### 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 fully comply with and 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. 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:

| <b><u>COMBINED SINGLE LIMIT</u></b> |               |
|-------------------------------------|---------------|
| \$ 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 \$5,000,000 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.

\$ 5,000,000

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. Unmanned Aerial Vehicle (UAV): If Contractor or any of its Subcontractors or agents will operate an Unmanned Aerial Vehicle (“UAV”), a policy of UAV insurance shall be provided on a standard form providing coverage for bodily injury (including death) and property damage on an “occurrence” basis with a combined single limit per occurrence of \$2,000,000. This coverage may also be provided by endorsement to the Commercial General Liability policy.

Contractor is responsible to follow the Cornell University UAV Policy, located at:

<https://www.risk.cornell.edu/events-and-staffing-main-page/use-of-drones/>

PDF of Insurance requirements per the above Cornell University Policy:

<https://bpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/8/4200/files/2016/09/UAV-Guidelines-28wl46t.pdf>

8. 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 10.06 A.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 \$10,000,000 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 \$10,000 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 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. If the project is bonded, a Consent of Surety to the reduction must be attached as well.

#### Section 12.04 - Withholding Payments

A. The Owner may, on account of contemporaneous or 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 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 - Laws Governing the Contract**

The Contract shall be governed by the laws of the State of New York, without reference to conflict of law principles. Any and all proceedings relating to the subject matter hereof shall be maintained in New York State Supreme Court, Tompkins County or the federal district court for the Northern District of New York, which courts shall have exclusive jurisdiction for such purposes.

### **Section 15.03 - Assignments**

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

### **Section 15.04 - 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 15.05 - 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 15.06 - 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 15.07 - 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 (David Vanderpoorten) shall be recognized by the Contractor.

## Section 15.08 - 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**

### **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.

### **Section 16.02 – Participation by Minority and Women Business Enterprises**

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 and WBE programs. These requirements include equal employment opportunities for minority group members and women ("EEO") and contracting opportunities for certified minority and women-owned business enterprises ("MWBEs"). 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:

With respect to the procurement of goods and services and university contracting, Cornell University shall comply with all applicable state and federal laws, and refrain from discriminating against or considering the following in hiring or contracting: race, sex, sexual orientation, color, national origin, religion, or disability. Cornell's obligations surrounding state programs (MWBE utilization) and federal law regarding non-discrimination obligations continue to be the rule of law.

## Section 16.03 – 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 Utilization Reports when requested by the Owner.

1. MWBE Utilization Report
2. Workforce Report

B. The Contractor shall provide a single monthly report, or as requested by the Owner, inclusive of all subcontractor information for the project labor and such report must document the use of MWBE businesses in the Contract.

## **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 on Non-Work Related Content**

The Contractor shall not use or permit on the job site, in its external, advertising, marketing program, social media, or other promotional efforts, any date, pictures, or other content unrelated to the Contracted Work, or any 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://policy.cornell.edu/policy-library/standards-ethical-conduct>. 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](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 entered into the electronic project management Bid Portal Response Form – Step 3 – Additional Required Information Custom Fields 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<br>RATE PAID | HOURS<br>WORKED | TOTAL<br>COST |
|--------------------|--------------------------|-----------------|---------------|
| _____              | _____                    | _____           | \$0           |
| _____              | _____                    | _____           | \$0           |
| _____              | _____                    | _____           | \$0           |
| _____              | _____                    | _____           | \$0           |
| <b>LABOR TOTAL</b> |                          |                 | <b>\$0</b>    |

**2 MATERIAL** (Attach Supporting Documentation)

MATERIAL REQUIRED FOR CHANGE

|                       | UNIT<br>PRICE | UNIT OF<br>MEASURE | REQUIRED<br>UNITS | TOTAL<br>COST |
|-----------------------|---------------|--------------------|-------------------|---------------|
| _____                 | _____         | _____              | _____             | \$0           |
| _____                 | _____         | _____              | _____             | \$0           |
| _____                 | _____         | _____              | _____             | \$0           |
| _____                 | _____         | _____              | _____             | \$0           |
| <b>MATERIAL TOTAL</b> |               |                    |                   | <b>\$0</b>    |

**3 EQUIPMENT** (Attach Supporting Documentation)

EQUIPMENT REQUIRED FOR CHANGE

|                        | UNIT<br>PRICE | UNIT OF<br>MEASURE | REQUIRED<br>UNITS | TOTAL<br>COST |
|------------------------|---------------|--------------------|-------------------|---------------|
| _____                  | _____         | _____              | _____             | \$0           |
| _____                  | _____         | _____              | _____             | \$0           |
| _____                  | _____         | _____              | _____             | \$0           |
| _____                  | _____         | _____              | _____             | \$0           |
| _____                  | _____         | _____              | _____             | \$0           |
| <b>EQUIPMENT TOTAL</b> |               |                    |                   | <b>\$0</b>    |

**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<br>COST OF WORK | SUB-SUB<br>MARK UP % | TOTAL<br>COST |
|--------------------------------|-------------------------|----------------------|---------------|
| _____                          | _____                   | _____                | \$0           |
| _____                          | _____                   | _____                | \$0           |
| _____                          | _____                   | _____                | \$0           |
| <b>SUB-SUBCONTRACTOR TOTAL</b> |                         |                      | <b>\$0</b>    |

**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**



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

\_\_\_\_\_  
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\_\_\_\_\_

TOTAL COST OF PROPOSED CHANGE ORDER ITEM \$0

TOTAL CONTRACT DAYS ADDED/DELETED FROM PROJECT SCHEDULE

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**FINAL RELEASE**

EXHIBIT "B"

**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

\_\_\_\_\_  
Corporation or Business Name

\_\_\_\_\_ Day of \_\_\_\_\_ 20\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

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**GUARANTEE**

Date: \_\_\_\_\_

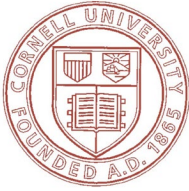
In accordance with plans and specifications and the terms and conditions of our contract with Cornell University dated \_\_\_\_\_, we hereby guarantee the \_\_\_\_\_ as found in the specifications for \_\_\_\_\_, Ithaca, New York to be free  
(Project Title)  
from defects in materials and workmanship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

\_\_\_\_\_  
(COMPANY)

By: \_\_\_\_\_

Title: \_\_\_\_\_

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## MWBE Utilization Report

### PART I – PROJECT INFORMATION

|                                                      |                                            |                 |
|------------------------------------------------------|--------------------------------------------|-----------------|
| ePM Project No.                                      | Project Name:                              | Contract Value: |
| Contractor Name and Address:                         | Primary Contact Name, Phone Number, Email: | Bid Date:       |
| Contractor's MWBE Contact Name, Phone Number, Email: |                                            |                 |

### PART II – MWBE LIST *(Update as MWBE firms come under contract, sign and date, resubmit)*

| Subcontractor Name, Address, Contact, Email, MBE or WBE<br><i>(List your firm if also MBE or WBE)</i> | Federal ID Number | Dollar Value of Contract or Purchase Order | Description of Work or Supplies | Subcontractor or Supplier Start and End Dates |
|-------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------|---------------------------------|-----------------------------------------------|
|                                                                                                       |                   |                                            |                                 |                                               |
|                                                                                                       |                   |                                            |                                 |                                               |
|                                                                                                       |                   |                                            |                                 |                                               |
|                                                                                                       |                   |                                            |                                 |                                               |
|                                                                                                       |                   |                                            |                                 |                                               |
|                                                                                                       |                   |                                            |                                 |                                               |

|  |  |
|--|--|
|  |  |
|  |  |
|  |  |

*(Update totals as MWBE firms are added/subtracted to above list)*

|                                     |        |
|-------------------------------------|--------|
| Print Name of Principal or Officer: | Title: |
| Signature:                          | Date:  |



**PART III – Quarterly Utilization Report** *(Subcontractors & Sub-subcontractors fill this out and submit to General Contractor to compile into a single form.)* Double click on table to edit.

[illegible]





**SUMMARY OF BID ACTIVITY WITH MBE AND WBE  
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 and WBE                              |                |                |        |              |        |             |  |
|------------------------------------------|----------------|----------------|--------|--------------|--------|-------------|--|
| Subcontractor/Vendor<br>(Indicate which) | Item/<br>Trade | Bid Submitted: |        | Award Status |        | Date of     |  |
|                                          |                | Date           | Amount | Date         | Amount | Elimination |  |
|                                          |                |                |        |              |        |             |  |
|                                          |                |                |        |              |        |             |  |
|                                          |                |                |        |              |        |             |  |
|                                          |                |                |        |              |        |             |  |
|                                          |                |                |        |              |        |             |  |
|                                          |                |                |        |              |        |             |  |
|                                          |                |                |        |              |        |             |  |

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

OFFICER OF FIRM:

|                 |       |
|-----------------|-------|
| Name and Title: | Date: |
| _____           | _____ |
| Signature:      |       |
| _____           |       |



## PROJECT

## WORKFORCE REPORT

(Month/Year)

| Prime Contractor, Subcontractor and Sub-Subcontractor's Name | Craft and/or Trade | Total of All Employee Hours By Trade | Non-Hispanic / Caucasian |        | Black |        | Hispanic |        | Asian / Pacific Islander |        | American Indian / Alaskan Native |        | Minority Employee Hours as a Percentage of Total Employee Hours | Total Number of Employees |        | Total Number of Minority Employees |
|--------------------------------------------------------------|--------------------|--------------------------------------|--------------------------|--------|-------|--------|----------|--------|--------------------------|--------|----------------------------------|--------|-----------------------------------------------------------------|---------------------------|--------|------------------------------------|
|                                                              |                    |                                      | Hours                    |        | Hours |        | Hours    |        | Hours                    |        | Hours                            |        |                                                                 | Total Number of Employees |        |                                    |
|                                                              |                    |                                      | Male                     | Female | Male  | Female | Male     | Female | Male                     | Female | Male                             | Female |                                                                 | Male                      | Female |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
|                                                              |                    |                                      |                          |        |       |        |          |        |                          |        |                                  |        | #DIV/0!                                                         |                           |        |                                    |
| MONTHLY PROJECT TOTALS                                       |                    | 0                                    | 0                        | 0      | 0     | 0      | 0        | 0      | 0                        | 0      | 0                                | 0      | #DIV/0!                                                         | 0                         | 0      | 0                                  |

**NOTE:** The Prime Contractor shall provide a single monthly report inclusive of all subcontractor information for the project.



## 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

\* Bodily Injury &amp; 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 &amp; 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:

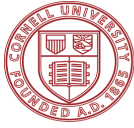
\_\_\_\_\_

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<br>Expectation | Needs<br>Improvement | Fully Achieve<br>Expectation | Freq Exceeds<br>Expectation | Cons Exceed<br>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:

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| Fails to Achieve<br>Expectation | Needs<br>Improvement | Fully Achieve<br>Expectation | Freq Exceeds<br>Expectation | Cons Exceed<br>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<br>Expectation | Needs<br>Improvement | Fully Achieve<br>Expectation | Freq Exceeds<br>Expectation | Cons Exceed<br>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-Built's, 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**

0

| 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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## GRANT INFORMATION

This project will be funded with the Department of Defense Grant For NY Consortium for Space Technology Innovation and Development; the language of [2 CFR 200 Appendix II](#) is incorporated in the requirements of this project.

Please see the attached National Policy requirements and US DOD Grant Program – Specific Terms and Conditions.



## **I. NATIONAL POLICY REQUIREMENTS**

### **NP Article I. Nondiscrimination national policy requirements. (OCTOBER 2015)**

**Section A. Cross-cutting nondiscrimination requirements.** By signing this agreement or accepting funds under this agreement, you assure that you will comply with applicable provisions of the national policies prohibiting discrimination:

1. On the basis of race, color, or national origin, in Title VI of the Civil Rights Act of 1964 (42 U.S.C. 2000d et seq.), as implemented by DoD regulations at 32 CFR part 195.
2. On the basis of gender, blindness, or visual impairment, in Title IX of the Education Amendments of 1972 (20 U.S.C. 1681 et seq.), as implemented by DoD regulations at 32 CFR part 196.
3. On the basis of age, in the Age Discrimination Act of 1975 (42 U.S.C. 6101 et seq.), as implemented by Department of Health and Human Services regulations at 45 CFR part 90.
4. On the basis of disability, in the Rehabilitation Act of 1973 (29 U.S.C. 794), as implemented by Department of Justice regulations at 28 CFR part 41 and DoD regulations at 32 CFR part 56.
5. On the basis of disability in the Architectural Barriers Act of 1968 (42 U.S.C. 4151 et seq.) related to physically handicapped persons' ready access to, and use of, buildings and facilities for which Federal funds are used in design, construction, or alteration.

**Section B. Other nondiscrimination requirements. RESERVED.**

### **NP Article II. Environmental national policy requirements. (OCTOBER 2015)**

**Section A. Cross-cutting environmental requirements.** You must:

1. Comply with applicable provisions of the Clean Air Act (42 U.S.C. 7401, et seq.) and Clean Water Act (33 U.S.C. 1251, et seq.).
2. Immediately identify to us, as the Federal awarding agency, any potential impact that you find this award may have on:
  - a. The quality of the human environment, including wetlands, and provide any help we may need to comply with the National Environmental Policy Act (NEPA, at 42 U.S.C. 4321 et seq.) and assist us to prepare Environmental Impact Statements or other environmental documentation. In such cases, you may take no action that will have an adverse environmental impact (e.g., physical disturbance of a site such as breaking of ground) or limit the choice of reasonable alternatives until we provide written notification of Federal compliance with NEPA.

- b. Flood-prone areas, and provide any help we may need to comply with the National Flood Insurance Act of 1968 and Flood Disaster Protection Act of 1973 (42 U.S.C. 4001 et seq.), which require flood insurance, when available, for federally assisted construction or acquisition in flood-prone areas.
  - c. Use of land and water resources of coastal zones, and provide any help we may need to comply with the Coastal Zone Management Act of 1972 (16 U.S.C. 1451, et seq.).
  - d. Coastal barriers along the Atlantic and Gulf coasts and Great Lakes' shores, and provide help we may need to comply with the Coastal Barriers Resource Act (16 U.S.C. 3501 et seq.), concerning preservation of barrier resources.
  - e. Any existing or proposed component of the National Wild and Scenic Rivers system, and provide any help we may need to comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1271 et seq.).
  - f. Underground sources of drinking water in areas that have an aquifer that is the sole or principal drinking water source, and provide any help we may need to comply with the Safe Drinking Water Act (42 U.S.C. 300h-3).
3. Comply with applicable provisions of the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4821-4846), as implemented by the Department of Housing and Urban Development at 24 CFR part 35. The requirements concern lead-based paint in buildings owned by the Federal Government or housing receiving Federal assistance.

**Section B. Other environmental requirements. RESERVED.**

**NP Article III. National policy requirements concerning live organisms. (OCTOBER 2015)**

**Section A. Cross-cutting requirements concerning live organisms. You must:**

1. **Human subjects.** You must protect the rights and welfare of individuals that participate as human subjects in research under this award in accordance with DoD regulations at 32 CFR part 219 and DoD Instruction 3216.2.
2. **Animals.**
  - a. You must comply with applicable provisions of Department of Agriculture rules at 9 CFR parts 1-4 and DoD Instruction 3216.1, which implement the Laboratory Animal Welfare Act of 1966 (7 U.S.C. 2131-2156) and provide for humane transportation, handling, care, and treatment of animals used in research, experimentation, testing, or training under this award. You may not begin any animal work under the award that the awarding DoD Component has not reviewed and approved, as specified in paragraph 2.d of Enclosure 3 to DoD Instruction 3216.1.

- b. Your animal care program must meet the standards set forth in the National Academy of Sciences publication "Guide for the Care and Use of Laboratory Animals" (eighth edition, 2011, which may be found currently at <http://www.nap.edu/catalog/12910/guide-for-the-care-and-use-of-laboratory-animals-eighth>).
- c. You must immediately identify to us, as the Federal awarding agency, any potential impact that you find this award may have on endangered species, as defined by the Endangered Species Act of 1973, as amended ("the Act," 16 U.S.C. 1531-1543), and implementing regulations of the Departments of the Interior (50 CFR parts 10-24) and Commerce (50 CFR parts 217-227). You also must provide any help we may need to comply with 16 U.S.C. 1536(a) (2). This is not in lieu of responsibilities you have to comply with provisions of the Act that apply directly to you as a U.S. entity, independent of receiving this award.

**Section B. Other requirements concerning live organisms. RESERVED.**

**NP Article IV. Other national policy requirements. (OCTOBER 2015)**

**Section A. Cross-cutting requirements.**

1. **Debarment and suspension.** You must comply with requirements regarding debarment and suspension in Subpart C of 2 CFR part 180, as adopted by DoD at 2 CFR part 1125. This includes requirements concerning your principals under this award, as well as requirements concerning your procurement transactions and subawards that are implemented in PROC Articles I through III and SUB Article II.
2. **Drug-free workplace.** You must comply with drug-free workplace requirements in Subpart B of 32 CFR part 26, which is the DoD implementation of 41 U.S.C. Chapter 81, "Drug-Free Workplace."
3. **Lobbying.**
  - a. You must comply with the restrictions on lobbying in 31 U.S.C. 1352, as implemented by DoD at 32 CFR part 28, and submit all disclosures required by that statute and regulation.
  - b. You must comply with the prohibition in 18 U.S.C. 1913 on the use of Federal funds, absent express Congressional authorization, to pay directly or indirectly for any service, advertisement or other written matter, telephone communication, or other device intended to influence at any time a Member of Congress or official of any government concerning any legislation, law, policy, appropriation, or ratification.
  - c. If you are a nonprofit organization described in section 501(c)(4) of title 26, United States Code (the Internal Revenue Code of 1968), you may not engage in lobbying activities as defined in the Lobbying Disclosure Act of 1995 (2 U.S.C., chapter 26). If we determine that you have engaged in lobbying activities, we will cease all payments to

you under this and other awards and terminate the awards unilaterally for material failure to comply with the award terms and conditions.

4. **Officials not to benefit.** You must comply with the requirement that no member of Congress shall be admitted to any share or part of this agreement, or to any benefit arising from it, in accordance with 41 U.S.C. 6306.

5. **Hatch Act.** If applicable, you must comply with the provisions of the Hatch Act (5 U.S.C. 1501-1508) concerning political activities of certain State and local government employees, as implemented by the Office of Personnel Management at 5 CFR part 151, which limits political activity of employees or officers of State or local governments whose employment is connected to an activity financed in whole or part with Federal funds.

6. **Native American graves protection and repatriation.** If you control or possess Native American remains and associated funerary objects, you must comply with the requirements of 43 CFR part 10, the Department of the Interior implementation of the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C., chapter 32).

7. **Fly America Act.** You must comply with the International Air Transportation Fair Competitive Practices Act of 1974 (49 U.S.C. 40118), commonly referred to as the “Fly America Act,” and implementing regulations at 41 CFR 301-10.131 through 301-10.143. The law and regulations require air transport of people or property to, from, between or within a country other than the United States, the cost of which is supported under this award, to be performed by or under a cost-sharing arrangement with a U.S. flag carrier, if service is available.

8. **Use of United States-flag vessels.** You must comply with the following award term specified by the Department of Transportation at 46 CFR 381.7, in regulations implementing the Cargo Preference Act of 1954:

- a. Pursuant to Pub. L. 83-664 (46 USC 55305), at least 50 percent of any equipment, materials or commodities procured, contracted for or otherwise obtained with funds under this award, and which may be transported by ocean vessel, must be transported on privately owned United States-flag commercial vessels, if available.
- b. Within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, “on-board” commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph 98.a of this section shall must be furnished to both our award administrator (through you in the case of your contractor’s bill-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

9. **Research misconduct.** You must comply with requirements concerning research misconduct in Enclosure 4 to DoD Instruction 3210.7, “Research Integrity and Misconduct.” The Instruction implements the Government wide research misconduct policy that the Office of Science and



Technology Policy published in the Federal Register (65 FR 76260, December 6, 2000), available through the U.S. Government Printing Office web site:

<http://www.gpo.gov/fdscys/browse/collection.action?Code=FR>).

**10. Requirements for an Institution of Higher Education Concerning Military Recruiters and Reserve Officers Training Corps (ROTC).**

- a. As a condition for receiving funds available to the DoD under this award, you agree that you are not an institution of higher education (as defined in 32 CFR part 216) that has a policy or practice that either prohibits, or in effect prevents:
  - (1) The Secretary of a Military Department from maintaining, establishing, or operating a unit of the Senior Reserve Officers Training Corps(ROTC)—in accordance with 10 U.S.C. 654 and other applicable Federal laws—at that institution (or any subelement of that institution);
  - (2) Any student at that institution (or any subelement of that institution) from enrolling in a unit of the Senior ROTC at another institution of higher education.
  - (3) The Secretary of a Military Department or Secretary of Homeland Security from gaining access to campuses, or access to students (who are 17 years of age or older) on campuses, for purposes of military recruiting in a manner that is at least equal in quality and scope to the access to campuses and to students that is provided to any other employer; or
  - (4) Access by military recruiters for purposes of military recruiting to the names of students (who are 17 years of age or older and enrolled at that institution or any subelement of that institution); their addresses, telephone listings, dates and places of birth, levels of education, academic majors, and degrees received; and the most recent educational institutions in which they were enrolled.
  - (5) If you are determined, using the procedures in 32 CFR part 216, to be such an institution of higher education during the period of performance of this award, we:
    - (a) Will cease all payments to you of DoD funds under this award and all other DoD grants and cooperative agreements; and
    - (b) May suspend or terminate those awards unilaterally for material failure to comply with the award terms and conditions.

**11. Historic preservation. You must identify to us any:**

- a. Any property listed or eligible for listing on the National Register of Historic Places that will be affected by this award, and provide any help we may need, with respect to this award, to comply with Section 106 of the National Historic Preservation Act of 1966 (16

U.S. C. 470f), as implemented by the Advisory Council on Historic Preservation regulations at 36 CFR part 800 and Executive Order 11593, "Identification and Protection of Historic Properties," [3 CFR, 1971-1975 Comp., p. 559].

- b. Potential under this award for irreparable loss or destruction of significant scientific, prehistorical, historical, or archeological data, and provide any help we may need, with respect to this award, to comply with the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. 469a-1, et seq.).

**12. Relocation and real property acquisition.** You must comply with applicable provisions of 49 CFR part 24, which implements the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. 4601, et seq.) and provides for fair and equitable treatment of persons displaced by federally assisted programs or persons whose property is acquired as a result of such programs.

**13. Confidentiality of patient records.** You must keep confidential any records that you maintain of the identity, diagnosis, prognosis, or treatment of any patient in connection with any program or activity relating to substance abuse education, prevention, training, treatment, or rehabilitation that is assisted directly or indirectly under this award, in accordance with 42 U.S.C. 290dd-2.

**14. Pro-Children Act.**

You must comply with applicable restrictions in the Pro-Children Act of 1994 (Title 20, Chapter 68, Subchapter X, Part B of the U.S. Code) on smoking in any indoor facility:

- a. Constructed, operated, or maintained under this award and used for routine or regular provision of kindergarten, elementary or secondary education or library services to children under the age of 18.
- b. Owned, leased, or contracted for and used under this award for the routine provision of federally funded health care, day care, or early childhood development (Head Start) services to children under the age of 18.

**15. Constitution Day.** You must comply with Public Law 108-447, Div. J, Title I, Sec. 111 (36 U.S.C. 106 note), which requires each educational institution receiving Federal funds in a Federal fiscal year to hold an educational program on the United States Constitution on September 17th during that year for the students served by the educational institution.

**16. Trafficking in persons.** You must comply with requirements concerning trafficking in persons specified in the award term at 2 CFR 175.15(b), as applicable.

**17. Whistleblower protections.** You must comply with 10 U.S.C. 2409, including the:

- a. Prohibition on reprisals against employees disclosing certain types of information to specified persons or bodies; and

- b. Requirement to notify your employees in writing, in the predominant native language of the workforce, of their rights and protections under that statute



**U.S. DEPARTMENT OF DEFENSE  
OFFICE OF ECONOMIC ADJUSTMENT  
GRANT PROGRAM-SPECIFIC  
TERMS AND CONDITIONS  
Effective: November 2, 2017**

The Office of Economic Adjustment's 'Notice of Award' consists of a 2-page form with numbered sections. Grantees should refer to the following section numbers to determine applicability: Section 3 for Award Type; Section 11 for Program Type; and Section 16 for CFDA Number and Title.

**I. COMMUNITY INVESTMENT (Construction Grants)**

CFDA 12.600, Community Investment includes four program areas:

- Public Schools on Military Installations
- Military Medical Center Access Improvement Program
- Civilian Infrastructure Investments on the Territory of Guam
- Projects that involve construction

The following program-specific terms and conditions are applicable to CFDA number 12.600, Community Investment:

- A. The Grantee agrees to retain ownership of the new, expanded, or renovated facility and to insure, operate, and maintain or replace the facilities to the same standard and conditions as any other Grantee-owned property, to include scheduling and funding necessary maintenance, expansion, an/or replacement of the improved real property, on the same basis as any other Grantee-owned property and facilities.
- B. Federal Interest
- (1) (Property Trust Relationship) Real property, equipment, and intangible property that are acquired or improved through the use of OEA grant funding must be held in trust by the Grantee as trustee for the beneficiaries of the project or program under which the property was acquired or improved. With respect to real property, the trust shall remain in effect for the entire Federal Interest Period specified in section I.B.(3)a., (Federal Interest Period, Real Property) of these terms & conditions, unless otherwise stipulated in the grant agreement.
- (2) (Notice of Federal Interest) A Grantee acquiring or improving real property through the use of OEA grant funding must record a Notice of Federal Interest (NFI) in the appropriate official records of the jurisdiction in which the property is located. NFI recordation must occur at the time the real property acquisition or improvement begins. The NFI shall remain in effect for the entire Federal Interest

Period applicable to the subject real property as set forth by OEA in section I.B.(3)a., (Federal Interest Period, Real Property), unless otherwise stipulated in the grant agreement. A copy of the recorded NFI must be provided to the OEA Project Manager (PM) within 10 days following the date of recordation.

### (3) Federal Interest Periods

- a. (Real Property) The OEA Federal Interest Period shall be 30 years from the start date of construction unless otherwise specified by the grant agreement.
- b. (Personal Property) All personal property (e.g., equipment and non-fixed asset machinery) conforming to 2 CFR § 200.33 definitions must be managed in accordance with 2 CFR § 200.311 and 2 CFR § 200.313. Management of personal property in accordance with local standards is acceptable, provided local standards meet 2 CFR 200 requirements. A list of all grant-purchased personal property must be submitted to OEA as a deliverable prior to grant closeout.

### (4) Real Property Monitoring

- a. (Real Property Status Report) Grantees are required to report on the status of real property acquired or improved through federal funding using the Office of Management and Budget (OMB) Standard Form 249 (SF 429). This reporting will occur at the time of grant closeout as part of the submission of the final performance report and at the time of disposal. The requirement to provide the real property status report at the time of grant closeout does not relieve the Grantee of its responsibility to provide a timely copy of the recorded NFI within the 10 days of the recordation as provided in sec. I.B.(2) above.
- b. (Prior Approval for Changes/Renovations to Real Property) For real property subject to an OEA federal interest, before undertaking significant changes or renovations that have the potential to alter aspects of the property's end use approved at the time of the grant award, Grantees must obtain written prior approval from the OEA Grants Management Officer. Grantees must use the SF 429 form to request written prior approval.

### (5) Disposal

- a. (Real Property) During the Federal Interest Period, Grantees must request in writing OEA instructions and written approval prior to disposing of real or personal property subject to an OEA federal interest. If an OMB form is current and available (e.g., the SF 429, Real Property Status Report), it must be used for the request.
- b. (Personal Property) The completed equipment list required for any grant that includes funding for the purchase of personal property should identify (among other information) the warranty period and expected useful life (from the date of

purchase) of that personal property. If such personal property will be disposed prior to the date of its expected useful life, the Grantee must request from OEA instructions and approval in writing on the disposal of the personal property. If disposed after that date, OEA notification and prior approval is not required.

- (6) (Federal Interest Expiration) The OEA federal interest in real property acquired or improved through an OEA grant will expire at the end of the Federal Interest Period specified in sec. I.B.(3)a. of this policy, unless otherwise stipulated in the grant agreement.
- C. (Site Control) Prior to the start of construction and any ground disturbing activity, the Grantee shall provide to the Grantor for prior approval evidence of adequate access and site control to permit necessary construction, renovation, repair, expansion, demolition and/or swing space activities as well as operation and maintenance of the completed facility. Generally, site control of not less than 25 years shall be evidenced.
- D. (Davis-Bacon) Grantees should verify whether Federal prevailing wage rates under the Davis-Bacon Act (40 U.S.C. § 276a to 276a-7) are required if a project undertaken under this program expends any Federal funds beyond just those from the Grantor. Generally, the Davis-Bacon Act does not apply to construction activities funded solely with Grantor funding under this program. This does not affect the Grantee's responsibility to comply with all other Federal laws, as well as state and local laws, which may, in some circumstances, require the application of state or locally mandated prevailing wage rates.
- E. (Buy American Act) The "Buy American" Act (BAA) provisions apply to Office of Economic Adjustment construction grant projects. The BAA does not apply.
- F. Grantee agrees to provide programs and services on the same basis as such programs are made available at any other Grantee-operated facility. The Grantee may not charge for the ordinary use of facilities, furnishing, or equipment purchased with Grant funds.
- G. The Grantee shall administer and supervise implementation of the project, maintaining competent architectural supervision and inspection at the project site to ensure the work conforms to the approved drawings and specifications.
- H. (Contingency) Project underrun amounts shall be added to the Contingencies line item. In the event the final project cost is less than the currently estimated total project cost, the amount of matching share funds shall be unchanged and the grant amount will be reduced, accordingly. Grantor prior approval is required before the Grantee may move any funding from the Contingencies budget category.
- I. (Project Overruns) In the event the final project cost exceeds the currently estimated total project cost, the Grantee may be required to provide the additional funding needed to complete the project.

- J. (Project Development Time Schedule) The Grantee will abide by the Project Development Time Schedule. Failure to meet the Project Development Time Schedule, as identified in the Notice of Award, is considered a violation of the Grant Agreement and may result in action by the Grantor to suspend and/or terminate the Grant. The Project Development Time Schedule may only be extended as a result of a written request from the Grantee and a written approval by the Grantor.
- K. (NEPA) The Grantee understands that, as of the date of this Notice of Award, the Grantor has not satisfied the requirements of the National Environmental Policy Act. The Grantee consequently shall not proceed with construction or undertake any other ground-disturbing project activities prior to receiving written notice from the Grantor that the requirements of the National Environmental Policy Act have been met. This restriction does not apply to project design, development of environmental information, administrative activities, securing permits, or other activities that present no risk of irreparable injury to the environment.
- L. Deliverables
  - (1) The Grantee will provide the Grantor with a copy of the certificate of occupancy for the completed project issued by the appropriate jurisdiction.
  - (2) The Grantee will provide the Grantor with a list of all grant-related personal property (e.g., equipment and non-fixed asset machinery—as conforming to 2 CFR § 200.33, § 200.313).
  - (3) The Grantee will provide the Grantor with final “as-built” construction plans as well as final inspection reports (including photo documentation).
  - (4) The Grantee will provide the Grantor with evidence a Notice of Federal Interest (NFI, see I.B.(2) above) has been recorded in the appropriate official records of the jurisdiction in which the property is located within 10 days of recordation.

## II. FORCE REDUCTION (Non-Construction Grants)

CFDA 12.604, Community Economic Adjustment Assistance for Reductions in Defense Spending

- A. The Grantee is restricted from using Office of Economic Adjustment grant funds on the following activities:
  - (1) Construction;
  - (2) International travel;
  - (3) Activities otherwise eligible for or funded through other Federal grant programs; and
  - (4) Activities that seek to reverse or oppose Defense spending reductions.



III. BASE REALIGNMENT AND CLOSURE (Non-Construction Grants)

The Base Realignment and Closure Grant Program consists of two (2) CFDA Numbers:

- CFDA 12.607, Community Economic Adjustment Assistance for Establishment, Expansion, Realignment, or Closure of a Military Installation; and
- CFDA 12.614, Community Economic Adjustment Assistance for Advance Planning and Economic Diversification.

- A. The Grantee is restricted from using Office of Economic Adjustment grant funds on the following activities:
- (1) Construction;
  - (2) International travel;
  - (3) Activities otherwise eligible for or funded through other Federal grant programs; and
  - (4) Activities that seek to reverse or oppose Defense spending reductions.

B. Business Relocation Provision

Funds provided under this award may not be used to directly identify or assist a business, including a business expansion, in the relocation of a plant, facility, or operation from one Labor Market Area (LMA) to another if the relocation is likely to result in the loss of jobs in the LMA from which the relocation occurs.

IV. JOINT LAND USE STUDY (Non-Construction)

CFDA 12.610, Community Economic Adjustment Assistance for Compatible Use and Joint Land Use Studies

- A. The Grantee will adhere to the Terms & Conditions included in Section 20 of the Notice of Award.

V. DEFENSE AND INDUSTRY ADJUSTMENT (Non-Construction)

The Defense Industry Adjustment Grant Program consists of three (3) CFDA Numbers:

- 12.611, Community Economic Adjustment Assistance for Reductions in Defense Industry Employment;

- 12.614, Community Economic Adjustment Assistance for Advance Planning and Economic Diversification; and
- 12.617, Economic Adjustment Assistance for State Governments.

The following program-specific terms and conditions are applicable:

- A. Unless otherwise specified by the grant agreement, the Grantee is restricted from using Office of Economic Adjustment grant funds on the following activities:
  - (1) Construction;
  - (2) Means of production;
  - (3) Activities otherwise eligible for or funded through other Federal grant programs; and
  - (4) Activities that seek to reverse or oppose Defense spending reductions.
- B. (Business Relocation Provision) Funds provided under this award may not be used to directly identify or assist a business, including a business expansion, in the relocation of a plant, facility, or operation from one Labor Market Area (LMA) to another if the relocation is likely to result in the loss of jobs in the LMA from which the relocation occurs.
- C. (Work and Information Produced Under the Grant) The Grantor reserves the right to reproduce, publish, use, and authorize others to use copyrighted works or other data developed under this assistance agreement for Federal purposes. Examples of a Federal purpose include but are not limited to: (1) Use by OEA and other Federal employees for official Government purposes; (2) Use by Federal contractors performing specific tasks for the Government; (3) Publication in DOD documents provided the document does not disclose trade secrets (e.g. software codes) and the work is properly attributed to the recipient through citation or otherwise; (4) Reproduction of documents for inclusion in Federal depositories; and (5) Limited use by other grantees to carry out Federal grants provided the use is consistent with the terms of OEA's authorization to the other grantee to use the copyrighted works or other data.
- D. Federal Interest for Personal Property (e.g., equipment) Acquired Under the Grant
  - (1) Terms and conditions specified under section I.B. of this document apply.

VI. RESEARCH AND TECHNICAL ASSISTANCE (Non-Construction)

CFDA 12.615, Research and Technical Assistance

- A. The Grantee will adhere to the Terms & Conditions included in Section 20 of the Notice of Award.





**GENERAL REQUIREMENTS**

**FOR**

**WARD CENTER RENOVATION NEW YORK CONSORTIUM  
FOR SPACE TECHNOLOGY (NYCST)**

**CORNELL UNIVERSITY  
ITHACA, NEW YORK**

MARCH 7, 2025



|                         |                                                    |          |
|-------------------------|----------------------------------------------------|----------|
| <b>SECTION 01 11 00</b> | <b>SUMMARY OF WORK.....</b>                        | <b>1</b> |
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| 1.1                     | DESCRIPTION.....                                   | 1        |
| 1.2                     | WORK UNDER OTHER CONTRACTS .....                   | 2        |
| 1.3                     | SCHEDULE OF OWNER FURNISHED ITEMS .....            | 2        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED .....</b>                   | <b>3</b> |
| <b>3.0</b>              | <b>EXECUTION – NOT USED .....</b>                  | <b>3</b> |
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| <b>1.0</b>              | <b>GENERAL.....</b>                                | <b>1</b> |
| 1.1                     | RELATED DOCUMENTS .....                            | 1        |
| 1.2                     | CONTRACTOR USE OF PREMISES.....                    | 1        |
| 1.3                     | UNIVERSITY CLOSURES .....                          | 2        |
| 1.4                     | WATER USE RESTRICTION.....                         | 2        |
| 1.5                     | PARKING.....                                       | 2        |
| 1.6                     | CHANGEOVERS AND CONTINUITY OF SERVICES .....       | 3        |
| 1.7                     | OBSTACLES, INTERFERENCE AND COORDINATION.....      | 4        |
| 1.8                     | EQUIPMENT ARRANGEMENTS.....                        | 4        |
| 1.9                     | EXISTING EQUIPMENT, MATERIALS, FIXTURES, ETC. .... | 5        |
| 1.10                    | EXAMINATION OF PREMISES, DRAWINGS, ETC.....        | 5        |
| 1.11                    | STAND DOWN DATES.....                              | 6        |
| 1.12                    | WORKING HOURS.....                                 | 6        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED .....</b>                   | <b>6</b> |
| <b>3.0</b>              | <b>EXECUTION – NOT USED .....</b>                  | <b>6</b> |
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| <b>1.0</b>              | <b>GENERAL.....</b>                                | <b>1</b> |
| 1.1                     | RELATED DOCUMENTS .....                            | 1        |
| 1.2                     | SUMMARY .....                                      | 1        |
| 1.3                     | SELECTION AND PURCHASE .....                       | 1        |
| 1.4                     | SUBMITTALS .....                                   | 2        |
| 1.5                     | COORDINATION.....                                  | 2        |
| 1.6                     | LUMP SUM AND UNIT PRICE ALLOWANCES.....            | 2        |
| 1.7                     | ADJUSTMENT OF ALLOWANCES.....                      | 3        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED .....</b>                   | <b>3</b> |
| <b>3.0</b>              | <b>EXECUTION .....</b>                             | <b>3</b> |
| 3.1                     | EXAMINATION .....                                  | 3        |
| 3.2                     | PREPARATION .....                                  | 3        |
| 3.3                     | SCHEDULE OF ALLOWANCES.....                        | 4        |

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| <b>1.0</b>              | <b>GENERAL.....</b>                           | <b>1</b> |
| 1.1                     | RELATED DOCUMENTS .....                       | 1        |
| 1.2                     | DESCRIPTION OF REQUIREMENTS.....              | 1        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED .....</b>              | <b>1</b> |
| <b>3.0</b>              | <b>EXECUTION .....</b>                        | <b>1</b> |
| 3.1                     | SCHEDULE OF ALTERNATES.....                   | 2        |
| <b>SECTION 01 25 00</b> | <b>SUBSTITUTIONS AND PRODUCT OPTIONS.....</b> | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL.....</b>                           | <b>1</b> |
| 1.1                     | DESCRIPTION.....                              | 1        |
| 1.2                     | DEFINITIONS.....                              | 1        |
| 1.3                     | ACTION SUBMITTALS .....                       | 2        |
| 1.4                     | PRODUCTS LIST .....                           | 2        |
| 1.5                     | QUALITY ASSURANCE .....                       | 2        |
| 1.6                     | PROCEDURES.....                               | 3        |
| 1.7                     | EQUIVALENTS – APPROVED EQUAL .....            | 3        |
| 1.8                     | CONTRACTOR'S OPTIONS.....                     | 4        |
| 1.9                     | SUBSTITUTIONS.....                            | 6        |
| 1.10                    | COMPARABLE PRODUCTS .....                     | 7        |
| 1.11                    | CONTRACTOR'S REPRESENTATION.....              | 8        |
| 1.12                    | ARCHITECT'S DUTIES .....                      | 8        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED .....</b>              | <b>8</b> |
| <b>3.0</b>              | <b>EXECUTION – NOT USED .....</b>             | <b>8</b> |
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| <b>1.0</b>              | <b>GENERAL.....</b>                           | <b>1</b> |
| 1.1                     | DESCRIPTION.....                              | 1        |
| 1.2                     | PRE-CONSTRUCTION MEETING .....                | 1        |
| 1.3                     | PROGRESS MEETINGS .....                       | 3        |
| 1.4                     | PRE-INSTALLATION MEETING(S).....              | 4        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED .....</b>              | <b>4</b> |
| <b>3.0</b>              | <b>EXECUTION – NOT USED .....</b>             | <b>4</b> |



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| <b>SECTION 01 31 50</b> | <b>ELECTRONIC PROJECT MANAGEMENT</b> | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL</b>                       | <b>1</b> |
| 1.1                     | SUMMARY                              | 1        |
| 1.2                     | RELATED SECTIONS                     | 1        |
| 1.3                     | DEFINITIONS                          | 1        |
| 1.4                     | PROCEDURES                           | 1        |
| 1.5                     | PROCESS OVERVIEW                     | 2        |
| 1.6                     | ADDITIONAL INFORMATION               | 4        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED</b>           | <b>4</b> |
| <b>3.0</b>              | <b>EXECUTION – NOT USED</b>          | <b>4</b> |
| <b>SECTION 01 32 16</b> | <b>CONSTRUCTION SCHEDULE</b>         | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL</b>                       | <b>1</b> |
| 1.1                     | SUMMARY                              | 1        |
| 1.2                     | FORM OF SCHEDULES                    | 1        |
| 1.3                     | CONTENT OF SCHEDULES                 | 1        |
| 1.4                     | PROGRESS REVISIONS                   | 2        |
| 1.5                     | SUBMISSIONS                          | 3        |
| <b>2.0</b>              | <b>PRODUCTS - NOT USED</b>           | <b>3</b> |
| <b>3.0</b>              | <b>EXECUTION</b>                     | <b>3</b> |
| 3.1                     | DISTRIBUTION                         | 3        |
| <b>SECTION 01 32 33</b> | <b>PHOTOGRAPHIC DOCUMENTATION</b>    | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL</b>                       | <b>1</b> |
| 1.1                     | DESCRIPTION                          | 1        |
| 1.2                     | SUBMITTALS                           | 1        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED</b>           | <b>1</b> |
| <b>3.0</b>              | <b>EXECUTION</b>                     | <b>1</b> |
| 3.1                     | EXISTING CONDITION PHOTOGRAPHS       | 1        |
| 3.2                     | PROGRESS PHOTOGRAPHS                 | 1        |
| 3.3                     | FINAL COMPLETION PHOTOGRAPHS         | 1        |

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| <b>SECTION 01 33 00</b> | <b>SUBMITTAL PROCEDURES</b>                      | <b>1</b>  |
| <b>1.0</b>              | <b>GENERAL</b>                                   | <b>1</b>  |
| 1.1                     | DESCRIPTION                                      | 1         |
| 1.2                     | SUBMITTAL REGISTRY AND SCHEDULE                  | 1         |
| 1.3                     | SHOP DRAWINGS                                    | 3         |
| 1.4                     | PRODUCT DATA                                     | 3         |
| 1.5                     | SAMPLES AND MOCK-UPS                             | 4         |
| 1.6                     | QUALITY ASSURANCE AND QUALITY CONTROL SUBMITTALS | 5         |
| 1.7                     | COORDINATION DRAWINGS                            | 6         |
| 1.8                     | CONTRACTOR RESPONSIBILITIES                      | 8         |
| 1.9                     | SUBMITTAL PROCEDURES                             | 10        |
| 1.10                    | RECORD SUBMITTALS                                | 11        |
| 1.11                    | RESUBMISSION REQUIREMENTS                        | 12        |
| 1.12                    | ARCHITECT'S DUTIES                               | 12        |
| 1.13                    | DISTRIBUTION                                     | 13        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED</b>                       | <b>13</b> |
| <b>3.0</b>              | <b>EXECUTION – NOT USED</b>                      | <b>13</b> |
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| <b>1.0</b>              | <b>GENERAL</b>                                   | <b>1</b>  |
| 1.1                     | DESCRIPTION                                      | 1         |
| 1.2                     | CONTRACTOR'S PROJECT SITE SPECIFIC PLAN          | 1         |
| 1.3                     | AERIAL WORK PLATFORMS                            | 2         |
| 1.4                     | ASBESTOS                                         | 3         |
| 1.5                     | LEAD                                             | 3         |
| 1.6                     | MERCURY COLLECTION                               | 3         |
| 1.7                     | SITE VISITS                                      | 4         |
| 1.8                     | CONFINED SPACE                                   | 4         |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED</b>                       | <b>4</b>  |
| <b>3.0</b>              | <b>EXECUTION – NOT USED</b>                      | <b>4</b>  |

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| <b>SECTION 01 35 43</b> | <b>GENERAL ENVIRONMENTAL REQUIREMENTS</b>   | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL</b>                              | <b>1</b> |
| 1.1                     | DESCRIPTION                                 | 1        |
| 1.2                     | RELATED SECTIONS                            | 1        |
| 1.3                     | SUBMITTALS                                  | 1        |
| 1.4                     | JOB SITE ADMINISTRATION                     | 1        |
| 1.5                     | NOISE AND VIBRATION                         | 2        |
| 1.6                     | DUST CONTROL                                | 2        |
| 1.7                     | PROTECTION OF THE ENVIRONMENT               | 2        |
| 1.8                     | TEMPORARY RE-ROUTING OF PIPING AND DUCTWORK | 3        |
| 1.9                     | HAZARDOUS OR TOXIC MATERIALS                | 3        |
| 1.10                    | DISPOSAL OF WASTE MATERIAL AND TITLE        | 4        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED</b>                  | <b>4</b> |
| <b>3.0</b>              | <b>EXECUTION – NOT USED</b>                 | <b>4</b> |
| <b>SECTION 01 35 44</b> | <b>SPILL CONTROL</b>                        | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL</b>                              | <b>1</b> |
| 1.1                     | SPILL PREVENTION                            | 1        |
| 1.2                     | SPILL CONTROL PROCEDURES                    | 1        |
| 1.3                     | SPILL REPORTING AND DOCUMENTATION           | 4        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED</b>                  | <b>5</b> |
| <b>3.0</b>              | <b>EXECUTION – NOT USED</b>                 | <b>5</b> |
| <b>SECTION 01 41 00</b> | <b>REGULATORY REQUIREMENTS</b>              | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL</b>                              | <b>1</b> |
| 1.1                     | PERMITS AND LICENSES                        | 1        |
| 1.2                     | INSPECTIONS                                 | 1        |
| 1.3                     | COMPLIANCE                                  | 2        |
| 1.4                     | OWNER’S REQUIREMENTS                        | 2        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED</b>                  | <b>2</b> |
| <b>3.0</b>              | <b>EXECUTION – NOT USED</b>                 | <b>2</b> |

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|-------------------------|------------------------------------------------------|-----------|
| <b>SECTION 01 42 00</b> | <b>REFERENCES.....</b>                               | <b>1</b>  |
| <b>1.0</b>              | <b>GENERAL.....</b>                                  | <b>1</b>  |
| 1.1                     | INTENT OF CONTRACT DOCUMENTS.....                    | 1         |
| 1.2                     | RELATED DOCUMENTS .....                              | 2         |
| 1.3                     | DEFINITIONS.....                                     | 2         |
| 1.4                     | OWNER AGREEMENTS .....                               | 4         |
| 1.5                     | INDUSTRY STANDARDS .....                             | 4         |
| 1.6                     | ABBREVIATIONS AND ACRONYMS .....                     | 5         |
| <b>2.0</b>              | <b>PRODUCTS - NOT USED.....</b>                      | <b>17</b> |
| <b>3.0</b>              | <b>EXECUTION - NOT USED.....</b>                     | <b>17</b> |
| <b>SECTION 01 45 00</b> | <b>QUALITY CONTROL.....</b>                          | <b>1</b>  |
| <b>1.0</b>              | <b>GENERAL.....</b>                                  | <b>1</b>  |
| 1.1                     | DESCRIPTION.....                                     | 1         |
| 1.2                     | CONTROL OF ON-SITE CONSTRUCTION .....                | 1         |
| 1.3                     | CONTROL OF OFF-SITE OPERATIONS.....                  | 2         |
| 1.4                     | TESTING.....                                         | 3         |
| 1.5                     | OWNER'S REPRESENTATIVE .....                         | 3         |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED .....</b>                     | <b>3</b>  |
| <b>3.0</b>              | <b>EXECUTION – NOT USED .....</b>                    | <b>3</b>  |
| <b>SECTION 01 45 29</b> | <b>TESTING LABORATORY SERVICES .....</b>             | <b>1</b>  |
| <b>1.0</b>              | <b>GENERAL.....</b>                                  | <b>1</b>  |
| 1.1                     | DESCRIPTION.....                                     | 1         |
| 1.2                     | QUALIFICATIONS OF LABORATORY .....                   | 1         |
| 1.3                     | LABORATORY DUTIES .....                              | 2         |
| 1.4                     | LIMITATIONS OF AUTHORITY OF TESTING LABORATORY ..... | 3         |
| 1.5                     | CONTRACTOR'S RESPONSIBILITIES .....                  | 3         |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED .....</b>                     | <b>3</b>  |
| <b>3.0</b>              | <b>EXECUTION – NOT USED.....</b>                     | <b>3</b>  |

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|-------------------------|-------------------------------------------|-------------------|----------------|--------------------|------------|-----------|
| <b>SECTION 01 45 33</b> | <b>CODE</b>                               | <b>REQUIRED</b>   | <b>SPECIAL</b> | <b>INSPECTIONS</b> | <b>AND</b> |           |
|                         |                                           | <b>PROCEDURES</b> |                |                    |            | <b>1</b>  |
| <b>1.0</b>              | <b>GENERAL</b>                            |                   |                |                    |            | <b>1</b>  |
| 1.1                     | REQUIREMENTS                              |                   |                |                    |            | 1         |
| 1.2                     | DEFINITIONS                               |                   |                |                    |            | 1         |
| 1.3                     | QUALIFICATIONS                            |                   |                |                    |            | 2         |
| 1.4                     | SUBMITTALS                                |                   |                |                    |            | 2         |
| 1.5                     | PAYMENT                                   |                   |                |                    |            | 2         |
| 1.6                     | OWNER RESPONSIBILITIES                    |                   |                |                    |            | 2         |
| 1.7                     | CONTRACTOR RESPONSIBILITIES               |                   |                |                    |            | 2         |
| 1.8                     | LIMITS ON AUTHORITY                       |                   |                |                    |            | 3         |
| <b>2.0</b>              | <b>INSPECTIONS AND TESTING</b>            |                   |                |                    |            | <b>3</b>  |
| <b>3.0</b>              | <b>DOCUMENTATION</b>                      |                   |                |                    |            | <b>4</b>  |
| 3.1                     | RECORDS AND REPORTS                       |                   |                |                    |            | 4         |
| 3.2                     | COMMUNICATION                             |                   |                |                    |            | 5         |
| 3.3                     | DISTRIBUTION OF REPORTS                   |                   |                |                    |            | 5         |
| 3.4                     | FINAL REPORT OF SPECIAL INSPECTIONS       |                   |                |                    |            | 5         |
| <b>SECTION 01 50 00</b> | <b>TEMPORARY FACILITIES AND CONTROLS</b>  |                   |                |                    |            | <b>1</b>  |
| <b>1.0</b>              | <b>GENERAL</b>                            |                   |                |                    |            | <b>1</b>  |
| 1.1                     | DESCRIPTION                               |                   |                |                    |            | 1         |
| 1.2                     | REQUIREMENTS OF REGULATORY AGENCIES       |                   |                |                    |            | 1         |
| <b>2.0</b>              | <b>PRODUCTS</b>                           |                   |                |                    |            | <b>1</b>  |
| 2.1                     | MATERIALS, GENERAL                        |                   |                |                    |            | 1         |
| 2.2                     | TEMPORARY FIRST AID FACILITIES            |                   |                |                    |            | 1         |
| 2.3                     | TEMPORARY FIRE PROTECTION                 |                   |                |                    |            | 1         |
| 2.4                     | CONSTRUCTION AIDS                         |                   |                |                    |            | 3         |
| 2.5                     | SUPPORTS                                  |                   |                |                    |            | 4         |
| 2.6                     | TEMPORARY ENCLOSURES                      |                   |                |                    |            | 4         |
| 2.7                     | TEMPORARY WATER CONTROL                   |                   |                |                    |            | 5         |
| 2.8                     | TREE, PLANT AND LAWN PROTECTION           |                   |                |                    |            | 5         |
| 2.9                     | PERSONNEL, PUBLIC AND EMPLOYEE PROTECTION |                   |                |                    |            | 9         |
| 2.10                    | ACCESS ROADS AND PARKING AREAS            |                   |                |                    |            | 9         |
| 2.11                    | PROJECT IDENTIFICATION AND SIGNS          |                   |                |                    |            | 9         |
| 2.12                    | SECURITY                                  |                   |                |                    |            | 9         |
| 2.13                    | FIELD OFFICES                             |                   |                |                    |            | 9         |
| <b>3.0</b>              | <b>EXECUTION</b>                          |                   |                |                    |            | <b>10</b> |
| 3.1                     | PREPARATION                               |                   |                |                    |            | 10        |
| 3.2                     | GENERAL                                   |                   |                |                    |            | 10        |
| 3.3                     | REMOVAL                                   |                   |                |                    |            | 10        |

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| <b>SECTION 01 51 00</b> | <b>TEMPORARY UTILITIES.....</b>                 | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL.....</b>                             | <b>1</b> |
| 1.1                     | DESCRIPTION.....                                | 1        |
| 1.2                     | REQUIREMENTS OF REGULATORY AGENCIES.....        | 1        |
| <b>2.0</b>              | <b>PRODUCTS.....</b>                            | <b>1</b> |
| 2.1                     | MATERIALS, GENERAL .....                        | 1        |
| 2.2                     | TEMPORARY ELECTRICITY, LIGHTING AND WATER ..... | 1        |
| 2.3                     | TEMPORARY USE OF ELEVATOR .....                 | 2        |
| 2.4                     | TEMPORARY CONTRACTOR TELEPHONE SERVICE .....    | 3        |
| 2.5                     | TEMPORARY SANITARY FACILITIES .....             | 3        |
| <b>3.0</b>              | <b>EXECUTION .....</b>                          | <b>3</b> |
| 3.1                     | REMOVAL.....                                    | 3        |
| <b>SECTION 01 66 00</b> | <b>STORAGE AND PROTECTION .....</b>             | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL.....</b>                             | <b>1</b> |
| 1.1                     | DESCRIPTION.....                                | 1        |
| 1.2                     | TRANSPORTATION AND HANDLING .....               | 1        |
| 1.3                     | ON-SITE STORAGE.....                            | 1        |
| 1.4                     | CAMPUS SITE / BOOKBANK DRIVE STORAGE .....      | 2        |
| 1.5                     | PROTECTION.....                                 | 3        |
| 1.6                     | PROTECTION AFTER INSTALLATION .....             | 4        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED .....</b>                | <b>5</b> |
| <b>3.0</b>              | <b>EXECUTION – NOT USED .....</b>               | <b>5</b> |
| <b>SECTION 01 73 29</b> | <b>CUTTING, PATCHING AND REPAIRING.....</b>     | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL.....</b>                             | <b>1</b> |
| 1.1                     | DESCRIPTION.....                                | 1        |
| 1.2                     | SUBMITTALS .....                                | 2        |
| 1.3                     | QUALITY ASSURANCE .....                         | 2        |
| 1.4                     | WARRANTIES .....                                | 4        |
| <b>2.0</b>              | <b>PRODUCTS.....</b>                            | <b>4</b> |
| 2.1                     | MATERIALS.....                                  | 4        |
| <b>3.0</b>              | <b>EXECUTION .....</b>                          | <b>4</b> |
| 3.1                     | INSPECTION .....                                | 4        |
| 3.2                     | PREPARATION .....                               | 5        |
| 3.3                     | PERFORMANCE .....                               | 5        |
| 3.4                     | CLEANING .....                                  | 7        |

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| <b>SECTION 01 77 00</b> | <b>PROJECT CLOSEOUT</b>               | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL</b>                        | <b>1</b> |
| 1.1                     | INSPECTIONS                           | 1        |
| 1.2                     | SUBMITTALS                            | 2        |
| 1.3                     | FINAL CLEAN UP                        | 3        |
| 1.4                     | MAINTENANCE STOCK                     | 4        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED</b>            | <b>4</b> |
| <b>3.0</b>              | <b>EXECUTION – NOT USED</b>           | <b>4</b> |
| <b>SECTION 01 78 23</b> | <b>OPERATING AND MAINTENANCE DATA</b> | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL</b>                        | <b>1</b> |
| 1.1                     | DESCRIPTION                           | 1        |
| 1.2                     | FORM OF SUBMITTALS                    | 1        |
| 1.3                     | CONTENT OF MANUAL                     | 2        |
| 1.4                     | MANUAL FOR MATERIALS AND FINISHES     | 3        |
| 1.5                     | MANUAL FOR EQUIPMENT AND SYSTEMS      | 4        |
| 1.6                     | SUBMITTAL REQUIREMENTS                | 6        |
| 1.7                     | INSTRUCTIONS OF OWNER'S PERSONNEL     | 6        |
| 1.8                     | OPERATING INSTRUCTIONS                | 7        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED</b>            | <b>7</b> |
| <b>3.0</b>              | <b>EXECUTION – NOT USED</b>           | <b>7</b> |
| <b>SECTION 01 78 36</b> | <b>WARRANTIES AND BONDS</b>           | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL</b>                        | <b>1</b> |
| 1.1                     | DESCRIPTION                           | 1        |
| 1.2                     | SUMMARY                               | 1        |
| 1.3                     | DEFINITIONS                           | 1        |
| 1.4                     | QUALITY ASSURANCE                     | 2        |
| 1.5                     | WARRANTY REQUIREMENTS                 | 2        |
| 1.6                     | SUBMITTAL REQUIREMENTS                | 3        |
| 1.7                     | SUBMITTALS REQUIRED                   | 4        |
| <b>2.0</b>              | <b>PRODUCTS – NOT USED</b>            | <b>4</b> |
| <b>3.0</b>              | <b>EXECUTION</b>                      | <b>4</b> |
| 3.1                     | FORM OF SUBMITTALS                    | 4        |
| 3.2                     | TIME OF SUBMITTALS                    | 5        |

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| <b>SECTION 01 78 39</b> | <b>RECORD DOCUMENTS .....</b>             | <b>1</b> |
| <b>1.0</b>              | <b>GENERAL.....</b>                       | <b>1</b> |
| 1.1                     | DESCRIPTION.....                          | 1        |
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**SECTION 01 11 00 SUMMARY OF WORK**

**1.0 GENERAL**

**1.1 DESCRIPTION**

**A. Work to be Done**

1. Provide temporary partitions at work areas. Maintain proper egress at all times. Protect existing finishes to remain in work areas.
2. Demolish, remove, or salvage select existing construction. Demolish existing select finishes and select wall partitions. Demolish existing metal stair construction. Demolish existing ceiling grid and tile, lighting, and other ceiling mounted devices or equipment in select project areas. Demolish existing mechanical and electrical systems only as indicated on the Drawings.
3. Demolition includes hazardous materials abatement.
4. Provide structural steel framing, slab on deck, slab on grade, and other structural steel to accommodate new floor infills and repair to existing structural stair and rails.
5. Provide concrete sidewalk at building exterior and restore all site conditions.
6. Provide select partitions and finishes, including flooring, wall and ceiling paint, and new acoustical ceiling tile and grid. Provide new room signage.
7. Provide interior and exterior doors and frames, including access control and door position switches. Provide interior and exterior automatic overhead doors.
8. Provide miscellaneous plumbing work mainly associated with a new single stall restroom and added hose bib.
9. Provide Fire Protection system adjustments in select areas.
10. Provide limited mechanical work including duct adjustments, supply and exhaust work, dedicated vehicle exhaust fan and system, and system balancing.
11. Provide adjusted electrical systems in select areas required for a complete installation. This includes but is not limited to new LED lighting, adjustments to the Fire Alarm System, and power distribution.

**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. Owner will provide three (3) TV monitors to be installed as shown in the documents.
  1. Unload Owner Furnished Equipment at the job site using necessary care and equipment as required to handle the equipment in a safe manner.
  2. Use adequate numbers of skilled workers necessary to handle, receive and install Owner Furnished Equipment.
  3. Install Owner Furnished Equipment as called for in the Drawings or in these Specifications.
- B. 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.

C. 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 or other pre-determined area for the duration of the project. 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 1<sup>st</sup> 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. The Owner may designate an area for parking of essential Contractor vehicles on 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 (David Vanderpoorten) 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.
- 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. **Restricted Work Dates** (delivery & demolition restrictions but otherwise work as usual):

|                                 |                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------|
| Friday, Sunday May 22-24, 2026  | Commencement weekend - deliveries and work outside fence stop at noon                |
| Thursday, Sunday June 4-7, 2026 | Reunion guest arrivals - no work outside fence; no demo or utility work inside fence |

**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.

**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.    Allowance No. 1

Lump Sum Allowance: Include the sum of \$7,500 for fire caulking and sealing at existing rated wall construction perimeters or penetrations discovered during construction within the Project Areas. See Section 078412 Penetration Firestopping, Section 1.2, 2.0, and 3.7.

**\*\*\*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**

Ward High Bay BR10 - Paint additional High-Bay walls as indicated. See Drawings: A-300 Building Sections and A-301 Building Sections.

**B.     ALTERNATE NO. 2**

Ward High Bay BR10 – In lieu of demolition, existing east connecting stair as indicated shall remain. See Drawings: AD-100A – Demolition Plan – Basement, AD-101 – Demolition Plan – First Floor, A-100A – Construction Plan – Basement, and A-101 – Construction Plan – First Floor.

**\*\*\*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
- 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. Subcontractors as appropriate to the agenda
  6. Suppliers as appropriate to the agenda
  7. 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 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.

**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 apprised 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. The Contractor shall, within fourteen (14) calendar days of Notice to Proceed, prepare and submit to the Owner estimated construction progress schedules for the entire Work, with sub-schedules of related activities which are essential to the progress of the Work.
- B. Meetings will be held with the Architect, Owner and Contractor at the start of the project to agree mutually on a progress schedule which must be diligently followed.
- C. Submit revised progress schedules periodically and when requested to do so by Owner.
- D. Submit to Owner and Architect a cash flow projection in accordance with Schedule of Values.
- E. Submit electronic versions of all schedules, including updates, as well as all back-up to the submitted schedules.

**1.2 FORM OF SCHEDULES**

- A. Prepare Network Analysis system, or prepare schedules in the form of a horizontal bar chart.
  - 1. Provide separate horizontal bar for each trade or operation.
  - 2. Horizontal time scale: Identify the first day of work of each week.
  - 3. Scale and spacing: To allow space for notations and future revisions.
- B. Format of listings: The chronological order of the start of each item of work.
- C. Identification of listings: By specification section numbers.

**1.3 CONTENT OF SCHEDULES**

- A. Construction Progress Schedule:
  - 1. Show the complete sequence of construction by activity.
  - 2. Show the dates for the beginning, and completion of, each major element of construction. Specifically list:
    - a. Site clearing
    - b. Site utilities

- c. Foundation work
  - d. Structural framing
  - e. Subcontractor work
  - f. Equipment installations
  - g. Finishes
  - h. Pre-Installation meetings
- 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.
- B. Submittals Schedule for Shop Drawings, Product Data and Samples: 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.

#### **1.4 PROGRESS REVISIONS**

- A. Indicate progress of each activity to date of submission.
- B. 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
- C. Provide a narrative report as needed to define:
  - 1. Problem areas, anticipated delays, and the impact on the schedule.
  - 2. Corrective action recommended, and its effect.

3. The effect of changes on schedules of other prime contractors.

**1.5 SUBMISSIONS**

- A. Submit initial Construction Progress Schedules within fourteen (14) calendar days after award of Contract.
  1. Owner will review schedules and return review copy within ten (10) calendar days after receipt.
  2. If required, resubmit within seven (7) calendar days after return of review copy.
- B. Submit progress revision schedules to accompany each application for payment.
- C. Submit Submittals Schedule within thirty (30) calendar days after date of commencement of work.

**2.0 PRODUCTS - NOT USED**

**3.0 EXECUTION**

**3.1 DISTRIBUTION**

- A. Upload copies of the reviewed schedules to the ePM system and distribute to other applicable project participants.
- 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](mailto: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. Removal and disposal of asbestos containing material shall be performed by the Contractor in accordance with Division 2 specifications.

#### **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 MERCURY COLLECTION**

- A. Building may contain mercury. Mercury is a metal that is liquid at room temperature and is toxic to humans and the environment. Mercury can accumulate under laboratory benches and especially in the pipes in old laboratories. Dismantling old fixtures with care can prevent unnecessary spills. The Contractor shall protect workers in accordance with OSHA regulations. Mercury is regulated by OSHA and the EPA. If encountered, mercury shall be collected safely utilizing proper measures to prevent exposure and must be turned over to Cornell Environment, Health and Safety for disposal. **In the event of a spill, leave and secure the area, call Cornell Dispatch 255-1111 and request the campus Spill Response Team.**

**1.7     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.

**1.8     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\*\*\***



February 13, 2025

Mr. William Knapp  
Richard McElhiney Architects LLC  
450 Seventh Avenue Suite 2701  
New York, New York 10123

**Re: Ward Center (2061) New York Consortium for Space Technology (NYCST) Renovation Project**  
**XRF Lead Paint Sampling Report**  
**Delta Project No.: 2017.286.013**

Dear Mr. Knapp:

Attached, please find the Lead Paint Report Form for the XRF Lead Paint Sampling performed by Delta Representative Thomas Ferro. The sampling was performed on February 13<sup>th</sup>, 2025 and included representative sampling of painted components of the B00SC / 100SC stair system at the Ward Center to be demolished as a part of the upcoming NYCST Renovation Project. Based on a review of the scope detailed in the project 90% CD Drawing Set dated January 25, 2025 and visual inspection of the affected area, a total of thirteen (13) assays were taken (plus 6 “pre” and 6 “post” calibration assays). Results for all thirteen (13) assays were reported as being less than 1.0 mg/cm<sup>2</sup>.

**APPLICABLE STANDARDS/GUIDELINES:**

The standards used to identify lead-based paint for this survey were taken from the OSHA 1926.62 (Lead) Standard, modification of the guidelines established by the U.S. Department of Housing and Urban Development (HUD) as well as New York State regulations.

Occupational Safety and Health Administration (OSHA)

On May 4, 1993, OSHA promulgated the Lead Exposure in Construction Rule and codified the regulation in Title 29, CFR, Part 1926.62. This particular regulation applies to all construction activities involving potential lead exposures. This regulation defines construction work as “work for construction, alteration, and/or repair including painting and decorating”. It further states “the standard for the construction industry applies to all occupational exposure to lead in all construction work in which lead, in any **amount**, is present in an occupationally related context where the source of the lead is employment related, all exposure to lead is covered by the standard.”

U.S. Department of Housing and Urban Development (HUD)

The U.S. Department of Housing and Urban Development (HUD) defines the action level for lead-based paint as a lead content equal to or greater than 1.0 milligrams of lead per square centimeter of painted surface ( $\geq 1.0$  mg Pb/cm<sup>2</sup>) when measured with an XRF analyzer, or 0.5 percent by weight when chemically tested. This definition is described in the HUD "Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing, September 1990."

New York State

The State of New York's definition of the action level for lead-based paint is consistent with the level established by HUD. The State is in the process of adopting LBP regulations which are based on the HUD guidelines and currently enforces only licensing/certification requirements.

**SAMPLING METHODS/PROCEDURES:**

Delta performed sampling utilizing a HEURESIS Pb200i XRF Lead Paint Analyzer. The Lead Paint Analyzer is a state-of-the-art XRF spectrum analyzing system for the quantitative measurement of lead in paint on any surface. The LPA- 1 Analyzer uses a Co-57 radioactive source and an advanced, solid-state, room temperature, radiation detector to generate and detect the x-ray fluorescence spectrum of a painted surface. The x-ray fluorescence properties are determined through calibration process and are used for automatic substrate correction and calculation of the lead content of a painted surface. The HEURESIS Pb200i XRF Lead Paint Analyzer is operated with guidance from the Performance Characteristic Sheet<sup>1</sup> developed by *QuanTech, Inc.* under a contract from the U.S. Department of Housing and Urban Development (HUD). The instrument has an action level of 1.0 mg/cm<sup>2</sup> with results at or above this value classified as Lead-Based Paint as per the applicable HUD and NYS regulations referenced above. Results reported as greater than 0.0 mg/cm<sup>2</sup> are considered Lead-Containing Paint as per the OSHA standards.

Reference Attachment A for the XRF Report Form listing assay details. Delta Company/Personnel Licenses and Certificates are provided in Attachment B. If you have any questions, or require any other information, please feel free to contact me at your convenience.

Respectfully,

**DELTA ENGINEERS, ARCHITECTS, & SURVEYORS**



Stephen Prislupsky  
Director of Environmental Services  
*Att: Project Paperwork*

Attachment A

XRF Lead Paint Report Form



|                                                                                                         |                                            |                                             |
|---------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------|
| <b>Client:</b> <u>Richard McElhiney Architects</u>                                                      | <b>Client Project No.:</b> <u>N/A</u>      | <b>Delta Proj. No.:</b> <u>2017.286.013</u> |
| <b>Project:</b> <u>Ward Center NYS Consortium Research Renovation Project - XRF Lead Paint Sampling</u> | <b>Date's of Sampling:</b> <u>02/13/25</u> | <b>Inspector(s):</b> <u>Thomas Ferro</u>    |
|                                                                                                         | <b>Date of Report:</b> <u>02/13/2025</u>   | <b>Number of XRF Readings:</b> <u>25</u>    |

**Overall XRF Lead-Based Paint Sample Report Form**

| Sample ID No. | Building    | Room  | Floor | Wall | Test Location  | Color | Substrate | XRF Reading mg/cm <sup>2</sup> |
|---------------|-------------|-------|-------|------|----------------|-------|-----------|--------------------------------|
| 1             |             |       |       |      | Calibration    |       |           | 0.1                            |
| 2             |             |       |       |      | Calibration    |       |           | 0.0                            |
| 3             |             |       |       |      | Calibration    |       |           | 0.1                            |
| 4             |             |       |       |      | Calibration    |       |           | 1.0                            |
| 5             |             |       |       |      | Calibration    |       |           | 1.0                            |
| 6             |             |       |       |      | Calibration    |       |           | 0.9                            |
| 7             | Ward Center | B00SC | Bsmt. | D    | Floor          | Grey  | Concrete  | 0.1                            |
| 8             | Ward Center | B00SC | Bsmt. | D    | Wall           | Blue  | Concrete  | 0.0                            |
| 9             | Ward Center | B00SC | Bsmt. | A    | Wall           | Blue  | CMU       | 0.2                            |
| 10            | Ward Center | B00SC | Bsmt. | D    | Stair Stringer | Grey  | Metal     | 0.1                            |
| 11            | Ward Center | B00SC | Bsmt. | D    | Stair Riser    | Grey  | Metal     | 0.2                            |
| 12            | Ward Center | B00SC | Bsmt. | D    | Stair Tread    | Grey  | Metal     | 0.1                            |
| 13            | Ward Center | B00SC | Bsmt. | D    | Stair Railing  | Grey  | Metal     | 0.3                            |
| 14            | Ward Center | 100SC | 1     | D    | Stair Landing  | Grey  | Metal     | 0.2                            |

|                                                                                                         |                                            |                                             |
|---------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------|
| <b>Client:</b> <u>Richard McElhiney Architects</u>                                                      | <b>Client Project No.:</b> <u>N/A</u>      | <b>Delta Proj. No.:</b> <u>2017.286.013</u> |
| <b>Project:</b> <u>Ward Center NYS Consortium Research Renovation Project - XRF Lead Paint Sampling</u> | <b>Date's of Sampling:</b> <u>02/13/25</u> | <b>Inspector(s):</b> <u>Thomas Ferro</u>    |
|                                                                                                         | <b>Date of Report:</b> <u>02/13/2025</u>   | <b>Number of XRF Readings:</b> <u>25</u>    |

**Overall XRF Lead-Based Paint Sample Report Form**

| Sample ID No. | Building    | Room  | Floor | Wall | Test Location  | Color | Substrate | XRF Reading mg/cm <sup>2</sup> |
|---------------|-------------|-------|-------|------|----------------|-------|-----------|--------------------------------|
| 15            | Ward Center | 100SC | 1     | D    | Stair Stringer | Grey  | Metal     | 0.2                            |
| 16            | Ward Center | 100SC | 1     | D    | Stair Tread    | Grey  | Metal     | 0.1                            |
| 17            | Ward Center | 100SC | 1     | D    | Stair Riser    | Grey  | Metal     | 0.3                            |
| 18            | Ward Center | 100SC | 1     | D    | Stair Railing  | Grey  | Metal     | 0.1                            |
| 19            | Ward Center | 100SC | 2     | D    | Stair Landing  | Grey  | Metal     | 0.2                            |
| 20            |             |       |       |      | Calibration    |       |           | 0.1                            |
| 21            |             |       |       |      | Calibration    |       |           | 0.0                            |
| 22            |             |       |       |      | Calibration    |       |           | 0.0                            |
| 23            |             |       |       |      | Calibration    |       |           | 1.0                            |
| 24            |             |       |       |      | Calibration    |       |           | 1.0                            |
| 25            |             |       |       |      | Calibration    |       |           | 1.0                            |

## Attachment B

### Company and Personnel Licenses/Certifications







UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

June 21, 2022

William Johnson  
Delta Engineers, Architects & Land Surveyors, P.C.  
860 Hooper Road  
Endwell, NY 13760

OFFICE OF CHEMICAL SAFETY  
AND POLLUTION PREVENTION

Dear William Johnson:

Thank you for applying to the U.S. Environmental Protection Agency (EPA) for certification to conduct Lead-based Paint Activities in target housing and child-occupied facilities. I am pleased to inform you that, pursuant to 40 CFR Part 745, Subpart L, your lead-based paint activities firm is certified. Your certificate is enclosed.

This certification **expires on August 10, 2025 and is valid in All EPA Administered States, Tribes, and Territories**. However, if a State in which you are certified obtains program authorization during the term of this certification, the scope of your certification will be diminished to exclude the affected area.

Your EPA firm certification is subject to the following restrictions:

- 1) Individual states and Indian tribes, whether authorized or not, are not required to accept EPA certification and may accept or reject it under its own authority. Please be aware that your EPA certification does not relieve you of any obligations you may have to any State or Indian tribe regarding lead-based paint activities.
- 2) EPA certification is specific and limited as described above. If you wish to obtain certification in other lead-based paint disciplines, you must apply separately.
- 3) In advertising the EPA certification, firms must indicate clearly that the firm is certified only for purposes of Section 402 of TSCA. Failure to accurately state EPA certification conditions could result in EPA suspending or withdrawing certification.
- 4) EPA may conduct audits and/or inspections to ensure continued compliance with regulatory standards, and may revoke or suspend its certification if subsequent alterations or deviations result with the firm no longer meeting the standards found at 40 CFR Part 745, Subpart L.

If you have questions about the lead-based paint activities rule or need assistance, please contact the Regional Lead Coordinator, Tracy Truesdale, of the EPA Region 2 staff at 732-906-6855. If you have any questions about your firm certification, please contact the National Lead Information Center at 1-800-424-LEAD and refer to **Application ID number A806350**. Congratulations, and thank you for your interest in being a certified abatement firm.

Sincerely,

A handwritten signature in black ink, appearing to read "Michelle Price", is positioned above the typed name.

Michelle Price, Chief  
Lead, Heavy Metals, and Inorganics Branch

Enclosures

# United States Environmental Protection Agency

This is to certify that

Delta Engineers, Architects & Land Surveyors, P.

C.

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires August 10, 2025

LBP-68796-3

Certification #

June 16, 2022

Issued On



A handwritten signature in black ink, appearing to read "Michelle Price".

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

# United States Environmental Protection Agency

This is to certify that



Thomas P Ferro

Risk Assessor

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

**In the Jurisdiction of:**

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires November 13, 2026

LBP-R-1218480-2

Certification #

September 09, 2022

Issued On



Adrienne Priselac, Manager, Toxics Office

Land Division



# "REVISED" Limited Pre-Renovation Asbestos Survey Report

Performed at  
Cornell University Frank HT Rhodes Hall (2051)

for the  
Ward Center New York Consortium for Space Technology  
(NYCST) Renovation Project  
Cornell University Ithaca, New York Campus



Prepared for:  
**Richard McElhiney Architects LLC**  
450 Seventh Avenue, Suite 2701  
New York, NY 10123

Prepared by:  
**DELTA**  
ENGINEERS, ARCHITECTS, & SURVEYORS  
860 Hooper Road  
Endwell, NY 13760  
Tel: 607-231-6600 Fax: 607-231-6640  
[www.delta-eas.com](http://www.delta-eas.com)  
Delta Project No. 2017.286.013

Field work performed by: Thomas P. Ferro  
February 5<sup>th</sup>, 2025

Report prepared by: Thomas P. Ferro

Report reviewed by: Stephen Prislupsky

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## **1.0 INTRODUCTION:**

Delta Engineers, Architects, & Surveyors (Delta) was contracted by Richard McElhiney Architects to perform a Pre-Renovation Asbestos Survey at the Cornell University Frank HT Rhodes Hall (Building 2051) located on the Cornell University Ithaca, New York Campus. This survey is being performed in support of the upcoming Ward Center New York Consortium for Space Technology (NYCST) Renovation Project. This Survey addressed accessible suspect building materials present within the Rhodes Hall Renovation Areas as per the 90% CD Construction Documents Drawing Set (dated January 24, 2025) provided by Richard McElhiney Architects and included the Basement Rooms B40, B30 and the adjacent Corridor Overhead Door. Reference Appendix E for the RMA drawing showing Rooms / Spaces included in the Survey.

The initial stage of the survey included a review of past sample information for the building. Bulk sample results through previous Delta and other Cornell Consultant sampling efforts have been incorporated into this Survey and associated Survey Report where applicable.

On February 5<sup>th</sup>, 2025 Delta Certified Inspector Thomas Ferro conducted a walkthrough of the renovation area spaces/rooms to identify the various accessible suspect materials present. Based on a visual inspection of the affected areas and existing sample information for the building, a total of two (2) bulk samples were collected representing one (1) suspect homogenous building material. Both samples collected were non-friable organically bound (NOB).

In addition to the samples collected above, other accessible suspect homogenous materials were observed to be present in the Project Renovation Areas but not sampled as they were addressed through previous sampling efforts. For the previously sampled materials, the results from the previous Surveys have been incorporated into this report. The suspect homogenous building materials identified and/or sampled in the affected project renovation areas included the following:

### Homogenous

| Area (HA) | Suspect Building Material              |
|-----------|----------------------------------------|
| 01        | Exterior Caulk from Overhead Door Trim |
| 02*       | Black w/ White 12" x 12" Floor Tile    |
| 03*       | Mastic from HA 02* Floor Tile          |
| 04*       | Grey Cove Base                         |
| 05*       | Cove Base Mastic                       |

\* - Materials previously sampled by Delta or Other Cornell Consultants. Results for previously sampled materials are available through Delta EAS or the Cornell Asbestos Program

Specific information required by 12 NYCRR Part 56-5.1, (f) – “Building/Structure Asbestos Survey Information” to be included in this pre-renovation report is as follows:

**1) Building Name/Address:** Frank HT Rhodes Hall (Building 2051)  
136 Hoy Road  
Cornell University Ithaca Campus  
City of Ithaca, NY 14850

- 2) Owner's Name/Address: Cornell University  
Humphreys Service Building  
Ithaca, NY 14853
- 3) Owner's Agent: Mr. William Knapp, Richard McElhiney Architects
- 4) Survey Performed By: Delta Engineers, Architects, & Surveyors  
860 Hooper Road, Endwell, NY 13760
- 5) Certified Inspectors: Thomas P. Ferro, Certificate No. 24-61U5N-SHAB
- 6) Dates of Survey: February 5<sup>th</sup>, 2025
- 7) Laboratory: America Science Team New York, Inc.  
117 East 30<sup>th</sup> Street, New York, NY 10016



## **2.0 ASBESTOS SURVEY AND SAMPLING PROCEDURES AND METHODS:**

### **2.1 Survey requirements**

Requirements to perform Pre-Demolition/Pre-Renovation Asbestos Surveys are based on the following State and Federal Regulations.

**Occupational Safety and Health Administration (OSHA):** OSHA survey requirements and sampling protocols are included in 29 CFR Part 1910.1001(j)(2) & (j)(8) and 29 CFR Part 1926.1101(k),(5):

29 CFR Part 1910.1001(j)(2), Installed Asbestos Containing Material: Employers and building owners are required to treat installed TSI and sprayed on and troweled-on surfacing materials as ACM in buildings constructed no later than 1980 for purposes of this standard. These materials are designated "presumed ACM or PACM", and are defined in paragraph (b) of this section. Asphalt and vinyl flooring material installed no later than 1980 also must be treated as asbestos-containing. The employer or building owner may demonstrate that PACM and flooring material do not contain asbestos by complying with paragraph (j)(8)(iii) of this section.

29 CFR Part 1910.1001(j)(8), Criteria to rebut the designation of installed material as PACM:

1910.1001(j)(8)(i) - At any time, an employer and/or building owner may demonstrate, for purposes of this standard, that PACM does not contain asbestos. Building owners and/or employers are not required to communicate information about the presence of building material for which such a demonstration pursuant to the requirements of paragraph (j)(8)(ii) of this section has been made. However, in all such cases, the information, data and analysis supporting the determination that PACM does not contain asbestos, shall be retained pursuant to paragraph (m) of this section.

1910.1001(j)(8)(ii) - An employer or owner may demonstrate that PACM does not contain asbestos by the following:

1910.1001(j)(8)(ii)(A) - Having a completed inspection conducted pursuant to the requirements of AHERA (40 CFR 763, Subpart E) which demonstrates that no ACM is present in the material; or

1910.1001(j)(8)(ii)(B) - Performing tests of the material containing PACM which demonstrate that no ACM is present in the material. Such tests shall include analysis of bulk samples collected in the manner described in 40 CFR 763.86. The tests, evaluation and sample collection shall be conducted by an accredited inspector or by a CIH. Analysis of samples shall be performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP) or the National Institute for Standards and Technology (NIST) or the Round Robin for bulk samples administered by the American Industrial Hygiene Association (AIHA) or an equivalent nationally-recognized round robin testing program.

1910.1001(j)(8)(iii) - The employer and/or building owner may demonstrate that flooring material including associated mastic and backing does not contain asbestos, by a determination of an industrial hygienist based upon recognized analytical techniques showing that the material is not ACM.

29 CFR Part 1926.1101(k)(5), Criteria to rebut the designation of installed material as PACM:

1926.1101(k)(5)(i) - At any time, an employer and/or building owner may demonstrate, for purposes of this standard, that PACM does not contain asbestos. Building owners and/or employers are not required to communicate information about the presence of building material for which such a demonstration pursuant to the requirements of paragraph (k)(5)(ii) of this section has been made. However, in all such cases, the information, data and analysis supporting the determination that PACM does not contain asbestos, shall be retained pursuant to paragraph (n) of this section.

1926.1101(k)(5)(ii) - An employer or owner may demonstrate that PACM does not contain more than 1 percent asbestos by the following:

1926.1101(k)(5)(ii)(A) - Having a completed inspection conducted pursuant to the requirements of AHERA (40 CFR Part 763, Subpart E) which demonstrates that the material is not ACM; or

*1926.1101(k)(5)(ii)(B) - Performing tests of the material containing PACM which demonstrate that no ACM is present in the material. Such tests shall include analysis of bulk samples collected in the manner described in 40 CFR 763.86. The tests, evaluation and sample collection shall be conducted by an accredited inspector or by a CIH. Analysis of samples shall be performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP) or the National Institute for Standards and Technology (NIST) or the Round Robin for bulk samples administered by the American Industrial Hygiene Association (AIHA) or an equivalent nationally-recognized round robin testing program.*

*1926.1101(k)(5)(iii) - The employer and/or building owner may demonstrate that flooring material including associated mastic and backing does not contain asbestos, by a determination of an industrial hygienist based upon recognized analytical techniques showing that the material is not ACM.*

**EPA National Emissions Standard for Hazardous Air Pollutants (NESHAPs):** (NESHAPs) regulates asbestos under “40 CFR Part 61, Subpart M - National Emission Standard for Asbestos”. Subpart M regulates demolition and/or renovation of “facilities” that may contain asbestos-containing materials (ACMs). “Facilities,” as defined by NESHAPs, includes any institutional, commercial, public, industrial, or residential structure or building, *except* residential buildings having four or fewer units. ACMs are defined in NESHAPs as materials containing more than 1 percent asbestos. Section 61.145 states:

**61.145 Standard for demolition and renovation.**

*(a) Applicability. To determine which requirements of paragraphs (a), (b), and (c) of this section apply to the owner or operator of a demolition or renovation activity and prior to the commencement of the demolition or renovation, thoroughly inspect the affected facility or part of the facility where the demolition or renovation operation will occur for the presence of asbestos, including Category I and Category II nonfriable ACM.*

It should be noted that 40 CFR Part 1 Subpart M, NESHAPS has no cut-off date exempting survey requirements.

**New York State Department of Labor (NYS DOL):** Guidelines followed for the inspection are those established by the NYS DOL’s Industrial Code Rule 56 (Cited as 12 NYCRR Part 56, as amended, adopted January 11, 2006; effective September 5, 2006). The specific survey, sampling and reporting requirements included in 12 NYCRR Part 56-5.1(e) – “Building/Structure Asbestos Survey Requirements” include:

**56-5.1 Asbestos Survey Requirements for Building/Structure Demolition, Renovation, Remodeling and Repair**

**(a) Asbestos Survey Required.** An owner or an owner’s agent, except the owner of one and two-family dwellings who contracts for, but does not direct or control the work, shall cause to be conducted, an asbestos survey completed by a licensed asbestos contractor using inspectors certified in compliance with Section 56-3.2(d), to determine whether or not the building or structure, or portion(s) thereof to be demolished, renovated, remodeled, or have repair work, contains ACM, PACM or asbestos material. This asbestos survey shall be completed and submitted as indicated in Subdivision (g) of this Section, prior to commencing work. All such asbestos surveys shall be conducted in conformance with the requirements of Subdivision (e) of this Section.

(b) **Exemptions to Asbestos Survey Requirements:** The asbestos survey required by this Subdivision (a) of this Section shall not be required for the following classes of buildings or structures:

- (1) An agricultural building;
- (2) Buildings or structures for which original construction commenced on or after January 1, 1974;
- (3) A structure certified in writing to be structurally unsound by a licensed Professional Engineer, Registered Architect, Building Inspector, Fire Inspector or other official of competent jurisdiction. (See Section 56-11.5)

(c) **Building/Structure Demolition.** If a building/structure asbestos survey is not required or performed per Subdivision (b) of this Section, and the building/structure is certified to be unsound or slated for contracted demolition, the building/structure shall be assumed to contain asbestos, and shall be demolished per this Part, unless the building/structure is adequately certified to be free of asbestos containing material. Acceptable documentation for certification shall be a previous thorough building/structure asbestos survey, abatement records or other documentation acceptable to the Commissioner or his or her representative.

(d) **Responsibility to Comply.** No exemption to the requirement to conduct an asbestos survey shall exempt any person, asbestos contractor, property owner or business entity from the inspection or asbestos survey requirements of EPA, OSHA, and any other applicable section of this Part.

(e) **Building/Structure Asbestos Survey Requirements.** The asbestos survey shall include a thorough inspection for and identification of all PACM, suspect miscellaneous ACM, or asbestos material throughout the building/structure or portion thereof to be demolished, renovated, remodeled, or to have repair work. The required inspection shall be performed by a certified asbestos inspector, and, at a minimum, shall include identification of PACM, suspect miscellaneous ACM or asbestos material by all of the following methods:

- (1) The review of building/structure plans and records, if available, for references to asbestos, ACM, PACM, suspect miscellaneous ACM or asbestos material used in construction, renovation or repair; and
- (2) A visual inspection for PACM and suspect miscellaneous ACM throughout the building/structure or portion thereof to be demolished, renovated, remodeled, or repaired. For the purpose of this Part, all PACM and suspect miscellaneous ACM visually assessed shall be treated and handled as ACM and shall be assumed to be ACM, unless bulk sampling is conducted as per this Section, standard EPA and OSHA accepted methods, including multi-layered systems sampling protocols; the subsequent analyses are performed by a laboratory that meets the requirements of Section 56-4.2 of this Part; and the analyses satisfies both ELAP and federal requirements, including multi-layered sample analyses, to document non-asbestos containing material.

(f) **Building/Structure Asbestos Survey Information.**

(1) The asbestos survey shall, at a minimum, identify and assess with due diligence, the locations, quantities, friability and conditions of all types of installations at the affected portion of the building/structure relative to the ACM, suspect miscellaneous ACM, PACM or asbestos material contained therein. The following list is not inclusive of all types of ACMs, it only summarizes typical

ACMs. The certified asbestos inspector is responsible for identification and assessment of all types ACM, PACM, suspect miscellaneous ACM and asbestos material within the affected portion of the building/structure:

**PACM**

**(i) Surfacing Treatments:**

- (a) Fireproofing;
- (b) Acoustical Plaster;
- (c) Finish Plasters; and
- (d) Skim Coats of Joint Compound.

**(ii) Thermal System Insulation:**

- (a) Equipment Insulation;
- (b) Boiler, Breeching, Boiler Rope, Duct, or Tank Insulation, Cement or Mortar Used for Boilers and Refractory Brick;
- (c) Piping and Fitting Insulations including but not limited to, Wrapped Paper, Aircell, Millboard, Rope, Cork, Preformed Plaster, Job Molded Plaster and coverings over fibrous glass insulation.

**SUSPECT MISCELLANEOUS ACM**

**(i) Roofing and Siding Miscellaneous Materials:**

- (a) Insulation Board;
- (b) Vapor Barriers;
- (c) Coatings;
- (d) Non-Metallic or Non-Wood Roof Decking
- (e) Felts;
- (f) Cementitious Board (Transite);
- (g) Flashing;
- (h) Shingles; and
- (i) Galbestos.

**(ii) Other Miscellaneous Materials:**

- (a) Dust and Debris;
- (b) Floor Tile;
- (c) Cove Base;
- (d) Floor Leveler Compound;
- (e) Ceiling Tile;
- (f) Vermiculite Insulation
- (g) Gaskets, Seals, Sealants (including for condensate control);
- (h) Vibration Isolators;
- (i) Laboratory Tables and Hoods;
- (j) Chalkboards;
- (k) Pipe Penetration Packing or Other Firestopping Materials
- (l) Cementitious Board;
- (m) Electrical Wire Insulation;
- (n) Fire Curtains;
- (o) Fire Blankets;
- (p) Fire Doors;
- (q) Brakes and Clutches;
- (r) Mastics, Adhesives and Glues;

- (s) Caulks;
- (t) Sheet Flooring (Linoleum);
- (u) Wallpaper;
- (v) Drywall;
- (w) Plasterboard
- (x) Spackling/Joint Compound;
- (y) Textured Paint;
- (z) Grout;
- (aa) Glazing Compound; and
- (ab) Terrazzo.

(2) All ACM, PACM, suspect miscellaneous ACM, or asbestos material reported under Paragraph (1) of this Subdivision shall include the location of the materials, an estimate of the quantities, types, friability and condition of the identified materials to be treated and handled as ACM. For the purpose of this Part, all PACM and suspect miscellaneous ACM visually assessed shall be treated and handled as ACM and shall be assumed to be ACM, unless bulk sampling is conducted as per this Section, standard EPA and OSHA accepted methods, including multilayered systems sampling protocols; the subsequent analyses are performed by a laboratory that meets the requirements of Section 56-4.2 of this Part; and the analyses satisfies both ELAP and federal requirements, including multi-layered sample analyses, to document non-asbestos containing material.

(3) The building/structure asbestos survey shall also include the building/structure name, address, the building/structure owner's name and address, the name and address of the owner's agent, the name of the firm performing the asbestos survey and a copy of the firm's current asbestos handling license, the names of the certified inspector(s) performing the survey and a copy of the current asbestos handling certificate for each inspector utilized, the dates of the asbestos survey, a listing of homogeneous areas identifying which ones are ACM, all laboratory analyses reports for bulk samples collected, and copies of the appropriate certifications for the laboratory used for analysis of samples taken during the asbestos survey.

**(g) Transmittal of Building/Structure Asbestos Survey Information.** One (1) copy of the results of the building/structure asbestos survey shall be immediately transmitted by the building/structure owner as follows:

- (1) One (1) copy of the completed asbestos survey shall be sent by the owner or their agent to the local government entity charged with issuing a permit for such demolition, renovation, remodeling or repair work under applicable State or local laws.
- (2) The completed asbestos survey for controlled demolition (as per Subpart 56-11.5) or pre-demolition asbestos projects shall also be submitted to the appropriate Asbestos Control Bureau district office.
- (3) The completed asbestos survey shall be kept on the construction site with the asbestos notification and variance, if required, throughout the duration of the asbestos project and any associated demolition, renovation, remodeling or repair project.

**(h) Removal Required.** If the building/structure asbestos survey finds that the portion of the building/structure to be demolished, renovated, remodeled, or have repair work contains ACM,



PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material, which is impacted by the work, the owner or the owner's agent shall conduct, or cause to have conducted, asbestos removal performed by a licensed asbestos abatement contractor in conformance with all standards set forth in this Part. All ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material impacted by the demolition, renovation, remodeling or repair project shall be removed as per this Part, prior to access or disturbance by other uncertified trades or personnel. No demolition, renovation, remodeling or repair work shall be commenced by any owner or the owner's agent prior to the completion of the asbestos abatement in accordance with the notification requirements of this Part. For multi-phased work, the access restriction for uncertified trades or personnel applies to each intermediate portion of the entire project. Upon completion of the intermediate portion of the asbestos project, other trades or personnel may access that portion of the work site.

For demolition projects that are exempt from asbestos survey requirements due to being structurally unsound, the demolition is considered an asbestos project and shall proceed as per Section 56-11.5.

(1) All building/structure owners and asbestos abatement contractors on a demolition, renovation, remodeling, or repair project, which includes work covered by this Part, shall inform all trades on the work site about PACM, ACM, asbestos material and suspect miscellaneous ACM assumed to be ACM at the work site.

(i) **Bidding.** Bids may be advertised and contracts awarded for demolition, remodeling, renovation, or repair work, but no work on the current intermediate portion of the project shall commence on the demolition, renovation, remodeling or repair work by any owner or agent prior to completion of all necessary asbestos abatement work for the current intermediate portion of the entire project, in conformance with all standards set forth in this Part.

(j) **Unidentified and Unassessed Asbestos.** When any construction activity, such as demolition, remodeling, renovation or repair work, reveals PACM or suspect miscellaneous ACM that has not been identified by the asbestos survey per this Part, or has not been identified by other inspections as per current OSHA or EPA requirements, all activities shall cease in the area where the PACM or suspect miscellaneous ACM is found and the Asbestos Control Bureau shall be notified by telephone by the building/structure owner or their representative, followed with a written notice in accordance with the notification requirements of this Part. Unassessed PACM or suspect miscellaneous ACM shall be treated and handled as ACM and assumed to be ACM, unless proven otherwise by standard EPA and OSHA accepted methods, including multi-layered systems sampling protocols; subsequent analyses performed by a laboratory that meets the requirements of Section 56-4.2 of this Part; and the analyses satisfies both NYS ELAP and federal requirements, including multi-layered sample analyses, to document non-asbestos containing material.

## **2.2 Sample Analysis**

Bulk sample analysis was performed by American Science Team New York Inc., an independent laboratory approved/accredited by the NYS Department of Health (ELAP), the American Industrial Hygiene Association (AIHA), and the National Voluntary Laboratory Accreditation Program (NVLAP).

Samples collected during the course of this survey fell into one of two categories. The first category includes non-friable organically bound (NOB) materials. These materials are those which have an organic binder in their matrix and include items such as floor tiles, sheet flooring, mastics, glazings, caulks and roofing materials. The second category includes non-NOB “friable” materials including parging, sheetrock, joint compound, wall insulations, and wallboard.

Analysis of all “NOB” materials was initially performed by Polarized Light Microscopy (PLM) following the New York State Department of Health ELAP 198.6 Gravimetric Reduction Methodology. If a given sample was reported as non-asbestos following this analysis, it was then analyzed by Transmission Electron Microscopy (TEM) following the NYS DOH ELAP 198.4 Methodology.

Analysis of all “non-NOB” materials was performed by Polarized Light Microscopy (PLM) following the EPA 600/M4/82/020 and the NYS DOH ELAP 198.1 Methodologies.

### ***2.3 Materials not sampled***

There were several materials present at the site which were not considered “suspect” by the inspector and were not sampled. These included various fiberglass, foam, vinyl, silicone, wood/cellulose products and concrete/cinder block/brick components. All countertop and tabletops were observed to be non-suspect. The fume hood was non-suspect stainless steel. No mastics were observed on the countertops or tabletops. All shelving and wall standards were observed to be mechanical fastened. All wiring was observed to be non-suspect vinyl wire wrap.

### **3.0 SURVEY FINDINGS AND CONCLUSIONS**

#### **3.1) Rhodes Hall Pre-Renovation Asbestos Survey for the Ward Center New York Consortium for Space Technology (NYCST) Renovation Project, Non-Asbestos Materials –**

Based on previous sample results and results reported for samples collected during this Survey of accessible suspect materials present in the Rhodes Hall NYCST Project Renovation Areas, the following were identified as being non-asbestos:

Homogenous

| Area (HA) | Non-Asbestos Material                  |
|-----------|----------------------------------------|
| 01        | Exterior Caulk from Overhead Door Trim |
| 02*       | Black w/ White 12" x 12" Floor Tile    |
| 03*       | Mastic from HA 02* Floor Tile          |
| 04*       | Grey Cove Base                         |
| 05*       | Cove Base Mastic                       |

\* - Materials previously sampled by Delta or Other Cornell Consultants. Results for previously sampled materials are available through Delta EAS or the Cornell Asbestos Program

#### **3.2) Rhodes Hall Pre-Renovation Asbestos Survey for the Ward Center New York Consortium for Space Technology (NYCST) Renovation Project, Asbestos Containing Materials –**

B Based on previous sample results and results reported for samples collected during this Survey of accessible suspect materials present in the Rhodes Hall NYCST Project Renovation Areas, **NONE** were identified as being asbestos-containing.

#### **3.3) Rhodes Hall Pre-Renovation Asbestos Survey for the Ward Center New York Consortium for Space Technology (NYCST) Renovation Project, Non-Suspect Materials:**

Non-suspect materials observed to be present within the renovation areas included the following:

- All accessible in-line pipe insulation was observed to be covered with non-suspect fiberglass / foam.
- Door core material was observed to be non-suspect fiberglass.
- All ductwork was observed to be either un-insulated or covered with non-suspect fiberglass.
- Vinyl-coated fiberglass panel partition wall system (with metal cove)
- Vinyl wire wrap.



#### **4.0 INACCESSIBLE AREAS**

Renovation spaces and areas which were visible and accessible were inspected and sampled as a part of this survey. Inaccessible areas such as wall chases/interstitial wall space, hard ceiling plenum spaces, and enclosed pipe chases could not be inspected without select demolition. Based on the fact that the building was occupied at the time of the survey, the inaccessible areas were not included as a part of this survey. Any materials encountered in those areas not accessible shall be assumed ACM until tested. As stated above, this survey was limited to only those spaces / areas and associated accessible suspect materials present in the Project Renovation Areas.



## **APPENDIX A**

### **Asbestos Bulk Sample Report Form**



| <b>Client:</b> <u>Richard McElhiney Architects</u>                                                                         |  | <b>Client Project No.:</b> <u>N/A</u>              |       | <b>Delta Proj. No.:</b> <u>2017.286.013</u>                 |               |               |                       |                       |
|----------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------------|-------|-------------------------------------------------------------|---------------|---------------|-----------------------|-----------------------|
| <b>Project:</b> <u>Ward Center NYS Consortium Research Renovation Project Pre-Renovation Asbestos Survey - RHODES HALL</u> |  | <b>Dates Sampling Performed:</b> <u>02/05/2025</u> |       | <b>Asbestos Inspectors:</b> <u>Thomas Ferro</u>             |               |               |                       |                       |
|                                                                                                                            |  | <b>Date of Report:</b> <u>02/13/2025</u>           |       | <b>Number of Samples Collected:</b> <u>2</u>                |               |               |                       |                       |
| <b>Building Code:</b> <u>2051</u>                                                                                          |  | <b>Laboratory:</b> <u>AmeriSci Labs</u>            |       | <b>Number of Samples Analyzed:</b> <u>PLM - 2 / TEM - 2</u> |               |               |                       |                       |
| <b>Asbestos Bulk Sample Report Form</b>                                                                                    |  |                                                    |       |                                                             |               |               |                       |                       |
| Sample Number                                                                                                              |  | HA*                                                | Floor | Bulk Sample Description / Details                           | Material Type | Asbestos Type | PLM Result % Asbestos | TEM Result % Asbestos |
| 2017.286 013 - 101A                                                                                                        |  | 101                                                | Bsmt  | Exterior Caulk, Overhead Door Trim                          | Misc.         | ND            | ND                    | ND                    |
| 2017.286 013 - 101B                                                                                                        |  | 101                                                | Bsmt  | Exterior Caulk, Overhead Door Trim                          | Misc.         | ND            | ND                    | ND                    |

**HA** - Homogenous Area      **ND** - No Asbestos Detected      **NA** - Not Analyzed by Methodology      **NA/PS** - Not Analyzed, Positive Stop  
**TSI** - Thermal System Insulation      **Misc** - Miscellaneous Material      **Trace / < 1%** - Non-asbestos by definition



## **APPENDIX B**

### **Laboratory Analytical Results**





**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** 2/6/2025 **AmeriSci Job #** 225021361  
**Date Examined** 02/06/25 **P.O. #**  
**ELAP #** 11480 **Page** 1 **of** 1  
**RE:** 2017.286.013; R. McElhiney Arch.; Rhodes Hall Garage  
Renovations Asbestos Bulk Sampling

| Client No. / HGA                                                                                                                                                                                                                          | Lab No.      | Asbestos Present | Total % Asbestos                                                               | Notes |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|--------------------------------------------------------------------------------|-------|
| 2017.286.013-101A<br>101<br><b>Location:</b> Bsmt / Overhead Door Trim - Exterior Caulk<br><b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 8.8% | 225021361-01 | <b>No</b>        | Inconclusive - NAD<br>(NOB by NYS ELAP 198.6)<br>by Kensen Caro<br>on 02/06/25 | 1     |
| 2017.286.013-101B<br>101<br><b>Location:</b> Bsmt / Overhead Door Trim - Exterior Caulk<br><b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 6.5% | 225021361-02 | <b>No</b>        | Inconclusive - NAD<br>(NOB by NYS ELAP 198.6)<br>by Kensen Caro<br>on 02/07/25 | 1     |

**Reporting Notes:**

(1) NAD results by NYS 198.6 are inconclusive and are not considered non-ACM

Analyzed by: Kensen Caro  
Date: 2/6/2025

Reviewed by: Karol H. Lu

\*NAD/NSD =no asbestos detected; NA =not analyzed; NAPS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229003, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); 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. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

\_\_\_\_\_  
END OF REPORT



Table I  
Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4  
2017.286.013; R. McElhiney Arch.; Rhodes Hall Garage Renovations Asbestos Bulk Sampling

| 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                                                   | 2017.286.013-101A | 101     | 0.126                    | 68.5                         | 22.7                         | 8.8                                    | NAD                     | NAD                  |
| Location: Bsmt / Overhead Door Trim - Exterior Caulk |                   |         |                          |                              |                              |                                        |                         |                      |
| 02                                                   | 2017.286.013-101B | 101     | 0.158                    | 70.9                         | 22.6                         | 6.5                                    | NAD                     | NAD                  |
| Location: Bsmt / Overhead Door Trim - Exterior Caulk |                   |         |                          |                              |                              |                                        |                         |                      |

Analyzed by: Khaalid W. Perine  
Date: 2/7/2025



Reviewed by: Karol H. Lu



\*\*Quantitative Analysis (Semi/Full): Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = < 1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; 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): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

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).



860 Hooper Road, Endwell, NY 13760 Tel: 607.231.6600 Fax 607.231.6640  
[www.delta-eas.com](http://www.delta-eas.com)

# 2 2 5 0 2 1 3 6 1

|                                                                       |                                        |                                 |
|-----------------------------------------------------------------------|----------------------------------------|---------------------------------|
| <b>Client:</b> R. McElhiney Arch.                                     | <b>Delta Project No.:</b> 2017.286.013 | <b>Date:</b> 2/5/2025           |
| <b>Project:</b> Rhodes Hall Garage Renovations Asbestos Bulk Sampling | <b>Client Project No.:</b>             | <b>Turnaround Time:</b> 24 hour |
| <b>Collected By:</b> Thomas Ferro                                     |                                        |                                 |

| Sample Number       | Material Type | Material Condition | Floor | Description / Sample Location      |
|---------------------|---------------|--------------------|-------|------------------------------------|
| 2017.286 013 - 101A | Misc.         | Intact             | Bsmt  | Exterior Caulk, Overhead Door Trim |
| 2017.286 013 - 101B | Misc.         | Intact             | Bsmt  | Exterior Caulk, Overhead Door Trim |
|                     |               |                    |       |                                    |
|                     |               |                    |       |                                    |
|                     |               |                    |       |                                    |
|                     |               |                    |       |                                    |
|                     |               |                    |       |                                    |
|                     |               |                    |       |                                    |
|                     |               |                    |       |                                    |
|                     |               |                    |       |                                    |

**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@delta-eas.com](mailto:wjohnson@delta-eas.com), [sprislupsky@delta-eas.com](mailto:sprislupsky@delta-eas.com), [rcherevko@delta-eas.com](mailto:rcherevko@delta-eas.com)

**Notes:** \_\_\_\_\_

|                                    |                           |
|------------------------------------|---------------------------|
| <b>Submitted By:</b> Thomas Ferro  | <b>Date:</b> 2/5/2025     |
| <b>Received By:</b> Justin Vertich | <b>Date:</b> 2/6/25 10:18 |

(Signature) (Signature)

## **APPENDIX C**

### **Delta Engineers, Architects, & Land Surveyors Company and Personnel Certifications**



**WE ARE YOUR DOL**



DIVISION OF SAFETY & HEALTH LICENSE AND CERTIFICATE UNIT, STATE OFFICE CAMPUS, BLDG. 12, ALBANY, NY 12226

# ASBESTOS HANDLING LICENSE

Delta Engineers, Architects, Land Surveyors, & Landscape, Architects, D.P.C.  
860 Hooper Road, Endwell, NY, 13760

License Number: 29322

License Class: RESTRICTED

Date of Issue: 10/22/2024

Expiration Date: 10/31/2025

Duly Authorized Representative: Stephen Prislupsky

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

STATE OF NEW YORK - DEPARTMENT OF LABOR  
ASBESTOS CERTIFICATE



**THOMAS P FERRO**

CLASS(EXPIRES)

C ATEC (12/25) D INSP (12/25)

H PM (12/25)

CERT# 25-6IU5N-SHAB  
DMV# 404844888

**MUST BE CARRIED ON ASBESTOS PROJECTS**

01213 007425535 79



IF FOUND, RETURN TO:  
NYSDOL - L&C UNIT  
ROOM 161A BUILDING 12  
STATE OFFICE CAMPUS  
ALBANY NY 12226



01213 007425535 79



## **APPENDIX D**

### **Laboratory Certifications**



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*

**MS. KAROL H. LU**  
**AMERICA SCIENCE TEAM NEW YORK, INC**  
**117 EAST 30TH ST**  
**NEW YORK, NY 10016**

**NY Lab Id No: 11480**

*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<br>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                      |

**Serial No.: 68795**

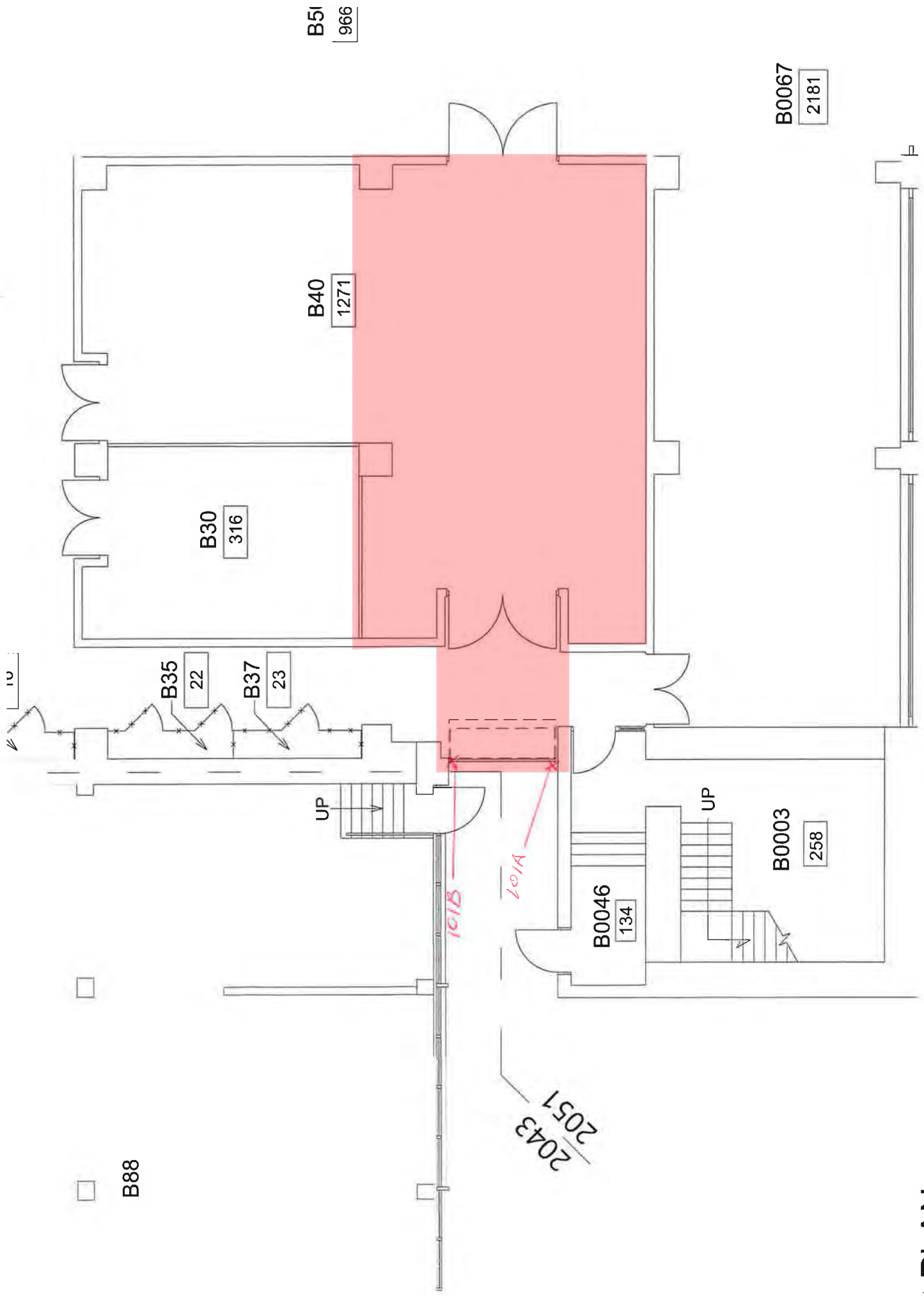
Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation 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](mailto:elap@health.ny.gov).



## **APPENDIX E**

### **Survey Locations and Bulk Sample Location Drawings**





PLAN  
FT.

Rhodes Hall Renovation Areas for Ward Center NYCST Project





# "REVISED" Limited Pre-Renovation Asbestos Survey Report

Performed at  
Cornell University Ward Center (Building 2061)

for the  
Ward Center New York Consortium for Space Technology  
(NYCST) Renovation Project  
Cornell University Ithaca, New York Campus



Prepared for:  
**Richard McElhiney Architects LLC**  
450 Seventh Avenue, Suite 2701  
New York, NY 10123

Prepared by:  
**DELTA**  
ENGINEERS, ARCHITECTS, & SURVEYORS  
860 Hooper Road  
Endwell, NY 13760  
Tel: 607-231-6600 Fax: 607-231-6640  
[www.delta-eas.com](http://www.delta-eas.com)  
Delta Project No. 2017.286.013

Field work performed by: Thomas P. Ferro, Joseph Seymour & Stephen Prislupsky  
August 21<sup>st</sup>, 2024 / October 24<sup>th</sup>, 2024 & February 11<sup>th</sup>, 2025

Report prepared by: Thomas P. Ferro

Report reviewed by: Stephen Prislupsky

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## **1.0 INTRODUCTION:**

Delta Engineers, Architects, & Surveyors (Delta) was contracted by Richard McElhiney Architects to perform a Pre-Renovation Asbestos Survey at the Cornell University Ward Center (Building 2061) located on the Cornell University Ithaca, New York Campus. This survey is being performed in support of the upcoming Ward Center New York Consortium for Space Technology (NYCST) Renovation Project. This Survey addressed accessible suspect building materials present within Ward Center Project Renovation Areas as per the August 2024 Drawings and the 90% CD Construction Documents Drawing Set (dated January 24, 2025) provided by Richard McElhiney Architects and included the Basement / 1<sup>st</sup> Floor / 2<sup>nd</sup> Floor Areas and the Building Exterior. Reference the Appendix E for the RMA drawings showing Rooms / Spaces included in the Survey.

The initial stage of the survey included a review of past sample information for the building. Bulk sample results through previous Delta and other Cornell Consultant sampling efforts have been incorporated into this Survey and associated Survey Report where applicable.

On August 21<sup>st</sup>, 2024, October 24<sup>th</sup>, 2024 and February 11<sup>th</sup>, 2025 Delta Certified Inspectors Thomas Ferro, Joseph Seymour and Stephen Prislupsky conducted a walkthrough of the renovation area spaces/rooms to identify the various accessible suspect materials present. Based on a visual inspection of the affected areas and existing sample information for the building, a total of eighty-four (84) bulk samples were collected representing thirty-seven (37) separate suspect homogenous building materials. Sixty-one (61) of the samples collected were non-friable organically bound (NOB) representing twenty-eight (28) homogenous materials. The remaining twenty-three (23) samples collected were non-NOB, "friable" materials representing nine (9) homogenous materials.

In addition to the samples collected above, other accessible suspect homogenous materials were observed to be present in the Project Renovation Areas but not sampled as they were addressed through previous sampling efforts. For the previously sampled materials, the results from the previous Surveys have been incorporated into this report. The suspect homogenous building materials identified and/or sampled in the affected project renovation areas included the following:

### Homogenous

| Area (HA) | Suspect Building Material                         |
|-----------|---------------------------------------------------|
| <b>01</b> | <b>Sink Countertop</b>                            |
| 02        | Sink Countertop Backsplash Mastic                 |
| 03        | Black Sink Undercoating                           |
| 04        | Tan Mottled 12" x 12" Floor Tile                  |
| 05        | Mastic from HA 04 Floor Tile                      |
| 06        | Grey Stone Patterned Sheet Flooring               |
| 07        | Mastic from HA 06 Flooring                        |
| 08        | Green Mottled 12" x 12" Floor Tile                |
| 09        | Mastic from HA 08 Floor Tile                      |
| 10        | Grey Epoxy Floor Coating                          |
| 11        | White w/ Grey Mottled 12" x 12" Floor Tile        |
| 12        | Mastic from HA 11 Floor Tile                      |
| 13        | Grout/ Mud Set from Tan 4' x 4" Ceramic Wall Tile |

Homogenous

| Area (HA)  | Suspect Building Material continued                               |
|------------|-------------------------------------------------------------------|
| 14         | Grout/ Mud Set from Grey Multi-Sized Patterned Ceramic Floor Tile |
| 15         | Door Slab Core Material, Algoma Grade 3/4 Hour Fire Rating        |
| 16         | Exterior & Interior Door Frame caulk                              |
| 17         | Top-Coat Wall Plaster                                             |
| 18         | Base-Coat Wall Plaster                                            |
| 19         | Basement Level Hard Packed Fitting Insulation                     |
| 20         | 1 <sup>st</sup> Floor Hard Packed Fitting Insulation              |
| 21         | 2 <sup>nd</sup> Floor Hard Packed Fitting Insulation              |
| <b>22</b>  | <b>Wall Seam Caulk</b>                                            |
| 23         | Red Fire Stop                                                     |
| 24         | Tan Carpet Square Mastic                                          |
| 25         | Black Carpet Square Mastic                                        |
| 26         | Duct Mastic from Fiberglass Duct Wrap                             |
| 27         | Red 12" x 12" Floor Tile                                          |
| 28         | Mastic from HA 27 Floor Tile                                      |
| 29         | Yellow 12" x 12" Floor Tile                                       |
| 30         | Blue Mottled 12" x 12" Floor Tile                                 |
| 31         | Mastic from HA 29 & HA 30 Floor Tiles                             |
| 32         | 2 <sup>nd</sup> Floor Carpet Square Mastic                        |
| 33         | Brown Epoxy Flooring                                              |
| 34         | Grey Interior Window Glazing Compound                             |
| <b>35</b>  | <b>Grey Exterior Window Frame Caulk</b>                           |
| 36         | Basement Gray Epoxy Flooring Confirmatory Samples                 |
| 37         | Basement Gray Epoxy Flooring Confirmatory Samples                 |
| 38         | Room BR10 White Floor Coating                                     |
| <b>39</b>  | <b>Exterior Tar/Felt Membrane behind brick</b>                    |
| <b>40*</b> | <b>All Colors / Patterns of 9" x 9" Floor Tile</b>                |
| 41*        | All Mastics from 9" x 9" floor tiles                              |
| 42*        | All Wall and Ceiling System Sheetrock                             |
| 43*        | All Wall and Ceiling System Joint Compound                        |
| 44*        | White Canvas / outer cloth Duct Wrap                              |
| 45*        | Tar Paper on Fiberglass Insulation                                |
| <b>46*</b> | <b>Brown Pin Mastic on ductwork</b>                               |
| 47*        | All colors / sizes of cove base                                   |
| 48*        | Mastics from all cove base                                        |
| 49*        | Black Wire Wrap                                                   |
| 50*        | Cloth Covering in Fiberglass Pips Insulation                      |
| 51*        | Gray Wall Penetration Caulk / Firestop                            |
| 52*        | Grey Vibration Dampening Cloth                                    |
| 53*        | All colors of Floor Leveler                                       |
| 54*        | 1' x 1' Splined Fissure Pattern Ceiling Tiles                     |
| 55*        | 1' x 1' Splined Rough Finish Ceiling Tiles                        |
| 56*        | Tan Carpet Mastic                                                 |
| 57*        | Grey Exterior Window Glazing Compound                             |
| <b>58*</b> | <b>Transite Lab-tops</b>                                          |

Homogenous

| Area (HA) | Suspect Building Material continued              |
|-----------|--------------------------------------------------|
| 59*       | <b>Black Mastic from Wall-Mounted Boards</b>     |
| 60*       | <b>Tan Exterior Window Glazing Compound</b>      |
| 61*       | <b>White Duct Insulation Seam Sealant</b>        |
| 62*       | <b>Exterior Tar/Felt Membrane behind Llenroc</b> |

\* - Materials previously sampled by Delta or Other Cornell Consultants. Results for previously sampled materials are available through Delta EAS or the Cornell Asbestos Program

Specific information required by 12 NYCRR Part 56-5.1, (f) – “Building/Structure Asbestos Survey Information” to be included in this pre-renovation report is as follows:

- 1) Building Name/Address: Ward Center (Building 2061)  
135 Hollister Drive  
City of Ithaca, NY 14850
- 2) Owner’s Name/Address: Cornell University  
Humphreys Service Building  
Ithaca, NY 14853
- 3) Owner’s Agent: Mr. William Knapp, Richard McElhiney Architects
- 4) Survey Performed By: Delta Engineers, Architects, & Surveyors  
860 Hooper Road, Endwell, NY 13760
- 5) Certified Inspectors: Thomas P. Ferro, Certificate No. 24-61U5N-SHAB  
Joseph Seymour, Certificate No. 24-6Z57V-SHAB  
Stephen Prislupsky, Certificate No. 24-6L43B-SHAB
- 6) Dates of Survey: August 21<sup>st</sup>, 2024, October 24<sup>th</sup>, 2024 and February 11<sup>th</sup>, 2025
- 7) Laboratory: America Science Team New York, Inc.  
117 East 30<sup>th</sup> Street, New York, NY 10016

## **2.0 ASBESTOS SURVEY AND SAMPLING PROCEDURES AND METHODS:**

### **2.1 Survey requirements**

Requirements to perform Pre-Demolition/Pre-Renovation Asbestos Surveys are based on the following State and Federal Regulations.

**Occupational Safety and Health Administration (OSHA):** OSHA survey requirements and sampling protocols are included in 29 CFR Part 1910.1001(j)(2) & (j)(8) and 29 CFR Part 1926.1101(k),(5):

29 CFR Part 1910.1001(j)(2), Installed Asbestos Containing Material: Employers and building owners are required to treat installed TSI and sprayed on and troweled-on surfacing materials as ACM in buildings constructed no later than 1980 for purposes of this standard. These materials are designated "presumed ACM or PACM", and are defined in paragraph (b) of this section. Asphalt and vinyl flooring material installed no later than 1980 also must be treated as asbestos-containing. The employer or building owner may demonstrate that PACM and flooring material do not contain asbestos by complying with paragraph (j)(8)(iii) of this section.

29 CFR Part 1910.1001(j)(8), Criteria to rebut the designation of installed material as PACM:

1910.1001(j)(8)(i) - At any time, an employer and/or building owner may demonstrate, for purposes of this standard, that PACM does not contain asbestos. Building owners and/or employers are not required to communicate information about the presence of building material for which such a demonstration pursuant to the requirements of paragraph (j)(8)(ii) of this section has been made. However, in all such cases, the information, data and analysis supporting the determination that PACM does not contain asbestos, shall be retained pursuant to paragraph (m) of this section.

1910.1001(j)(8)(ii) - An employer or owner may demonstrate that PACM does not contain asbestos by the following:

1910.1001(j)(8)(ii)(A) - Having a completed inspection conducted pursuant to the requirements of AHERA (40 CFR 763, Subpart E) which demonstrates that no ACM is present in the material; or

1910.1001(j)(8)(ii)(B) - Performing tests of the material containing PACM which demonstrate that no ACM is present in the material. Such tests shall include analysis of bulk samples collected in the manner described in 40 CFR 763.86. The tests, evaluation and sample collection shall be conducted by an accredited inspector or by a CIH. Analysis of samples shall be performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP) or the National Institute for Standards and Technology (NIST) or the Round Robin for bulk samples administered by the American Industrial Hygiene Association (AIHA) or an equivalent nationally-recognized round robin testing program.

1910.1001(j)(8)(iii) - The employer and/or building owner may demonstrate that flooring material including associated mastic and backing does not contain asbestos, by a determination of an industrial hygienist based upon recognized analytical techniques showing that the material is not ACM.

29 CFR Part 1926.1101(k)(5), Criteria to rebut the designation of installed material as PACM:

1926.1101(k)(5)(i) - At any time, an employer and/or building owner may demonstrate, for purposes of this standard, that PACM does not contain asbestos. Building owners and/or employers are not required to communicate information about the presence of building material for which such a demonstration pursuant to the requirements of paragraph (k)(5)(ii) of this section has been made. However, in all such cases, the information, data and analysis supporting the determination that PACM does not contain asbestos, shall be retained pursuant to paragraph (n) of this section.

1926.1101(k)(5)(ii) - An employer or owner may demonstrate that PACM does not contain more than 1 percent asbestos by the following:

1926.1101(k)(5)(ii)(A) - Having a completed inspection conducted pursuant to the requirements of AHERA (40 CFR Part 763, Subpart E) which demonstrates that the material is not ACM; or



*1926.1101(k)(5)(ii)(B) - Performing tests of the material containing PACM which demonstrate that no ACM is present in the material. Such tests shall include analysis of bulk samples collected in the manner described in 40 CFR 763.86. The tests, evaluation and sample collection shall be conducted by an accredited inspector or by a CIH. Analysis of samples shall be performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP) or the National Institute for Standards and Technology (NIST) or the Round Robin for bulk samples administered by the American Industrial Hygiene Association (AIHA) or an equivalent nationally-recognized round robin testing program.*

*1926.1101(k)(5)(iii) - The employer and/or building owner may demonstrate that flooring material including associated mastic and backing does not contain asbestos, by a determination of an industrial hygienist based upon recognized analytical techniques showing that the material is not ACM.*

**EPA National Emissions Standard for Hazardous Air Pollutants (NESHAPs):** (NESHAPs) regulates asbestos under “40 CFR Part 61, Subpart M - National Emission Standard for Asbestos”. Subpart M regulates demolition and/or renovation of “facilities” that may contain asbestos-containing materials (ACMs). “Facilities,” as defined by NESHAPs, includes any institutional, commercial, public, industrial, or residential structure or building, *except* residential buildings having four or fewer units. ACMs are defined in NESHAPs as materials containing more than 1 percent asbestos. Section 61.145 states:

**61.145 Standard for demolition and renovation.**

*(a) Applicability. To determine which requirements of paragraphs (a), (b), and (c) of this section apply to the owner or operator of a demolition or renovation activity and prior to the commencement of the demolition or renovation, thoroughly inspect the affected facility or part of the facility where the demolition or renovation operation will occur for the presence of asbestos, including Category I and Category II nonfriable ACM.*

It should be noted that 40 CFR Part 1 Subpart M, NESHAPS has no cut-off date exempting survey requirements.

**New York State Department of Labor (NYS DOL):** Guidelines followed for the inspection are those established by the NYS DOL’s Industrial Code Rule 56 (Cited as 12 NYCRR Part 56, as amended, adopted January 11, 2006; effective September 5, 2006). The specific survey, sampling and reporting requirements included in 12 NYCRR Part 56-5.1(e) – “Building/Structure Asbestos Survey Requirements” include:

**56-5.1 Asbestos Survey Requirements for Building/Structure Demolition, Renovation, Remodeling and Repair**

**(a) Asbestos Survey Required.** An owner or an owner’s agent, except the owner of one and two-family dwellings who contracts for, but does not direct or control the work, shall cause to be conducted, an asbestos survey completed by a licensed asbestos contractor using inspectors certified in compliance with Section 56-3.2(d), to determine whether or not the building or structure, or portion(s) thereof to be demolished, renovated, remodeled, or have repair work, contains ACM, PACM or asbestos material. This asbestos survey shall be completed and submitted as indicated in Subdivision (g) of this Section, prior to commencing work. All such asbestos surveys shall be conducted in conformance with the requirements of Subdivision (e) of this Section.

(b) **Exemptions to Asbestos Survey Requirements:** The asbestos survey required by this Subdivision (a) of this Section shall not be required for the following classes of buildings or structures:

- (1) An agricultural building;
- (2) Buildings or structures for which original construction commenced on or after January 1, 1974;
- (3) A structure certified in writing to be structurally unsound by a licensed Professional Engineer, Registered Architect, Building Inspector, Fire Inspector or other official of competent jurisdiction. (See Section 56-11.5)

(c) **Building/Structure Demolition.** If a building/structure asbestos survey is not required or performed per Subdivision (b) of this Section, and the building/structure is certified to be unsound or slated for contracted demolition, the building/structure shall be assumed to contain asbestos, and shall be demolished per this Part, unless the building/structure is adequately certified to be free of asbestos containing material. Acceptable documentation for certification shall be a previous thorough building/structure asbestos survey, abatement records or other documentation acceptable to the Commissioner or his or her representative.

(d) **Responsibility to Comply.** No exemption to the requirement to conduct an asbestos survey shall exempt any person, asbestos contractor, property owner or business entity from the inspection or asbestos survey requirements of EPA, OSHA, and any other applicable section of this Part.

(e) **Building/Structure Asbestos Survey Requirements.** The asbestos survey shall include a thorough inspection for and identification of all PACM, suspect miscellaneous ACM, or asbestos material throughout the building/structure or portion thereof to be demolished, renovated, remodeled, or to have repair work. The required inspection shall be performed by a certified asbestos inspector, and, at a minimum, shall include identification of PACM, suspect miscellaneous ACM or asbestos material by all of the following methods:

- (1) The review of building/structure plans and records, if available, for references to asbestos, ACM, PACM, suspect miscellaneous ACM or asbestos material used in construction, renovation or repair; and
- (2) A visual inspection for PACM and suspect miscellaneous ACM throughout the building/structure or portion thereof to be demolished, renovated, remodeled, or repaired. For the purpose of this Part, all PACM and suspect miscellaneous ACM visually assessed shall be treated and handled as ACM and shall be assumed to be ACM, unless bulk sampling is conducted as per this Section, standard EPA and OSHA accepted methods, including multi-layered systems sampling protocols; the subsequent analyses are performed by a laboratory that meets the requirements of Section 56-4.2 of this Part; and the analyses satisfies both ELAP and federal requirements, including multi-layered sample analyses, to document non-asbestos containing material.

(f) **Building/Structure Asbestos Survey Information.**

(1) The asbestos survey shall, at a minimum, identify and assess with due diligence, the locations, quantities, friability and conditions of all types of installations at the affected portion of the building/structure relative to the ACM, suspect miscellaneous ACM, PACM or asbestos material contained therein. The following list is not inclusive of all types of ACMs, it only summarizes typical



ACMs. The certified asbestos inspector is responsible for identification and assessment of all types ACM, PACM, suspect miscellaneous ACM and asbestos material within the affected portion of the building/structure:

**PACM**

**(i) Surfacing Treatments:**

- (a) Fireproofing;
- (b) Acoustical Plaster;
- (c) Finish Plasters; and
- (d) Skim Coats of Joint Compound.

**(ii) Thermal System Insulation:**

- (a) Equipment Insulation;
- (b) Boiler, Breeching, Boiler Rope, Duct, or Tank Insulation, Cement or Mortar Used for Boilers and Refractory Brick;
- (c) Piping and Fitting Insulations including but not limited to, Wrapped Paper, Aircell, Millboard, Rope, Cork, Preformed Plaster, Job Molded Plaster and coverings over fibrous glass insulation.

**SUSPECT MISCELLANEOUS ACM**

**(i) Roofing and Siding Miscellaneous Materials:**

- (a) Insulation Board;
- (b) Vapor Barriers;
- (c) Coatings;
- (d) Non-Metallic or Non-Wood Roof Decking
- (e) Felts;
- (f) Cementitious Board (Transite);
- (g) Flashing;
- (h) Shingles; and
- (i) Galbestos.

**(ii) Other Miscellaneous Materials:**

- (a) Dust and Debris;
- (b) Floor Tile;
- (c) Cove Base;
- (d) Floor Leveler Compound;
- (e) Ceiling Tile;
- (f) Vermiculite Insulation
- (g) Gaskets, Seals, Sealants (including for condensate control);
- (h) Vibration Isolators;
- (i) Laboratory Tables and Hoods;
- (j) Chalkboards;
- (k) Pipe Penetration Packing or Other Firestopping Materials
- (l) Cementitious Board;
- (m) Electrical Wire Insulation;
- (n) Fire Curtains;
- (o) Fire Blankets;
- (p) Fire Doors;
- (q) Brakes and Clutches;
- (r) Mastics, Adhesives and Glues;

- (s) Caulks;
- (t) Sheet Flooring (Linoleum);
- (u) Wallpaper;
- (v) Drywall;
- (w) Plasterboard
- (x) Spackling/Joint Compound;
- (y) Textured Paint;
- (z) Grout;
- (aa) Glazing Compound; and
- (ab) Terrazzo.

(2) All ACM, PACM, suspect miscellaneous ACM, or asbestos material reported under Paragraph (1) of this Subdivision shall include the location of the materials, an estimate of the quantities, types, friability and condition of the identified materials to be treated and handled as ACM. For the purpose of this Part, all PACM and suspect miscellaneous ACM visually assessed shall be treated and handled as ACM and shall be assumed to be ACM, unless bulk sampling is conducted as per this Section, standard EPA and OSHA accepted methods, including multilayered systems sampling protocols; the subsequent analyses are performed by a laboratory that meets the requirements of Section 56-4.2 of this Part; and the analyses satisfies both ELAP and federal requirements, including multi-layered sample analyses, to document non-asbestos containing material.

(3) The building/structure asbestos survey shall also include the building/structure name, address, the building/structure owner's name and address, the name and address of the owner's agent, the name of the firm performing the asbestos survey and a copy of the firm's current asbestos handling license, the names of the certified inspector(s) performing the survey and a copy of the current asbestos handling certificate for each inspector utilized, the dates of the asbestos survey, a listing of homogeneous areas identifying which ones are ACM, all laboratory analyses reports for bulk samples collected, and copies of the appropriate certifications for the laboratory used for analysis of samples taken during the asbestos survey.

**(g) Transmittal of Building/Structure Asbestos Survey Information.** One (1) copy of the results of the building/structure asbestos survey shall be immediately transmitted by the building/structure owner as follows:

- (1) One (1) copy of the completed asbestos survey shall be sent by the owner or their agent to the local government entity charged with issuing a permit for such demolition, renovation, remodeling or repair work under applicable State or local laws.
- (2) The completed asbestos survey for controlled demolition (as per Subpart 56-11.5) or pre-demolition asbestos projects shall also be submitted to the appropriate Asbestos Control Bureau district office.
- (3) The completed asbestos survey shall be kept on the construction site with the asbestos notification and variance, if required, throughout the duration of the asbestos project and any associated demolition, renovation, remodeling or repair project.

**(h) Removal Required.** If the building/structure asbestos survey finds that the portion of the building/structure to be demolished, renovated, remodeled, or have repair work contains ACM,

PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material, which is impacted by the work, the owner or the owner's agent shall conduct, or cause to have conducted, asbestos removal performed by a licensed asbestos abatement contractor in conformance with all standards set forth in this Part. All ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material impacted by the demolition, renovation, remodeling or repair project shall be removed as per this Part, prior to access or disturbance by other uncertified trades or personnel. No demolition, renovation, remodeling or repair work shall be commenced by any owner or the owner's agent prior to the completion of the asbestos abatement in accordance with the notification requirements of this Part. For multi-phased work, the access restriction for uncertified trades or personnel applies to each intermediate portion of the entire project. Upon completion of the intermediate portion of the asbestos project, other trades or personnel may access that portion of the work site.

For demolition projects that are exempt from asbestos survey requirements due to being structurally unsound, the demolition is considered an asbestos project and shall proceed as per Section 56-11.5.

(1) All building/structure owners and asbestos abatement contractors on a demolition, renovation, remodeling, or repair project, which includes work covered by this Part, shall inform all trades on the work site about PACM, ACM, asbestos material and suspect miscellaneous ACM assumed to be ACM at the work site.

(i) **Bidding.** Bids may be advertised and contracts awarded for demolition, remodeling, renovation, or repair work, but no work on the current intermediate portion of the project shall commence on the demolition, renovation, remodeling or repair work by any owner or agent prior to completion of all necessary asbestos abatement work for the current intermediate portion of the entire project, in conformance with all standards set forth in this Part.

(j) **Unidentified and Unassessed Asbestos.** When any construction activity, such as demolition, remodeling, renovation or repair work, reveals PACM or suspect miscellaneous ACM that has not been identified by the asbestos survey per this Part, or has not been identified by other inspections as per current OSHA or EPA requirements, all activities shall cease in the area where the PACM or suspect miscellaneous ACM is found and the Asbestos Control Bureau shall be notified by telephone by the building/structure owner or their representative, followed with a written notice in accordance with the notification requirements of this Part. Unassessed PACM or suspect miscellaneous ACM shall be treated and handled as ACM and assumed to be ACM, unless proven otherwise by standard EPA and OSHA accepted methods, including multi-layered systems sampling protocols; subsequent analyses performed by a laboratory that meets the requirements of Section 56-4.2 of this Part; and the analyses satisfies both NYS ELAP and federal requirements, including multi-layered sample analyses, to document non-asbestos containing material.

## **2.2 Sample Analysis**

Bulk sample analysis was performed by American Science Team New York Inc., an independent laboratory approved/accredited by the NYS Department of Health (ELAP), the American Industrial Hygiene Association (AIHA), and the National Voluntary Laboratory Accreditation Program (NVLAP).

Samples collected during the course of this survey fell into one of two categories. The first category includes non-friable organically bound (NOB) materials. These materials are those which have an organic binder in their matrix and include items such as floor tiles, sheet flooring, mastics, glazings, caulks and roofing materials. The second category includes non-NOB “friable” materials including parging, sheetrock, joint compound, wall insulations, and wallboard.

Analysis of all “NOB” materials was initially performed by Polarized Light Microscopy (PLM) following the New York State Department of Health ELAP 198.6 Gravimetric Reduction Methodology. If a given sample was reported as non-asbestos following this analysis, it was then analyzed by Transmission Electron Microscopy (TEM) following the NYS DOH ELAP 198.4 Methodology.

Analysis of all “non-NOB” materials was performed by Polarized Light Microscopy (PLM) following the EPA 600/M4/82/020 and the NYS DOH ELAP 198.1 Methodologies.

### ***2.3 Materials not sampled***

There were several materials present at the site which were not considered “suspect” by the inspector and were not sampled. These included various fiberglass, foam, vinyl, silicone, wood/cellulose products and concrete/cinder block/brick components. All countertop and tabletops were observed to be non-suspect. The fume hood was non-suspect stainless steel. No mastics were observed on the countertops or tabletops. All shelving and wall standards were observed to be mechanical fastened. All wiring was observed to be non-suspect vinyl wire wrap.

### **3.0 SURVEY FINDINGS AND CONCLUSIONS**

**3.1) Ward Center New York Consortium for Space Technology (NYCST) Renovation Project Pre-Renovation Asbestos Survey, Non-Asbestos Materials** – Based on previous sample results and results reported for samples collected during this Survey of accessible suspect materials present in the Ward Center NYCST Project Renovation Areas, the following were identified as being non-asbestos:

Homogenous

| Area (HA) | Non-Asbestos Material                                             |
|-----------|-------------------------------------------------------------------|
| 02        | Sink Countertop Backsplash Mastic                                 |
| 03        | Black Sink Undercoating                                           |
| 04        | Tan Mottled 12" x 12" Floor Tile                                  |
| 05        | Mastic from HA 04 Floor Tile                                      |
| 06        | Grey Stone Patterned Sheet Flooring                               |
| 07        | Mastic from HA 06 Flooring                                        |
| 08        | Green Mottled 12" x 12" Floor Tile                                |
| 09        | Mastic from HA 08 Floor Tile                                      |
| 10        | Grey Epoxy Floor Coating                                          |
| 11        | White w/ Grey Mottled 12" x 12" Floor Tile                        |
| 12        | Mastic from HA 11 Floor Tile                                      |
| 13        | Grout/ Mud Set from Tan 4' x 4" Ceramic Wall Tile                 |
| 14        | Grout/ Mud Set from Grey Multi-Sized Patterned Ceramic Floor Tile |
| 15        | Door Slab Core Material, Algoma Grade 3/4 Hour Fire Rating        |
| 16        | Exterior & Interior Door Frame caulk                              |
| 17        | Top-Coat Wall Plaster                                             |
| 18        | Base-Coat Wall Plaster                                            |
| 19        | Basement Level Hard Packed Fitting Insulation                     |
| 20        | 1 <sup>st</sup> Floor Hard Packed Fitting Insulation              |
| 21        | 2 <sup>nd</sup> Floor Hard Packed Fitting Insulation              |
| 23        | Red Fire Stop                                                     |
| 24        | Tan Carpet Square Mastic                                          |
| 25        | Black Carpet Square Mastic                                        |
| 26        | Duct Mastic from Fiberglass Duct Wrap                             |
| 27        | Red 12" x 12" Floor Tile                                          |
| 28        | Mastic from HA 27 Floor Tile                                      |
| 29        | Yellow 12" x 12" Floor Tile                                       |
| 30        | Blue Mottled 12" x 12" Floor Tile                                 |
| 31        | Mastic from HA 29 & HA 30 Floor Tiles                             |
| 32        | 2 <sup>nd</sup> Floor Carpet Square Mastic                        |
| 33        | Brown Epoxy Flooring                                              |
| 34        | Grey Interior Window Glazing Compound                             |
| 36        | Basement Gray Epoxy Flooring Confirmatory Samples                 |
| 37        | Basement Gray Epoxy Flooring Confirmatory Samples                 |
| 38        | Room BR10 White Floor Coating                                     |
| 41*       | All Mastics from 9" x 9" floor tiles                              |
| 42*       | All Wall and Ceiling System Sheetrock                             |

Homogenous

| Area (HA) | Non-Asbestos Material (continued)             |
|-----------|-----------------------------------------------|
| 43*       | All Wall and Ceiling System Joint Compound    |
| 44*       | White Canvas / outer cloth Duct Wrap          |
| 45*       | Tar Paper on Fiberglass Insulation            |
| 47*       | All colors / sizes of cove base               |
| 48*       | Mastics from all cove base                    |
| 49*       | Black Wire Wrap                               |
| 50*       | Cloth Covering in Fiberglass Pips Insulation  |
| 51*       | Gray Wall Penetration Caulk / Firestop        |
| 52*       | Grey Vibration Dampening Cloth                |
| 53*       | All colors of Floor Leveler                   |
| 54*       | 1' x 1' Splined Fissure Pattern Ceiling Tiles |
| 55*       | 1' x 1' Splined Rough Finish Ceiling Tiles    |
| 56*       | Tan Carpet Mastic                             |
| 57*       | Grey Exterior Window Glazing Compound         |

\* - Materials previously sampled by Delta or Other Cornell Consultants. Results for previously sampled materials are available through Delta EAS or the Cornell Asbestos Program

*It should be noted that the results for the initial samples of the Gray Epoxy Floor Coating (initial Samples 10A/10B) present throughout the basement were reported as being Asbestos Containing. However previous results for this coating material collected in several other areas of the building were consistently reported as "No Asbestos Detected". Based on this, Supplemental / Confirmatory Bulk Samples of the Gray Epoxy Floor Coating were collected from the same locations originally reported as being ACM (Samples 36A/36B) and from two other locations in the Basement Room BR10 where it will be impacted by the Project (Samples 37A/37B). And results for all four (4) of the Supplemental / Confirmatory Bulk Samples were reported as "No Asbestos Detected". Based on this, and conversations with the Lab, the initial "positive" results for this material was determined to be a false positive due to cross-contamination at the Laboratory and the Grey Epoxy Floor Coating is confirmed to be Non-Asbestos.*

**3.2) Ward Center New York Consortium for Space Technology (NYCST) Renovation Project Pre-Renovation Asbestos Survey, Asbestos Containing Materials** – Based on previous sample results and results reported for samples collected during this Survey of accessible suspect materials present in the Ward Center NYCST Project Renovation Areas, the following were identified as being **asbestos-containing**:

Homogenous

| Area (HA) | Asbestos-Containing Material                |
|-----------|---------------------------------------------|
| 01        | Sink Countertop                             |
| 22        | Wall Seam Caulk                             |
| 35        | Grey Exterior Window Frame Caulk            |
| 39        | Exterior Tar/Felt Membrane behind brick     |
| 40*       | All Colors / Patterns of 9" x 9" Floor Tile |
| 46*       | Brown Pin Mastic on ductwork                |



## Homogenous

| Area (HA) | Asbestos-Containing Material continued    |
|-----------|-------------------------------------------|
| 58*       | Transite Lab-tops                         |
| 59*       | Black Mastic from Wall-Mounted Boards     |
| 60*       | Tan Exterior Window Glazing Compound      |
| 61*       | White Duct Insulation Seam Sealant        |
| 62*       | Exterior Tar/Felt Membrane behind Llenroc |

\* - Materials previously sampled by Delta or Other Cornell Consultants. Results for previously sampled materials are available through Delta EAS or the Cornell Asbestos Program

A breakdown / description of asbestos-containing materials by Homogeneous Area is as follows:

A) Transite Sink Counter-tops & Transite Lab-tops, HA's 01 & 58\*: Asbestos containing sink-tops, lab-tops and their associated back-splashes are present in several of the renovation areas. ***But based on a review of the 90% Construction Documents, No Transite Sink Counter-tops & Transite Lab-tops are anticipated to be impacted by the Project.***

B) Wall Seam Caulk, HA 22: Asbestos containing wall seam caulk is present on various CMU, Concrete and Brick Wall joints throughout the Basement, 1<sup>st</sup> Floor and 2<sup>nd</sup> Floor Renovation Areas. ***This material will be impacted at those locations where the referenced wall type is to be removed as a part of the project.***

C) Exterior Grey Window Frame Caulk & Exterior Tan Window Glazing Compound, HA's 35 / 60\*: Asbestos containing grey exterior window frame caulk and tan exterior window glazing compound are applied to the majority of the building windows. ***These materials will be impacted as a part of this project on the 1<sup>st</sup> floor in Corridor 100SA where 2 window units are scheduled to be removed for a new entry Door installation.***

D) Exterior Tar/Felt Membrane behind Brick, HA 39: Asbestos containing tar/felt membrane is applied behind the exterior brick wall system. ***This will be impacted as a part of this project on the basement level where a new entry door is to be installed into Room BR10.***

E) 9" x 9" Floor Tile, HA 40\*: All colors / patterns of 9" x 9" Floor Tile (VAT) were previously sampled and reported as being asbestos-containing, with all associated mastics reported as non-asbestos. VAT is present throughout the Basement, 1<sup>st</sup> Floor and 2<sup>nd</sup> Floor Renovation Areas as the finished flooring as well as beneath carpeting / carpet squares. ***VAT will be impacted at several locations on the 1<sup>st</sup> floor at existing wall demolition / new wall installation locations.***

F) Brown Pin Mastic on Ductwork, HA 46\*: Asbestos containing pin mastic was previously sampled and is present on all ductwork that is insulated with various types of non-suspect fiberglass. ***But based on a review of the 90% Construction Documents, No Duct Pin Mastic is anticipated to be impacted by the Project.***

G) Black Mastic associated with Wall-Mounted Boards, HA 59\*: Asbestos containing mastic was previously sampled and is associated with wall-mounted boards. ***This ACM will be impacted in Room B05 where the West Wall board is to be removed.***

H) White Duct Insulation Seam Sealant, HA 61\*: Asbestos containing duct insulation seam sealant previously sampled and is associated with the various types of non-suspect fiberglass duct insulations. ***But based on a review of the 90% Construction Documents, No Duct Seam Sealant is anticipated to be impacted by the Project.***

I) Exterior Tar/Felt Membrane behind Llenroc, HA 62\*: Asbestos containing tar/felt membrane is applied behind the exterior Llenroc stone facing. ***This will be impacted as a part of this project on the 1<sup>st</sup> floor elevation where a new entry door is to be installed into in Corridor 100SA.***

### **3.3) Ward Center New York Consortium for Space Technology (NYCST) Renovation Project Pre-Renovation Asbestos Survey, Non-Suspect Materials:**

Non-suspect materials observed to be present within the renovation areas included the following:

- All accessible in-line pipe insulation was observed to be covered with non-suspect fiberglass / foam.
- All Wall Cabinets were observed to be mechanically fastened.
- Vinyl Wire Wrap.
- All ductwork was observed to be either un-insulated or covered with non-suspect fiberglass.

### **4.0 INACCESSIBLE AREAS**

Renovation spaces and areas which were visible and accessible were inspected and sampled as a part of this survey. Inaccessible areas such as wall chases/interstitial wall space, hard ceiling plenum spaces, and enclosed pipe chases could not be inspected without select demolition. Based on the fact that the building was occupied at the time of the survey, the inaccessible areas were not included as a part of this survey. Any materials encountered in those areas not accessible shall be assumed ACM until tested. As stated above, this survey was limited to only those spaces / areas and associated accessible suspect materials present in the Project Renovation Areas.

***It should be noted that several sub-slab sanitary lines are to be impacted as a part of the project. Based on their location, these lines could not be accessed / inspected / sampled as a part of this Pre-Renovation Asbestos Survey.***



## **APPENDIX A**

### **Asbestos Bulk Sample Report Form**



| <b>Client:</b> <u>Richard McElhiney Architects</u>                                                           |     | <b>Client Project No.:</b> <u>N/A</u>                                           |                                               | <b>Delta Proj. No.:</b> <u>2017.286.013</u>                            |               |                       |                       |
|--------------------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------|-----------------------------------------------|------------------------------------------------------------------------|---------------|-----------------------|-----------------------|
| <b>Project:</b> <u>Ward Center NYS Consortium Research Renovation Project Pre-Renovation Asbestos Survey</u> |     | <b>Dates Sampling Performed:</b> <u>08/21/2024, 10/24/2024 &amp; 02/11/2025</u> |                                               | <b>Asbestos Inspectors:</b> <u>T.Ferro / J.Seymour / S. Prislupsky</u> |               |                       |                       |
|                                                                                                              |     | <b>Date of Report:</b> <u>09/16/2024</u>                                        |                                               | <b>Number of Samples Collected:</b> <u>84</u>                          |               |                       |                       |
| <b>Building Code:</b> <u>2061</u>                                                                            |     | <b>Laboratory:</b> <u>AmeriSci NY</u>                                           |                                               | <b>Number of Samples Analyzed:</b> <u>PLM - 81 / TEM - 55</u>          |               |                       |                       |
| <b>Asbestos Bulk Sample Report Form</b>                                                                      |     |                                                                                 |                                               |                                                                        |               |                       |                       |
| Sample Number                                                                                                | HA* | Floor                                                                           | Bulk Sample Description / Details             | Material Type                                                          | Asbestos Type | PLM Result % Asbestos | TEM Result % Asbestos |
|                                                                                                              |     |                                                                                 |                                               |                                                                        |               |                       |                       |
| 2017.286 013 - 01A                                                                                           | 01  | Bsmt                                                                            | Sink Countertop, Room B01                     | Misc.                                                                  | Chrysotile    | 14.8%                 | NA                    |
| 2017.286 013 - 01B                                                                                           | 01  | Bsmt                                                                            | Sink Countertop, Room B02A                    | Misc.                                                                  |               | NA/PS                 | NA                    |
| 2017.286 013 - 02A                                                                                           | 02  | Bsmt                                                                            | Sink Countertop Backsplash Mastic, Room B01   | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286 013 - 02B                                                                                           | 02  | Bsmt                                                                            | Sink Countertop Backsplash Mastic, Room B02A  | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286 013 - 03A                                                                                           | 03  | Bsmt                                                                            | Black Sink Undercoating, Room B02A            | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286 013 - 03B                                                                                           | 03  | Bsmt                                                                            | Black Sink Undercoating, Room B01             | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286 013 - 04A                                                                                           | 04  | Bsmt                                                                            | Tan Mottled 12" x 12" Floor Tile, Room B04    | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286 013 - 04B                                                                                           | 04  | Bsmt                                                                            | Tan Mottled 12" x 12" Floor Tile, Room B04    | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 05A                                                                                           | 05  | Bsmt                                                                            | Mastic from HA 04A                            | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 05B                                                                                           | 05  | Bsmt                                                                            | Mastic from HA 04A                            | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 06A                                                                                           | 06  | Bsmt                                                                            | Grey Stone Patterned Sheet Flooring, Room B08 | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 06B                                                                                           | 06  | Bsmt                                                                            | Grey Stone Patterned Sheet Flooring, Room B08 | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 07A                                                                                           | 07  | Bsmt                                                                            | Mastic from HA 06A                            | Misc.                                                                  | ND            | ND                    | ND                    |

| <b>Client:</b> <u>Richard McElhiney Architects</u>                                                           |     | <b>Client Project No.:</b> <u>N/A</u>                                           |                                                              | <b>Delta Proj. No.:</b> <u>2017.286.013</u>                            |                  |                       |                       |
|--------------------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------|------------------|-----------------------|-----------------------|
| <b>Project:</b> <u>Ward Center NYS Consortium Research Renovation Project Pre-Renovation Asbestos Survey</u> |     | <b>Dates Sampling Performed:</b> <u>08/21/2024, 10/24/2024 &amp; 02/11/2025</u> |                                                              | <b>Asbestos Inspectors:</b> <u>T.Ferro / J.Seymour / S. Prislupsky</u> |                  |                       |                       |
|                                                                                                              |     | <b>Date of Report:</b> <u>09/16/2024</u>                                        |                                                              | <b>Number of Samples Collected:</b> <u>84</u>                          |                  |                       |                       |
| <b>Building Code:</b> <u>2061</u>                                                                            |     | <b>Laboratory:</b> <u>AmeriSci NY</u>                                           |                                                              | <b>Number of Samples Analyzed:</b> <u>PLM - 81 / TEM - 55</u>          |                  |                       |                       |
| <b>Asbestos Bulk Sample Report Form</b>                                                                      |     |                                                                                 |                                                              |                                                                        |                  |                       |                       |
| Sample Number                                                                                                | HA* | Floor                                                                           | Bulk Sample Description / Details                            | Material Type                                                          | Asbestos Type    | PLM Result % Asbestos | TEM Result % Asbestos |
|                                                                                                              |     |                                                                                 |                                                              |                                                                        |                  |                       |                       |
| 2017.286.013 - 07B                                                                                           | 07  | Bsmt                                                                            | Mastic from HA 06B                                           | Misc.                                                                  | ND               | ND                    | ND                    |
| 2017.286.013 - 08A                                                                                           | 08  | Bsmt                                                                            | Green Mottled 12" x 12" Floor Tile, Room B08A                | Misc.                                                                  | ND               | ND                    | ND                    |
| 2017.286.013 - 08B                                                                                           | 08  | Bsmt                                                                            | Green Mottled 12" x 12" Floor Tile, Room B08A                | Misc.                                                                  | ND               | ND                    | ND                    |
| 2017.286.013 - 09A                                                                                           | 09  | Bsmt                                                                            | Mastic from HA 08A                                           | Misc.                                                                  | ND               | ND                    | ND                    |
| 2017.286.013 - 09B                                                                                           | 09  | Bsmt                                                                            | Mastic from HA 08B                                           | Misc.                                                                  | ND               | ND                    | ND                    |
| 2017.286.013 - 10A                                                                                           | 10  | Bsmt                                                                            | Grey Epoxy Flooring, Room BR10                               | Misc.                                                                  | SEE NOTE 1 BELOW | Invalid               | Invalid               |
| 2017.286.013 - 10B                                                                                           | 10  | Bsmt                                                                            | Grey Epoxy Flooring, Room BR03                               | Misc.                                                                  |                  | Invalid               | Invalid               |
| 2017.286.013 - 11A                                                                                           | 11  | Bsmt                                                                            | White w/ Grey Mottled 12" x 12" Floor Tile, Room B05         | Misc.                                                                  | ND               | ND                    | ND                    |
| 2017.286.013 - 11B                                                                                           | 11  | Bsmt                                                                            | White w/ Grey Mottled 12" x 12" Floor Tile, Room B05         | Misc.                                                                  | ND               | ND                    | ND                    |
| 2017.286.013 - 12A                                                                                           | 12  | Bsmt                                                                            | Mastic from HA 11A                                           | Misc.                                                                  | ND               | ND                    | ND                    |
| 2017.286.013 - 12B                                                                                           | 12  | Bsmt                                                                            | Mastic from HA 11B                                           | Misc.                                                                  | ND               | ND                    | ND                    |
| 2017.286.013 - 13A                                                                                           | 13  | Bsmt                                                                            | Grout/ Mud Set from Tan 4' x 4" Ceramic Wall Tile, Room B00T | Misc.                                                                  | ND               | ND                    | NA                    |
| 2017.286.013 - 13B                                                                                           | 13  | Bsmt                                                                            | Grout/ Mud Set from Tan 4' x 4" Ceramic Wall Tile, Room B00T | Misc.                                                                  | ND               | ND                    | NA                    |

| <b>Client:</b> <u>Richard McElhiney Architects</u>                                                           |     | <b>Client Project No.:</b> <u>N/A</u>                                           |                                                                          | <b>Delta Proj. No.:</b> <u>2017.286.013</u>                            |               |                       |                       |
|--------------------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------------------|---------------|-----------------------|-----------------------|
| <b>Project:</b> <u>Ward Center NYS Consortium Research Renovation Project Pre-Renovation Asbestos Survey</u> |     | <b>Dates Sampling Performed:</b> <u>08/21/2024, 10/24/2024 &amp; 02/11/2025</u> |                                                                          | <b>Asbestos Inspectors:</b> <u>T.Ferro / J.Seymour / S. Prislupsky</u> |               |                       |                       |
|                                                                                                              |     | <b>Date of Report:</b> <u>09/16/2024</u>                                        |                                                                          | <b>Number of Samples Collected:</b> <u>84</u>                          |               |                       |                       |
| <b>Building Code:</b> <u>2061</u>                                                                            |     | <b>Laboratory:</b> <u>AmeriSci NY</u>                                           |                                                                          | <b>Number of Samples Analyzed:</b> <u>PLM - 81 / TEM - 55</u>          |               |                       |                       |
| <b>Asbestos Bulk Sample Report Form</b>                                                                      |     |                                                                                 |                                                                          |                                                                        |               |                       |                       |
| Sample Number                                                                                                | HA* | Floor                                                                           | Bulk Sample Description / Details                                        | Material Type                                                          | Asbestos Type | PLM Result % Asbestos | TEM Result % Asbestos |
|                                                                                                              |     |                                                                                 |                                                                          |                                                                        |               |                       |                       |
| 2017.286.013 - 14A                                                                                           | 14  | Bsmt                                                                            | Grout/ Mud Set from Grey Multi Sized Ceramic Floor Tile, Room B00T       | Misc.                                                                  | ND            | ND                    | NA                    |
| 2017.286.013 - 14B                                                                                           | 14  | Bsmt                                                                            | Grout/ Mud Set from Grey Multi Sized Ceramic Floor Tile, Room B00T       | Misc.                                                                  | ND            | ND                    | NA                    |
| 2017.286.013 - 15A                                                                                           | 15  | Bsmt                                                                            | Door Slab Core Material, Algoma Grade 3/4 Hour Fire Rating, Room B01     | Misc.                                                                  | ND            | ND                    | NA                    |
| 2017.286.013 - 15B                                                                                           | 15  | Bsmt                                                                            | Door Slab Core Material, Algoma Grade 3/4 Hour Fire Rating, Room B06     | Misc.                                                                  | ND            | ND                    | NA                    |
| 2017.286.013 - 16A                                                                                           | 16  | Bsmt                                                                            | Interior Door Frame caulk, Room B08A                                     | Misc.                                                                  | Non-Asbestos  | Trace                 | < 1.0%                |
| 2017.286.013 - 16B                                                                                           | 16  | Bsmt                                                                            | Exterior Door Frame caulk, Room B08A                                     | Misc.                                                                  | Non-Asbestos  | Trace                 | < 1.0%                |
| 2017.286.013 - 17A                                                                                           | 17  | Bsmt                                                                            | Top Coat Wall Plaster, Room B00T                                         | Surfacing                                                              | ND            | ND                    | NA                    |
| 2017.286.013 - 17B                                                                                           | 17  | Bsmt                                                                            | Top Coat Wall Plaster, Room B00T                                         | Surfacing                                                              | ND            | ND                    | NA                    |
| 2017.286.013 - 17C                                                                                           | 17  | Bsmt                                                                            | Top Coat Ceiling Plaster, Room B00T                                      | Surfacing                                                              | ND            | ND                    | NA                    |
| 2017.286.013 - 18A                                                                                           | 18  | Bsmt                                                                            | Base Coat Wall Plaster, Room B00T                                        | Surfacing                                                              | ND            | ND                    | NA                    |
| 2017.286.013 - 18B                                                                                           | 18  | Bsmt                                                                            | Base Coat Wall Plaster, Room B00T                                        | Surfacing                                                              | ND            | ND                    | NA                    |
| 2017.286.013 - 18C                                                                                           | 18  | Bsmt                                                                            | Base Coat Ceiling Plaster, Room B00T                                     | Surfacing                                                              | ND            | ND                    | NA                    |
| 2017.286.013 - 19A                                                                                           | 19  | Bsmt                                                                            | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room B08A | TSI                                                                    | ND            | ND                    | NA                    |

| <b>Client:</b> <u>Richard McElhiney Architects</u>                                                           |     | <b>Client Project No.:</b> <u>N/A</u>                                           |                                                                          | <b>Delta Proj. No.:</b> <u>2017.286.013</u>                            |                |                       |                       |
|--------------------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------------------|----------------|-----------------------|-----------------------|
| <b>Project:</b> <u>Ward Center NYS Consortium Research Renovation Project Pre-Renovation Asbestos Survey</u> |     | <b>Dates Sampling Performed:</b> <u>08/21/2024, 10/24/2024 &amp; 02/11/2025</u> |                                                                          | <b>Asbestos Inspectors:</b> <u>T.Ferro / J.Seymour / S. Prislupsky</u> |                |                       |                       |
|                                                                                                              |     | <b>Date of Report:</b> <u>09/16/2024</u>                                        |                                                                          | <b>Number of Samples Collected:</b> <u>84</u>                          |                |                       |                       |
| <b>Building Code:</b> <u>2061</u>                                                                            |     | <b>Laboratory:</b> <u>AmeriSci NY</u>                                           |                                                                          | <b>Number of Samples Analyzed:</b> <u>PLM - 81 / TEM - 55</u>          |                |                       |                       |
| <b>Asbestos Bulk Sample Report Form</b>                                                                      |     |                                                                                 |                                                                          |                                                                        |                |                       |                       |
| Sample Number                                                                                                | HA* | Floor                                                                           | Bulk Sample Description / Details                                        | Material Type                                                          | Asbestos Type  | PLM Result % Asbestos | TEM Result % Asbestos |
|                                                                                                              |     |                                                                                 |                                                                          |                                                                        |                |                       |                       |
| 2017.286.013 - 19B                                                                                           | 19  | Bsmt                                                                            | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, B00CA     | TSI                                                                    | ND             | ND                    | NA                    |
| 2017.286.013 - 19C                                                                                           | 19  | Bsmt                                                                            | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room B03  | TSI                                                                    | ND             | ND                    | NA                    |
| 2017.286.013 - 20A                                                                                           | 20  | 1                                                                               | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room 1R07 | TSI                                                                    | ND             | ND                    | NA                    |
| 2017.286.013 - 20B                                                                                           | 20  | 1                                                                               | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room 111  | TSI                                                                    | ND             | ND                    | NA                    |
| 2017.286.013 - 20C                                                                                           | 20  | 1                                                                               | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room 111  | TSI                                                                    | ND             | ND                    | NA                    |
| 2017.286.013 - 21A                                                                                           | 21  | 2                                                                               | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room 2R01 | TSI                                                                    | ND             | ND                    | NA                    |
| 2017.286.013 - 21B                                                                                           | 21  | 2                                                                               | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, 200CB     | TSI                                                                    | ND             | ND                    | NA                    |
| 2017.286.013 - 21C                                                                                           | 21  | 2                                                                               | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room 2R02 | TSI                                                                    | ND             | ND                    | NA                    |
| 2017.286.013 - 22A                                                                                           | 22  | Bsmt                                                                            | Wall Seam Caulk, Room BR03                                               | Misc.                                                                  | Anthrophyllite | Trace                 | 1.9%                  |
| 2017.286.013 - 22B                                                                                           | 22  | 1                                                                               | Wall Seam Caulk, Room 109                                                | Misc.                                                                  |                | Trace                 | NA/PS                 |
| 2017.286.013 - 22C                                                                                           | 22  | 2                                                                               | Wall Seam Caulk, Room 2R05                                               | Misc.                                                                  |                | Trace                 | NA/PS                 |
| 2017.286.013 - 23A                                                                                           | 23  | 1                                                                               | Red Fire Stop, Wall, Room 1R07                                           | Misc.                                                                  | ND             | ND                    | ND                    |
| 2017.286.013 - 23B                                                                                           | 23  | 1                                                                               | Red Fire Stop, Wall, Room 1R07                                           | Misc.                                                                  | ND             | ND                    | ND                    |

| <b>Client:</b> <u>Richard McElhiney Architects</u>                                                           |     | <b>Client Project No.:</b> <u>N/A</u>                                           |                                                  | <b>Delta Proj. No.:</b> <u>2017.286.013</u>                            |               |                       |                       |
|--------------------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------|---------------|-----------------------|-----------------------|
| <b>Project:</b> <u>Ward Center NYS Consortium Research Renovation Project Pre-Renovation Asbestos Survey</u> |     | <b>Dates Sampling Performed:</b> <u>08/21/2024, 10/24/2024 &amp; 02/11/2025</u> |                                                  | <b>Asbestos Inspectors:</b> <u>T.Ferro / J.Seymour / S. Prislupsky</u> |               |                       |                       |
|                                                                                                              |     | <b>Date of Report:</b> <u>09/16/2024</u>                                        |                                                  | <b>Number of Samples Collected:</b> <u>84</u>                          |               |                       |                       |
| <b>Building Code:</b> <u>2061</u>                                                                            |     | <b>Laboratory:</b> <u>AmeriSci NY</u>                                           |                                                  | <b>Number of Samples Analyzed:</b> <u>PLM - 81 / TEM - 55</u>          |               |                       |                       |
| <b>Asbestos Bulk Sample Report Form</b>                                                                      |     |                                                                                 |                                                  |                                                                        |               |                       |                       |
| Sample Number                                                                                                | HA* | Floor                                                                           | Bulk Sample Description / Details                | Material Type                                                          | Asbestos Type | PLM Result % Asbestos | TEM Result % Asbestos |
|                                                                                                              |     |                                                                                 |                                                  |                                                                        |               |                       |                       |
| 2017.286.013 - 24A                                                                                           | 24  | 1                                                                               | Carpet Square Mastic, Room 109                   | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 24B                                                                                           | 24  | 1                                                                               | Carpet Square Mastic, Room 101                   | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 25A                                                                                           | 25  | 1                                                                               | Carpet Square Mastic, Room 111                   | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 25B                                                                                           | 25  | 1                                                                               | Carpet Square Mastic, Room 111                   | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 26A                                                                                           | 26  | 1                                                                               | Duct Mastic from Fiberglass Duct Wrap, Room 1R03 | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 26B                                                                                           | 26  | 1                                                                               | Duct Mastic from Fiberglass Duct Wrap, Room 1R03 | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 27A                                                                                           | 27  | 1                                                                               | Red 12" x 12" Floor Tile, Room 1R01              | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 27B                                                                                           | 27  | 1                                                                               | Red 12" x 12" Floor Tile, Room 1R01              | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 28A                                                                                           | 28  | 1                                                                               | Black w/ White 12" x 12" Floor Tile, Room 1R01   | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 28B                                                                                           | 28  | 1                                                                               | Black w/ White 12" x 12" Floor Tile, Room 1R01   | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 29A                                                                                           | 29  | 1                                                                               | Yellow 12" x 12" Floor Tile, Room 1R01           | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 29B                                                                                           | 29  | 1                                                                               | Yellow 12" x 12" Floor Tile, Room 1R01           | Misc.                                                                  | ND            | ND                    | ND                    |
| 2017.286.013 - 30A                                                                                           | 30  | 1                                                                               | Blue Mottled 12" x 12" Floor Tile, Room 1R01     | Misc.                                                                  | ND            | ND                    | ND                    |

| <b>Client:</b> <u>Richard McElhiney Architects</u>                                                           |  | <b>Client Project No.:</b> <u>N/A</u>                                           |          | <b>Delta Proj. No.:</b> <u>2017.286.013</u>                            |               |                   |                       |                       |
|--------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------|----------|------------------------------------------------------------------------|---------------|-------------------|-----------------------|-----------------------|
| <b>Project:</b> <u>Ward Center NYS Consortium Research Renovation Project Pre-Renovation Asbestos Survey</u> |  | <b>Dates Sampling Performed:</b> <u>08/21/2024, 10/24/2024 &amp; 02/11/2025</u> |          | <b>Asbestos Inspectors:</b> <u>T.Ferro / J.Seymour / S. Prislupsky</u> |               |                   |                       |                       |
|                                                                                                              |  | <b>Date of Report:</b> <u>09/16/2024</u>                                        |          | <b>Number of Samples Collected:</b> <u>84</u>                          |               |                   |                       |                       |
| <b>Building Code:</b> <u>2061</u>                                                                            |  | <b>Laboratory:</b> <u>AmeriSci NY</u>                                           |          | <b>Number of Samples Analyzed:</b> <u>PLM - 81 / TEM - 55</u>          |               |                   |                       |                       |
| <b>Asbestos Bulk Sample Report Form</b>                                                                      |  |                                                                                 |          |                                                                        |               |                   |                       |                       |
| Sample Number                                                                                                |  | HA*                                                                             | Floor    | Bulk Sample Description / Details                                      | Material Type | Asbestos Type     | PLM Result % Asbestos | TEM Result % Asbestos |
| 2017.286.013 - 30B                                                                                           |  | 30                                                                              | 1        | Blue Mottled 12" x 12" Floor Tile, Room 1R01                           | Misc.         | ND                | ND                    | ND                    |
| 2017.286.013 - 31A                                                                                           |  | 31                                                                              | 1        | Mastic from HA 27A                                                     | Misc.         | ND                | ND                    | ND                    |
| 2017.286.013 - 31B                                                                                           |  | 31                                                                              | 1        | Mastic from HA 28B                                                     | Misc.         | ND                | ND                    | ND                    |
| 2017.286.013 - 32A                                                                                           |  | 32                                                                              | 2        | Carpet Square Mastic, Room 2R05                                        | Misc.         | ND                | ND                    | ND                    |
| 2017.286.013 - 32B                                                                                           |  | 32                                                                              | 2        | Carpet Square Mastic, Room 2R01                                        | Misc.         | ND                | ND                    | ND                    |
| 2017.286.013 - 33A                                                                                           |  | 33                                                                              | 2        | Brown Epoxy Flooring, 200CB                                            | Misc.         | ND                | ND                    | ND                    |
| 2017.286.013 - 33B                                                                                           |  | 33                                                                              | 2        | Brown Epoxy Flooring, 200CB                                            | Misc.         | ND                | ND                    | ND                    |
| 2017.286.013 - 34A                                                                                           |  | 34                                                                              | 1        | Grey Interior Window Glazing Compound, 100CB                           | Misc.         | ND                | ND                    | ND                    |
| 2017.286.013 - 34B                                                                                           |  | 34                                                                              | 1        | Grey Interior Window Glazing Compound, 100CB                           | Misc.         | ND                | ND                    | ND                    |
| <b>2017.286.013 - 35A</b>                                                                                    |  | <b>35</b>                                                                       | <b>1</b> | <b>Grey Exterior Window Frame Caulk</b>                                | <b>Misc.</b>  | <b>Chrysotile</b> | <b>2.4%</b>           | <b>NA/PS</b>          |
| <b>2017.286.013 - 35B</b>                                                                                    |  | <b>35</b>                                                                       | <b>1</b> | <b>Grey Exterior Window Frame Caulk</b>                                | <b>Misc.</b>  |                   |                       |                       |
| 2017.286.013 - 36A                                                                                           |  | 36                                                                              | Bsmt     | Epoxy Flooring, Room BR10                                              | Misc.         | ND                | ND                    | ND                    |
| 2017.286.013 - 36B                                                                                           |  | 36                                                                              | Bsmt     | Epoxy Flooring, Room BR10                                              | Misc.         | ND                | ND                    | ND                    |



|                                                                                                       |                                                                      |                                                                 |
|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------|
| <b>Client:</b> Richard McElhiney Architects                                                           | <b>Client Project No.:</b> N/A                                       | <b>Delta Proj. No.:</b> 2017.286.013                            |
| <b>Project:</b> Ward Center NYS Consortium Research Renovation Project Pre-Renovation Asbestos Survey | <b>Dates Sampling Performed:</b> 08/21/2024, 10/24/2024 & 02/11/2025 | <b>Asbestos Inspectors:</b> T.Ferro / J.Seymour / S. Prislupsky |
|                                                                                                       | <b>Date of Report:</b> 09/16/2024                                    | <b>Number of Samples Collected:</b> 84                          |
| <b>Building Code:</b> 2061                                                                            | <b>Laboratory:</b> AmeriSci NY                                       | <b>Number of Samples Analyzed:</b> PLM - 81 / TEM - 55          |

| Asbestos Bulk Sample Report Form |  |     |       |                                   |               |               |                       |                       |
|----------------------------------|--|-----|-------|-----------------------------------|---------------|---------------|-----------------------|-----------------------|
| Sample Number                    |  | HA* | Floor | Bulk Sample Description / Details | Material Type | Asbestos Type | PLM Result % Asbestos | TEM Result % Asbestos |
| 2017.286.013 - 37A               |  | 37  | Bsmt  | Epoxy Flooring, Room BR03         | Misc.         | ND            | ND                    | ND                    |
| 2017.286.013 - 37B               |  | 37  | Bsmt  | Epoxy Flooring, Room BR10         | Misc.         | ND            | ND                    | ND                    |
| 2017.286.013 - 38A               |  | 38  | Bsmt  | White Floor Coating, Room BR10    | Misc.         | Non-Asbestos  | ND                    | < 1.0%                |
| 2017.286.013 - 38B               |  | 38  | Bsmt  | White Floor Coating, Room BR10    | Misc.         | Non-Asbestos  | ND                    | < 1.0%                |
| 2017.286.013 - 39A               |  | 39  | Ext   | Tar / Felt Membrane behind Brick  | Misc.         | Chrysotile    | 3.7%                  | NA/PS                 |
| 2017.286.013 - 39B               |  | 39  | Ext   | Tar / Felt Membrane behind Brick  | Misc.         |               | NA/PS                 | NA/PS                 |

**HA** - Homogenous Area      **ND** - No Asbestos Detected      **NA** - Not Analyzed by Methodology      **NA/PS** - Not Analyzed, Positive Stop

**TSI** - Thermal System Insulation      **Misc** - Miscellaneous Material      **Trace / < 1%** - Non-asbestos by definition

Note 1 - Results for the initial samples of the Gray Epoxy Floor Coating (Samples 10A/10B) present throughout the basement were reported as being Asbestos Containing. However previous results for this coating material collected in several other areas of the building were consistently reported as "No Asbestos Detected". Based on this, Supplemental / Confirmatory Bulk Samples of the Gray Epoxy Floor Coating were collected from the same locations originally reported as being ACM (Samples 36A/36B) and from two other locations in the Basement Room BR10 where it will be impacted by the Project (Samples 37A/37B). And results for all four (4) of the Supplemental / Confirmatory Bulk Samples were reported as "No Asbestos Detected". Based on this, and conversations with the Lab, the initial "positive" results for this material was determined to be a false positive due to cross-contamination at the Laboratory and the Grey Epoxy Floor Coating is confirmed to be Non-Asbestos.



## **APPENDIX B**

### **Laboratory Analytical Results**



**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** 08/23/24 **AmeriSci Job #** 224083504  
**Date Examined** 08/25/24 **P.O. #**  
**ELAP #** 11480 **Page** 1 of 14  
**RE:** 2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

| Client No. / HGA                                                                                                                                               | Lab No.                                                                                   | Asbestos Present | Total % Asbestos                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------|
| 2017.286.013-01A<br>01                                                                                                                                         | 224083504-01<br><b>Location:</b> Bsmt. Fl., Room B01 - Sink Countertop                    | <b>Yes</b>       | 14.8%<br>(by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Black, Homogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 14.8 %<br><b>Other Material:</b> Non-fibrous 85.2% |                                                                                           |                  |                                                                 |
| 2017.286.013-01B<br>01                                                                                                                                         | 224083504-02<br><b>Location:</b> Bsmt. Fl., Room B02A - Sink Countertop                   |                  | NA/PS                                                           |
| <b>Analyst Description:</b> Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b>                                                                  |                                                                                           |                  |                                                                 |
| 2017.286.013-02A<br>02                                                                                                                                         | 224083504-03<br><b>Location:</b> Bsmt. Fl., Room B01 - Sink Countertop Backsplash Mastic  | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24   |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 27.7%               |                                                                                           |                  |                                                                 |
| 2017.286.013-02B<br>02                                                                                                                                         | 224083504-04<br><b>Location:</b> Bsmt. Fl., Room B02A - Sink Countertop Backsplash Mastic | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24   |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 26.9%               |                                                                                           |                  |                                                                 |
| 2017.286.013-03A<br>03                                                                                                                                         | 224083504-05<br><b>Location:</b> Bsmt. Fl., Room B02A - Black Sink Undercoating           | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24   |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 5.1%                |                                                                                           |                  |                                                                 |

## PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

| Client No. / HGA                                                                                                                                   | Lab No.      | Asbestos Present | Total % Asbestos                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|---------------------------------------------------------------|
| 2017.286.013-03B<br>03<br><b>Location:</b> Bsmt. Fl., Room B01 - Black Sink Undercoating                                                           | 224083504-06 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 1.2%    |              |                  |                                                               |
| 2017.286.013-04A<br>04<br><b>Location:</b> Bsmt. Fl., Room B04 - Tan Mottled 12" x 12" Floor Tile                                                  | 224083504-07 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Tan, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 0.9%      |              |                  |                                                               |
| 2017.286.013-04B<br>04<br><b>Location:</b> Bsmt. Fl., Room B04 - Tan Mottled 12" x 12" Floor Tile                                                  | 224083504-08 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Tan, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 1.7%      |              |                  |                                                               |
| 2017.286.013-05A<br>05<br><b>Location:</b> Bsmt. Fl. - Mastic From HA 04A                                                                          | 224083504-09 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Black, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 8.9%  |              |                  |                                                               |
| 2017.286.013-05B<br>05<br><b>Location:</b> Bsmt. Fl. - Mastic From HA 04B                                                                          | 224083504-10 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Black, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 13.7% |              |                  |                                                               |
| 2017.286.013-06A<br>06<br><b>Location:</b> Bsmt. Fl., Room B08 - Grey Stone Patterned Sheet Flooring                                               | 224083504-11 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 31.1%    |              |                  |                                                               |

# PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

| Client No. / HGA                                                          | Lab No.      | Asbestos Present | Total % Asbestos                                       |
|---------------------------------------------------------------------------|--------------|------------------|--------------------------------------------------------|
| 2017.286.013-06B<br>06                                                    | 224083504-12 | No               | NAD                                                    |
| Location: Bsmt. Fl., Room B08 - Grey Stone Patterned Sheet Flooring       |              |                  | (by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material        |              |                  |                                                        |
| Asbestos Types:                                                           |              |                  |                                                        |
| Other Material: Non-fibrous 31.2%                                         |              |                  |                                                        |
| 2017.286.013-07A<br>07                                                    | 224083504-13 | No               | NAD                                                    |
| Location: Bsmt. Fl. - Mastic From HA 06A                                  |              |                  | (by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Tan, Heterogeneous, Non-Fibrous, Bulk Material       |              |                  |                                                        |
| Asbestos Types:                                                           |              |                  |                                                        |
| Other Material: Non-fibrous 17%                                           |              |                  |                                                        |
| 2017.286.013-07B<br>07                                                    | 224083504-14 | No               | NAD                                                    |
| Location: Bsmt. Fl. - Mastic From HA 06B                                  |              |                  | (by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material         |              |                  |                                                        |
| Asbestos Types:                                                           |              |                  |                                                        |
| Other Material: Non-fibrous 24.3%                                         |              |                  |                                                        |
| 2017.286.013-08A<br>08                                                    | 224083504-15 | No               | NAD                                                    |
| Location: Bsmt. Fl., Room B08A - Green Mottled 12" x 12" Floor Tile       |              |                  | (by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Teal, Homogeneous, Non-Fibrous, Bulk Material        |              |                  |                                                        |
| Asbestos Types:                                                           |              |                  |                                                        |
| Other Material: Non-fibrous 0.9%                                          |              |                  |                                                        |
| 2017.286.013-08B<br>08                                                    | 224083504-16 | No               | NAD                                                    |
| Location: Bsmt. Fl., Room B08A - Green Mottled 12" x 12" Floor Tile       |              |                  | (by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Teal, Homogeneous, Non-Fibrous, Bulk Material        |              |                  |                                                        |
| Asbestos Types:                                                           |              |                  |                                                        |
| Other Material: Non-fibrous 1.3%                                          |              |                  |                                                        |
| 2017.286.013-09A<br>09                                                    | 224083504-17 | No               | NAD                                                    |
| Location: Bsmt. Fl. - Mastic From HA 08A                                  |              |                  | (by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Tan/Black, Heterogeneous, Non-Fibrous, Bulk Material |              |                  |                                                        |
| Asbestos Types:                                                           |              |                  |                                                        |
| Other Material: Non-fibrous 4.6%                                          |              |                  |                                                        |

# PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

| Client No. / HGA                                                                                                                                                                                            | Lab No.                                                                                               | Asbestos Present                                                                                                     | Total % Asbestos                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 2017.286.013-09B<br>09<br><br><b>Analyst Description:</b> Tan/Black, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 3.3%                         | 224083504-18<br><br><b>Location:</b> Bsmt. Fl. - Mastic From HA 08B                                   | No                                                                                                                   | NAD<br><br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| 2017.286.013-10A<br>10<br><br><b>Analyst Description:</b> Gray/Green, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 41.9% | 224083504-19<br><br><b>Location:</b> Bsmt. Fl., Room BR10 - Grey Epoxy Flooring                       | Sample Analysis Invalid due to cross-contamination. See Samples 36A/B and 37A/B For Grey Epoxy Floor Coating Results |                                                                   |
| 2017.286.013-10B<br>10<br><br><b>Analyst Description:</b> Gray/Green, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 40.5% | 224083504-20<br><br><b>Location:</b> Bsmt. Fl., Room BR03 - Grey Epoxy Flooring                       | Sample Analysis Invalid due to cross-contamination. See Samples 36A/B and 37A/B For Grey Epoxy Floor Coating Results |                                                                   |
| 2017.286.013-11A<br>11<br><br><b>Analyst Description:</b> Off-White, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 1.9%                           | 224083504-21<br><br><b>Location:</b> Bsmt. Fl., Room B05 - White W/ Grey Mottled 12" x 12" Floor Tile | No                                                                                                                   | NAD<br><br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| 2017.286.013-11B<br>11<br><br><b>Analyst Description:</b> Off-White, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 0.6%                           | 224083504-22<br><br><b>Location:</b> Bsmt. Fl., Room B05 - White W/ Grey Mottled 12" x 12" Floor Tile | No                                                                                                                   | NAD<br><br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| 2017.286.013-12A<br>12<br><br><b>Analyst Description:</b> Black, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 31.7%                            | 224083504-23<br><br><b>Location:</b> Bsmt. Fl. - Mastic From HA 11A                                   | No                                                                                                                   | NAD<br><br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |



# PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

| Client No. / HGA                                                                                                                                                                         | Lab No.      | Asbestos Present | Total % Asbestos                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|---------------------------------------------------------------|
| 2017.286.013-12B<br>12<br><b>Location:</b> Bsmt. Fl. - Mastic From HA 11B                                                                                                                | 224083504-24 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Black, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 33.7%                                       |              |                  |                                                               |
| 2017.286.013-13A<br>13<br><b>Location:</b> Bsmt. Fl., Room B00T - Grout / Mudset From Tan 4' x 4" Ceramic Wall Tile                                                                      | 224083504-25 | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> White, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100%                                          |              |                  |                                                               |
| 2017.286.013-13B<br>13<br><b>Location:</b> Bsmt. Fl., Room B00T - Grout / Mudset From Tan 4' x 4" Ceramic Wall Tile                                                                      | 224083504-26 | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> White, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 100%                                          |              |                  |                                                               |
| 2017.286.013-14A<br>14<br><b>Location:</b> Bsmt. Fl., Room B00T - Grout / Mudset From Grey Multisized Ceramic Floor Tile                                                                 | 224083504-27 | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose Trace, Non-fibrous 100%            |              |                  |                                                               |
| 2017.286.013-14B<br>14<br><b>Location:</b> Bsmt. Fl., Room B00T - Grout / Mudset From Grey Multisized Ceramic Floor Tile                                                                 | 224083504-28 | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose Trace, Non-fibrous 100%            |              |                  |                                                               |
| 2017.286.013-15A<br>15<br><b>Location:</b> Bsmt. Fl., Room B01 - Door Slab Core Material, Algoma Grade 3/4 House Fire Rating                                                             | 224083504-29 | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose 25%, Fibrous glass 2%, Non-fibrous 73% |              |                  |                                                               |

# PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

| Client No. / HGA                                                                            | Lab No.      | Asbestos Present | Total % Asbestos                                       |
|---------------------------------------------------------------------------------------------|--------------|------------------|--------------------------------------------------------|
| 2017.286.013-15B<br>15                                                                      | 224083504-30 | No               | NAD                                                    |
| Location: Bsmt. Fl., Room B06 - Door Slab Core Material, Algoma Grade 3/4 House Fire Rating |              |                  | (by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Gray, Homogeneous, Fibrous, Cementitious, Bulk Material                |              |                  |                                                        |
| Asbestos Types:                                                                             |              |                  |                                                        |
| Other Material: Cellulose 25%, Fibrous glass 3%, Non-fibrous 72%                            |              |                  |                                                        |
| 2017.286.013-16A<br>16                                                                      | 224083504-31 | Yes              | Trace (<0.25 % pc) <sup>1</sup>                        |
| Location: Bsmt. Fl., Room B08A - Interior Door Frame Caulk                                  |              |                  | (ELAP 400 PC)<br>by Valeriu Voicu<br>on 08/25/24       |
| Analyst Description: Off-White/Beige, Heterogeneous, Non-Fibrous, Bulk Material             |              |                  |                                                        |
| Asbestos Types: Anthophyllite <0.25 % pc                                                    |              |                  |                                                        |
| Other Material: Non-fibrous 16.6%                                                           |              |                  |                                                        |
| 2017.286.013-16B<br>16                                                                      | 224083504-32 | Yes              | Trace (<0.25 % pc) <sup>1</sup>                        |
| Location: Bsmt. Fl., Room B08A - Exterior Door Frame Caulk                                  |              |                  | (ELAP 400 PC)<br>by Valeriu Voicu<br>on 08/25/24       |
| Analyst Description: Off-White/Beige, Heterogeneous, Non-Fibrous, Bulk Material             |              |                  |                                                        |
| Asbestos Types: Anthophyllite <0.25 % pc                                                    |              |                  |                                                        |
| Other Material: Non-fibrous 14.4%                                                           |              |                  |                                                        |
| 2017.286.013-17A<br>17                                                                      | 224083504-33 | No               | NAD                                                    |
| Location: Bsmt. Fl., Room B00T - Top Coat Wall Plaster                                      |              |                  | (by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material                         |              |                  |                                                        |
| Asbestos Types:                                                                             |              |                  |                                                        |
| Other Material: Non-fibrous 100%                                                            |              |                  |                                                        |
| 2017.286.013-17B<br>17                                                                      | 224083504-34 | No               | NAD                                                    |
| Location: Bsmt. Fl., Room B00T - Top Coat Wall Plaster                                      |              |                  | (by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material                         |              |                  |                                                        |
| Asbestos Types:                                                                             |              |                  |                                                        |
| Other Material: Non-fibrous 100%                                                            |              |                  |                                                        |
| 2017.286.013-17C<br>17                                                                      | 224083504-35 | No               | NAD                                                    |
| Location: Bsmt. Fl., Room B00T - Top Coat Ceiling Plaster                                   |              |                  | (by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material                         |              |                  |                                                        |
| Asbestos Types:                                                                             |              |                  |                                                        |
| Other Material: Non-fibrous 100%                                                            |              |                  |                                                        |

# PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

| Client No. / HGA                                                                                                                                                              | Lab No.      | Asbestos Present | Total % Asbestos                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|---------------------------------------------------------------|
| 2017.286.013-18A<br>18<br><b>Location:</b> Bsmt. Fl., Room B00T - Base Coat Wall Plaster                                                                                      | 224083504-36 | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose Trace, Non-fibrous 100% |              |                  |                                                               |
| 2017.286.013-18B<br>18<br><b>Location:</b> Bsmt. Fl., Room B00T - Base Coat Wall Plaster                                                                                      | 224083504-37 | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose Trace, Non-fibrous 100% |              |                  |                                                               |
| 2017.286.013-18C<br>18<br><b>Location:</b> Bsmt. Fl., Room B00T - Base Coat Ceiling Plaster                                                                                   | 224083504-38 | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose Trace, Non-fibrous 100% |              |                  |                                                               |
| 2017.286.013-19A<br>19<br><b>Location:</b> Bsmt. Fl., Room B08A - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation                                               | 224083504-39 | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose Trace, Fibrous glass 20%, Non-fibrous 80% |              |                  |                                                               |
| 2017.286.013-19B<br>19<br><b>Location:</b> Bsmt. Fl., B00CA - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation                                                   | 224083504-40 | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose Trace, Fibrous glass 20%, Non-fibrous 80% |              |                  |                                                               |
| 2017.286.013-19C<br>19<br><b>Location:</b> Bsmt. Fl., Room B03 - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation                                                | 224083504-41 | <b>No</b>        | NAD<br>(by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Cellulose Trace, Fibrous glass 15%, Non-fibrous 85% |              |                  |                                                               |

# PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

| Client No. / HGA                                                                                    | Lab No.      | Asbestos Present | Total % Asbestos                                       |
|-----------------------------------------------------------------------------------------------------|--------------|------------------|--------------------------------------------------------|
| 2017.286.013-20A<br>20                                                                              | 224083504-42 | <b>No</b>        | NAD                                                    |
| <b>Location:</b> 1st Fl., Room 1R07 - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation |              |                  | (by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Fibrous, Bulk Material                               |              |                  |                                                        |
| <b>Asbestos Types:</b>                                                                              |              |                  |                                                        |
| <b>Other Material:</b> Cellulose Trace, Fibrous glass 30%, Non-fibrous 70%                          |              |                  |                                                        |
| 2017.286.013-20B<br>20                                                                              | 224083504-43 | <b>No</b>        | NAD                                                    |
| <b>Location:</b> 1st Fl., Room 111 - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation  |              |                  | (by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Fibrous, Bulk Material                               |              |                  |                                                        |
| <b>Asbestos Types:</b>                                                                              |              |                  |                                                        |
| <b>Other Material:</b> Cellulose Trace, Fibrous glass 20%, Non-fibrous 80%                          |              |                  |                                                        |
| 2017.286.013-20C<br>20                                                                              | 224083504-44 | <b>No</b>        | NAD                                                    |
| <b>Location:</b> 1st Fl., Room 111 - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation  |              |                  | (by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Fibrous, Bulk Material                               |              |                  |                                                        |
| <b>Asbestos Types:</b>                                                                              |              |                  |                                                        |
| <b>Other Material:</b> Cellulose Trace, Fibrous glass 25%, Non-fibrous 75%                          |              |                  |                                                        |
| 2017.286.013-21A<br>21                                                                              | 224083504-45 | <b>No</b>        | NAD                                                    |
| <b>Location:</b> 2nd Fl., Room 2R01 - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation |              |                  | (by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Fibrous, Bulk Material                               |              |                  |                                                        |
| <b>Asbestos Types:</b>                                                                              |              |                  |                                                        |
| <b>Other Material:</b> Cellulose Trace, Fibrous glass 25%, Non-fibrous 75%                          |              |                  |                                                        |
| 2017.286.013-21B<br>21                                                                              | 224083504-46 | <b>No</b>        | NAD                                                    |
| <b>Location:</b> 2nd Fl., 200CB - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation     |              |                  | (by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Fibrous, Bulk Material                               |              |                  |                                                        |
| <b>Asbestos Types:</b>                                                                              |              |                  |                                                        |
| <b>Other Material:</b> Cellulose Trace, Fibrous glass 20%, Non-fibrous 80%                          |              |                  |                                                        |
| 2017.286.013-21C<br>21                                                                              | 224083504-47 | <b>No</b>        | NAD                                                    |
| <b>Location:</b> 2nd Fl., Room 2R02 - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation |              |                  | (by NYS ELAP 198.1)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Off-White/Gray, Heterogeneous, Fibrous, Bulk Material                   |              |                  |                                                        |
| <b>Asbestos Types:</b>                                                                              |              |                  |                                                        |
| <b>Other Material:</b> Cellulose 10%, Fibrous glass 20%, Non-fibrous 70%                            |              |                  |                                                        |

# PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

| Client No. / HGA                                                                                                                                                                                        | Lab No.                                                                   | Asbestos Present | Total % Asbestos                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------|
| 2017.286.013-22A<br>22                                                                                                                                                                                  | 224083504-48<br><b>Location:</b> Bsmt. Fl., Room BR03 - Wall Seam Caulk   | <b>Yes</b>       | Trace (<0.25 % pc) <sup>1</sup><br>(ELAP 400 PC)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Beige, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Anthophyllite <0.25 % pc<br><b>Other Material:</b> Non-fibrous 18.8%                               |                                                                           |                  |                                                                                     |
| 2017.286.013-22B<br>22                                                                                                                                                                                  | 224083504-49<br><b>Location:</b> 1st Fl., Room 109 - Wall Seam Caulk      | <b>Yes</b>       | Trace (<0.25 % pc) <sup>1</sup><br>(ELAP 400 PC)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Beige/Gray, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc, Anthophyllite <0.25 % pc<br><b>Other Material:</b> Non-fibrous 29.5% |                                                                           |                  |                                                                                     |
| 2017.286.013-22C<br>22                                                                                                                                                                                  | 224083504-50<br><b>Location:</b> 2nd Fl., Room 2R05 - Wall Seam Caulk     | <b>Yes</b>       | Trace (<0.25 % pc) <sup>1</sup><br>(ELAP 400 PC)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Off-White/Gray, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile <0.25 % pc<br><b>Other Material:</b> Non-fibrous 21.6%                       |                                                                           |                  |                                                                                     |
| 2017.286.013-23A<br>23                                                                                                                                                                                  | 224083504-51<br><b>Location:</b> 1st Fl., Room 1R07 - Red Wall Firestop   | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24                       |
| <b>Analyst Description:</b> Red, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 32.6%                                                          |                                                                           |                  |                                                                                     |
| 2017.286.013-23B<br>23                                                                                                                                                                                  | 224083504-52<br><b>Location:</b> 1st Fl., Room 1R07 - Red Wall Firestop   | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24                       |
| <b>Analyst Description:</b> Red, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 36.6%                                                          |                                                                           |                  |                                                                                     |
| 2017.286.013-24A<br>24                                                                                                                                                                                  | 224083504-53<br><b>Location:</b> 1st Fl., Room 109 - Carpet Square Mastic | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24                       |
| <b>Analyst Description:</b> Tan, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 1%                                                             |                                                                           |                  |                                                                                     |

## PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

| Client No. / HGA                                                                                                                                                | Lab No.      | Asbestos Present | Total % Asbestos                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|---------------------------------------------------------------|
| 2017.286.013-24B<br>24<br><b>Location:</b> 1st Fl., Room 101 - Carpet Square Mastic                                                                             | 224083504-54 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Tan, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 1%                     |              |                  |                                                               |
| 2017.286.013-25A<br>25<br><b>Location:</b> 1st Fl., Room 111 - Carpet Square Mastic                                                                             | 224083504-55 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 23.5%                |              |                  |                                                               |
| 2017.286.013-25B<br>25<br><b>Location:</b> 1st Fl., Room 111 - Carpet Square Mastic                                                                             | 224083504-56 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Black, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 19%                  |              |                  |                                                               |
| 2017.286.013-26A<br>26<br><b>Location:</b> 1st Fl., Room 1R03 - Duct Mastic From Fiberglass Duct Wrap                                                           | 224083504-57 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Black, Heterogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Fibrous glass 9%, Non-fibrous 1%   |              |                  |                                                               |
| 2017.286.013-26B<br>26<br><b>Location:</b> 1st Fl., Room 1R03 - Duct Mastic From Fiberglass Duct Wrap                                                           | 224083504-58 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Black, Heterogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Fibrous glass 5%, Non-fibrous 1.5% |              |                  |                                                               |
| 2017.286.013-27A<br>27<br><b>Location:</b> 1st Fl., Room 1R01 - Red 12" x 12" Floor Tile                                                                        | 224083504-59 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Red, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 0.6%                   |              |                  |                                                               |

## PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

| Client No. / HGA                                                                                                               | Lab No.                                                                            | Asbestos Present | Total % Asbestos                                              |
|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------|---------------------------------------------------------------|
| 2017.286.013-27B<br>27                                                                                                         | 224083504-60<br>Location: 1st Fl., Room 1R01 - Red 12" x 12" Floor Tile            | No               | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material<br>Asbestos Types:<br>Other Material: Non-fibrous 2.1%       |                                                                                    |                  |                                                               |
| 2017.286.013-28A<br>28                                                                                                         | 224083504-61<br>Location: 1st Fl., Room 1R01 - Black W/ White 12" x 12" Floor Tile | No               | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material<br>Asbestos Types:<br>Other Material: Non-fibrous 0.6%     |                                                                                    |                  |                                                               |
| 2017.286.013-28B<br>28                                                                                                         | 224083504-62<br>Location: 1st Fl., Room 1R01 - Black W/ White 12" x 12" Floor Tile | No               | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material<br>Asbestos Types:<br>Other Material: Non-fibrous 0.7%     |                                                                                    |                  |                                                               |
| 2017.286.013-29A<br>29                                                                                                         | 224083504-63<br>Location: 1st Fl., Room 1R01 - Yellow 12" x 12" Floor Tile         | No               | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material<br>Asbestos Types:<br>Other Material: Non-fibrous 1.9%    |                                                                                    |                  |                                                               |
| 2017.286.013-29B<br>29                                                                                                         | 224083504-64<br>Location: 1st Fl., Room 1R01 - Yellow 12" x 12" Floor Tile         | No               | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material<br>Asbestos Types:<br>Other Material: Non-fibrous 1.8%    |                                                                                    |                  |                                                               |
| 2017.286.013-30A<br>30                                                                                                         | 224083504-65<br>Location: 1st Fl., Room 1R01 - Blue Mottled 12" x 12" Floor Tile   | No               | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Dark Blue, Homogeneous, Non-Fibrous, Bulk Material<br>Asbestos Types:<br>Other Material: Non-fibrous 1.4% |                                                                                    |                  |                                                               |

## PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

| Client No. / HGA                                                                                                                                        | Lab No.      | Asbestos Present | Total % Asbestos                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|---------------------------------------------------------------|
| 2017.286.013-30B<br>30<br><b>Location:</b> 1st Fl., Room 1R01 - Blue Mottled 12" x 12" Floor Tile                                                       | 224083504-66 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Dark Blue, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 1.1%     |              |                  |                                                               |
| 2017.286.013-31A<br>31<br><b>Location:</b> 1st Fl. - Mastic From 27A                                                                                    | 224083504-67 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Tan/Black, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 25%    |              |                  |                                                               |
| 2017.286.013-31B<br>31<br><b>Location:</b> 1st Fl. - Mastic From 28B                                                                                    | 224083504-68 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Tan/Black, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 26.6%  |              |                  |                                                               |
| 2017.286.013-32A<br>32<br><b>Location:</b> 2nd Fl., Room 2R05 - Carpet Square Mastic                                                                    | 224083504-69 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Green, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 6.2%         |              |                  |                                                               |
| 2017.286.013-32B<br>32<br><b>Location:</b> 2nd Fl., Room 2R01 - Carpet Square Mastic                                                                    | 224083504-70 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Green, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 4.9%         |              |                  |                                                               |
| 2017.286.013-33A<br>33<br><b>Location:</b> 2nd Fl., 200CB - Brown Epoxy Flooring                                                                        | 224083504-71 | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| <b>Analyst Description:</b> Brown/Gray, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 36.2% |              |                  |                                                               |



## PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

| Client No. / HGA                                                                                                                            | Lab No.                                                                          | Asbestos Present | Total % Asbestos                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------|----------------------------------------------------------------|
| 2017.286.013-33B<br>33                                                                                                                      | 224083504-72<br>Location: 2nd Fl., 200CB - Brown Epoxy Flooring                  | No               | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24  |
| Analyst Description: Brown/Gray, Heterogeneous, Non-Fibrous, Bulk Material<br>Asbestos Types:<br>Other Material: Non-fibrous 38.7%          |                                                                                  |                  |                                                                |
| 2017.286.013-34A<br>34                                                                                                                      | 224083504-73<br>Location: 1st Fl., 100CB - Grey Interior Window Glazing Compound | No               | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24  |
| Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material<br>Asbestos Types:<br>Other Material: Non-fibrous 0.9%                   |                                                                                  |                  |                                                                |
| 2017.286.013-34B<br>34                                                                                                                      | 224083504-74<br>Location: 1st Fl., 100CB - Grey Interior Window Glazing Compound | No               | NAD<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24  |
| Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material<br>Asbestos Types:<br>Other Material: Non-fibrous 10%                    |                                                                                  |                  |                                                                |
| 2017.286.013-35A<br>35                                                                                                                      | 224083504-75<br>Location: 1st Fl. - Grey Exterior Window Frame Caulk             | Yes              | 2.4%<br>(by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 08/25/24 |
| Analyst Description: Dark Gray, Homogeneous, Fibrous, Bulk Material<br>Asbestos Types: Chrysotile 2.4 %<br>Other Material: Non-fibrous 9.8% |                                                                                  |                  |                                                                |
| 2017.286.013-35B<br>35                                                                                                                      | 224083504-76<br>Location: 1st Fl. - Grey Exterior Window Frame Caulk             |                  | NA/PS                                                          |
| Analyst Description: Bulk Material<br>Asbestos Types:<br>Other Material:                                                                    |                                                                                  |                  |                                                                |

## PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Bulk Sampling

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### Reporting Notes:

- (1) Sample prepared for analysis by ELAP 198.6 method

Analyzed by: Valeriu Voicu  
Date: 8/25/2024



Reviewed by: Marwan A. Alahiri



\*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229915, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); 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. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

\_\_\_\_\_END OF REPORT\_\_\_\_\_

Table I  
Summary of Bulk Asbestos Analysis Results  
2017.286.013; R. McElhiney Arch.; Ward Center NYS Consortium Research Renovation Project Bulk Sampling

| 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                                                                  | 2017.286.013-01A | 01      | ----                 | ----                     | ----                     | ----                               | Chrysotile 14.8         | NA                   |
| Location: Bsmt. Fl., Room B01 - Sink Countertop                     |                  |         |                      |                          |                          |                                    |                         |                      |
| 02                                                                  | 2017.286.013-01B | 01      | ----                 | ----                     | ----                     | ----                               | NA/PS                   | NA                   |
| Location: Bsmt. Fl., Room B02A - Sink Countertop                    |                  |         |                      |                          |                          |                                    |                         |                      |
| 03                                                                  | 2017.286.013-02A | 02      | 0.195                | 60.1                     | 12.2                     | 27.7                               | NAD                     | NAD                  |
| Location: Bsmt. Fl., Room B01 - Sink Countertop Backsplash Mastic   |                  |         |                      |                          |                          |                                    |                         |                      |
| 04                                                                  | 2017.286.013-02B | 02      | 0.143                | 59.5                     | 13.6                     | 26.9                               | NAD                     | NAD                  |
| Location: Bsmt. Fl., Room B02A - Sink Countertop Backsplash Mastic  |                  |         |                      |                          |                          |                                    |                         |                      |
| 05                                                                  | 2017.286.013-03A | 03      | 0.230                | 57.5                     | 37.4                     | 5.1                                | NAD                     | NAD                  |
| Location: Bsmt. Fl., Room B02A - Black Sink Undercoating            |                  |         |                      |                          |                          |                                    |                         |                      |
| 06                                                                  | 2017.286.013-03B | 03      | 0.082                | 59.6                     | 39.2                     | 1.2                                | NAD                     | NAD                  |
| Location: Bsmt. Fl., Room B01 - Black Sink Undercoating             |                  |         |                      |                          |                          |                                    |                         |                      |
| 07                                                                  | 2017.286.013-04A | 04      | 0.295                | 16.5                     | 82.6                     | 0.9                                | NAD                     | NAD                  |
| Location: Bsmt. Fl., Room B04 - Tan Mottled 12" x 12" Floor Tile    |                  |         |                      |                          |                          |                                    |                         |                      |
| 08                                                                  | 2017.286.013-04B | 04      | 0.209                | 16.7                     | 81.5                     | 1.7                                | NAD                     | NAD                  |
| Location: Bsmt. Fl., Room B04 - Tan Mottled 12" x 12" Floor Tile    |                  |         |                      |                          |                          |                                    |                         |                      |
| 09                                                                  | 2017.286.013-05A | 05      | 0.077                | 55.5                     | 35.6                     | 8.9                                | NAD                     | NAD                  |
| Location: Bsmt. Fl. - Mastic From HA 04A                            |                  |         |                      |                          |                          |                                    |                         |                      |
| 10                                                                  | 2017.286.013-05B | 05      | 0.089                | 45.0                     | 41.4                     | 13.7                               | NAD                     | NAD                  |
| Location: Bsmt. Fl. - Mastic From HA 04B                            |                  |         |                      |                          |                          |                                    |                         |                      |
| 11                                                                  | 2017.286.013-06A | 06      | 0.202                | 65.4                     | 3.5                      | 31.1                               | NAD                     | NAD                  |
| Location: Bsmt. Fl., Room B08 - Grey Stone Patterned Sheet Flooring |                  |         |                      |                          |                          |                                    |                         |                      |
| 12                                                                  | 2017.286.013-06B | 06      | 0.177                | 65.3                     | 3.5                      | 31.2                               | NAD                     | NAD                  |
| Location: Bsmt. Fl., Room B08 - Grey Stone Patterned Sheet Flooring |                  |         |                      |                          |                          |                                    |                         |                      |
| 13                                                                  | 2017.286.013-07A | 07      | 0.065                | 43.5                     | 39.5                     | 17.0                               | NAD                     | NAD                  |
| Location: Bsmt. Fl. - Mastic From HA 06A                            |                  |         |                      |                          |                          |                                    |                         |                      |
| 14                                                                  | 2017.286.013-07B | 07      | 0.120                | 37.3                     | 38.3                     | 24.3                               | NAD                     | NAD                  |
| Location: Bsmt. Fl. - Mastic From HA 06B                            |                  |         |                      |                          |                          |                                    |                         |                      |
| 15                                                                  | 2017.286.013-08A | 08      | 0.242                | 11.1                     | 88.0                     | 0.9                                | NAD                     | NAD                  |
| Location: Bsmt. Fl., Room B08A - Green Mottled 12" x 12" Floor Tile |                  |         |                      |                          |                          |                                    |                         |                      |
| 16                                                                  | 2017.286.013-08B | 08      | 0.279                | 11.1                     | 87.6                     | 1.3                                | NAD                     | NAD                  |
| Location: Bsmt. Fl., Room B08A - Green Mottled 12" x 12" Floor Tile |                  |         |                      |                          |                          |                                    |                         |                      |

Table I  
Summary of Bulk Asbestos Analysis Results

2017.286.013; R. McElhiney Arch.; Ward Center NYS Consortium Research Renovation Project Bulk Sampling

| AmeriSci<br>Sample #                                                                        | Client Sample#   | HG<br>Area | Sample<br>Weight<br>(gram) | Heat<br>Sensitive<br>Organic % | Acid<br>Soluble<br>Inorganic % | Insoluble<br>Non-Asbestos<br>Inorganic % | ** Asbestos % by<br>PLM/DS                                                                                           | ** Asbestos % by<br>TEM |
|---------------------------------------------------------------------------------------------|------------------|------------|----------------------------|--------------------------------|--------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------|
| 17                                                                                          | 2017.286.013-09A | 09         | 0.179                      | 80.4                           | 15.1                           | 4.6                                      | NAD                                                                                                                  | NAD                     |
| Location: Bsmt. Fl. - Mastic From HA 08A                                                    |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 18                                                                                          | 2017.286.013-09B | 09         | 0.164                      | 84.1                           | 12.7                           | 3.3                                      | NAD                                                                                                                  | NAD                     |
| Location: Bsmt. Fl. - Mastic From HA 08B                                                    |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 19                                                                                          | 2017.286.013-10A | 10         | 0.171                      | 51.0                           | 7.1                            | 39.9                                     | Sample Analysis Invalid due to cross-contamination. See Samples 36A/B and 37A/B For Grey Epoxy Floor Coating Results |                         |
| Location: Bsmt. Fl., Room BR10 - Grey Epoxy Flooring                                        |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 20                                                                                          | 2017.286.013-10B | 10         | 0.187                      | 52.7                           | 6.8                            | 40.5                                     |                                                                                                                      |                         |
| Location: Bsmt. Fl., Room BR03 - Grey Epoxy Flooring                                        |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 21                                                                                          | 2017.286.013-11A | 11         | 0.310                      | 10.7                           | 87.4                           | 1.9                                      |                                                                                                                      |                         |
| Location: Bsmt. Fl., Room B05 - White W/ Grey Mottled 12" x 12" Floor Tile                  |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 22                                                                                          | 2017.286.013-11B | 11         | 0.221                      | 7.9                            | 91.5                           | 0.6                                      |                                                                                                                      |                         |
| Location: Bsmt. Fl., Room B05 - White W/ Grey Mottled 12" x 12" Floor Tile                  |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 23                                                                                          | 2017.286.013-12A | 12         | 0.147                      | 41.7                           | 26.7                           | 31.7                                     |                                                                                                                      |                         |
| Location: Bsmt. Fl. - Mastic From HA 11A                                                    |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 24                                                                                          | 2017.286.013-12B | 12         | 0.226                      | 38.7                           | 27.7                           | 33.7                                     | NAD                                                                                                                  | NAD                     |
| Location: Bsmt. Fl. - Mastic From HA 11B                                                    |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 25                                                                                          | 2017.286.013-13A | 13         | ----                       | ----                           | ----                           | ----                                     | NAD                                                                                                                  | NA                      |
| Location: Bsmt. Fl., Room B00T - Grout / Mudset From Tan 4' x 4" Ceramic Wall Tile          |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 26                                                                                          | 2017.286.013-13B | 13         | ----                       | ----                           | ----                           | ----                                     | NAD                                                                                                                  | NA                      |
| Location: Bsmt. Fl., Room B00T - Grout / Mudset From Tan 4' x 4" Ceramic Wall Tile          |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 27                                                                                          | 2017.286.013-14A | 14         | ----                       | ----                           | ----                           | ----                                     | NAD                                                                                                                  | NA                      |
| Location: Bsmt. Fl., Room B00T - Grout / Mudset From Grey Multisized Ceramic Floor Tile     |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 28                                                                                          | 2017.286.013-14B | 14         | ----                       | ----                           | ----                           | ----                                     | NAD                                                                                                                  | NA                      |
| Location: Bsmt. Fl., Room B00T - Grout / Mudset From Grey Multisized Ceramic Floor Tile     |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 29                                                                                          | 2017.286.013-15A | 15         | ----                       | ----                           | ----                           | ----                                     | NAD                                                                                                                  | NA                      |
| Location: Bsmt. Fl., Room B01 - Door Slab Core Material, Algoma Grade 3/4 House Fire Rating |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 30                                                                                          | 2017.286.013-15B | 15         | ----                       | ----                           | ----                           | ----                                     | NAD                                                                                                                  | NA                      |
| Location: Bsmt. Fl., Room B06 - Door Slab Core Material, Algoma Grade 3/4 House Fire Rating |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 31                                                                                          | 2017.286.013-16A | 16         | 0.147                      | 24.4                           | 59.0                           | 16.4                                     | Anthophyllite <0.25                                                                                                  | Anthophyllite <1.0      |
| Location: Bsmt. Fl., Room B08A - Interior Door Frame Caulk                                  |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |
| 32                                                                                          | 2017.286.013-16B | 16         | 0.136                      | 29.1                           | 56.6                           | 14.2                                     | Anthophyllite <0.25                                                                                                  | Anthophyllite <1.0      |
| Location: Bsmt. Fl., Room B08A - Exterior Door Frame Caulk                                  |                  |            |                            |                                |                                |                                          |                                                                                                                      |                         |

Table I  
Summary of Bulk Asbestos Analysis Results

2017.286.013; R. McElhiney Arch.; Ward Center NYS Consortium Research Renovation Project Bulk Sampling

| 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                                                                                             | 2017.286.013-17A | 17      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: Bsmt. Fl., Room B00T - Top Coat Wall Plaster                                         |                  |         |                      |                          |                          |                                    |                         |                      |
| 34                                                                                             | 2017.286.013-17B | 17      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: Bsmt. Fl., Room B00T - Top Coat Wall Plaster                                         |                  |         |                      |                          |                          |                                    |                         |                      |
| 35                                                                                             | 2017.286.013-17C | 17      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: Bsmt. Fl., Room B00T - Top Coat Ceiling Plaster                                      |                  |         |                      |                          |                          |                                    |                         |                      |
| 36                                                                                             | 2017.286.013-18A | 18      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: Bsmt. Fl., Room B00T - Base Coat Wall Plaster                                        |                  |         |                      |                          |                          |                                    |                         |                      |
| 37                                                                                             | 2017.286.013-18B | 18      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: Bsmt. Fl., Room B00T - Base Coat Wall Plaster                                        |                  |         |                      |                          |                          |                                    |                         |                      |
| 38                                                                                             | 2017.286.013-18C | 18      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: Bsmt. Fl., Room B00T - Base Coat Ceiling Plaster                                     |                  |         |                      |                          |                          |                                    |                         |                      |
| 39                                                                                             | 2017.286.013-19A | 19      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: Bsmt. Fl., Room B08A - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation |                  |         |                      |                          |                          |                                    |                         |                      |
| 40                                                                                             | 2017.286.013-19B | 19      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: Bsmt. Fl., B00CA - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation     |                  |         |                      |                          |                          |                                    |                         |                      |
| 41                                                                                             | 2017.286.013-19C | 19      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: Bsmt. Fl., Room B03 - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation  |                  |         |                      |                          |                          |                                    |                         |                      |
| 42                                                                                             | 2017.286.013-20A | 20      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: 1st Fl., Room 1R07 - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation   |                  |         |                      |                          |                          |                                    |                         |                      |
| 43                                                                                             | 2017.286.013-20B | 20      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: 1st Fl., Room 111 - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation    |                  |         |                      |                          |                          |                                    |                         |                      |
| 44                                                                                             | 2017.286.013-20C | 20      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: 1st Fl., Room 111 - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation    |                  |         |                      |                          |                          |                                    |                         |                      |
| 45                                                                                             | 2017.286.013-21A | 21      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: 2nd Fl., Room 2R01 - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation   |                  |         |                      |                          |                          |                                    |                         |                      |
| 46                                                                                             | 2017.286.013-21B | 21      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: 2nd Fl., 200CB - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation       |                  |         |                      |                          |                          |                                    |                         |                      |
| 47                                                                                             | 2017.286.013-21C | 21      | ----                 | ----                     | ----                     | ----                               | NAD                     | NA                   |
| Location: 2nd Fl., Room 2R02 - Hard Packed Elbow Insulation On In-Line Fiberglass Insulation   |                  |         |                      |                          |                          |                                    |                         |                      |
| 48                                                                                             | 2017.286.013-22A | 22      | 0.177                | 18.1                     | 63.1                     | 16.9                               | Anthophyllite <0.25     | Anthophyllite 1.9    |
| Location: Bsmt. Fl., Room BR03 - Wall Seam Caulk                                               |                  |         |                      |                          |                          |                                    |                         |                      |

Table I  
Summary of Bulk Asbestos Analysis Results

2017.286.013; R. McElhiney Arch.; Ward Center NYS Consortium Research Renovation Project Bulk Sampling

| 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                                                                   | 2017.286.013-22B | 22      | 0.207                | 49.3                     | 21.1                     | 29.5                               | Chrysotile <0.25        | NA/PS                |
| Location: 1st Fl., Room 109 - Wall Seam Caulk                        |                  |         |                      |                          |                          |                                    | Anthophyllite <0.25     |                      |
| 50                                                                   | 2017.286.013-22C | 22      | 0.180                | 33.8                     | 44.6                     | 21.6                               | Chrysotile <0.25        | NA/PS                |
| Location: 2nd Fl., Room 2R05 - Wall Seam Caulk                       |                  |         |                      |                          |                          |                                    |                         |                      |
| 51                                                                   | 2017.286.013-23A | 23      | 0.156                | 55.9                     | 11.5                     | 32.6                               | NAD                     | NAD                  |
| Location: 1st Fl., Room 1R07 - Red Wall Firestop                     |                  |         |                      |                          |                          |                                    |                         |                      |
| 52                                                                   | 2017.286.013-23B | 23      | 0.243                | 55.1                     | 8.3                      | 36.6                               | NAD                     | NAD                  |
| Location: 1st Fl., Room 1R07 - Red Wall Firestop                     |                  |         |                      |                          |                          |                                    |                         |                      |
| 53                                                                   | 2017.286.013-24A | 24      | 0.107                | 92.6                     | 6.4                      | 1.0                                | NAD                     | NAD                  |
| Location: 1st Fl., Room 109 - Carpet Square Mastic                   |                  |         |                      |                          |                          |                                    |                         |                      |
| 54                                                                   | 2017.286.013-24B | 24      | 0.105                | 93.3                     | 5.7                      | 1.0                                | NAD                     | NAD                  |
| Location: 1st Fl., Room 101 - Carpet Square Mastic                   |                  |         |                      |                          |                          |                                    |                         |                      |
| 55                                                                   | 2017.286.013-25A | 25      | 0.217                | 67.4                     | 9.2                      | 23.5                               | NAD                     | NAD                  |
| Location: 1st Fl., Room 111 - Carpet Square Mastic                   |                  |         |                      |                          |                          |                                    |                         |                      |
| 56                                                                   | 2017.286.013-25B | 25      | 0.185                | 70.1                     | 10.9                     | 19.0                               | NAD                     | NAD                  |
| Location: 1st Fl., Room 111 - Carpet Square Mastic                   |                  |         |                      |                          |                          |                                    |                         |                      |
| 57                                                                   | 2017.286.013-26A | 26      | 0.422                | 87.6                     | 2.4                      | 10.0                               | NAD                     | NAD                  |
| Location: 1st Fl., Room 1R03 - Duct Mastic From Fiberglass Duct Wrap |                  |         |                      |                          |                          |                                    |                         |                      |
| 58                                                                   | 2017.286.013-26B | 26      | 0.214                | 89.8                     | 3.7                      | 6.5                                | NAD                     | NAD                  |
| Location: 1st Fl., Room 1R03 - Duct Mastic From Fiberglass Duct Wrap |                  |         |                      |                          |                          |                                    |                         |                      |
| 59                                                                   | 2017.286.013-27A | 27      | 0.254                | 18.4                     | 81.0                     | 0.6                                | NAD                     | NAD                  |
| Location: 1st Fl., Room 1R01 - Red 12" x 12" Floor Tile              |                  |         |                      |                          |                          |                                    |                         |                      |
| 60                                                                   | 2017.286.013-27B | 27      | 0.310                | 18.6                     | 79.3                     | 2.1                                | NAD                     | NAD                  |
| Location: 1st Fl., Room 1R01 - Red 12" x 12" Floor Tile              |                  |         |                      |                          |                          |                                    |                         |                      |
| 61                                                                   | 2017.286.013-28A | 28      | 0.315                | 18.6                     | 80.8                     | 0.6                                | NAD                     | NAD                  |
| Location: 1st Fl., Room 1R01 - Black W/ White 12" x 12" Floor Tile   |                  |         |                      |                          |                          |                                    |                         |                      |
| 62                                                                   | 2017.286.013-28B | 28      | 0.288                | 17.8                     | 81.5                     | 0.7                                | NAD                     | NAD                  |
| Location: 1st Fl., Room 1R01 - Black W/ White 12" x 12" Floor Tile   |                  |         |                      |                          |                          |                                    |                         |                      |
| 63                                                                   | 2017.286.013-29A | 29      | 0.304                | 16.7                     | 81.4                     | 1.9                                | NAD                     | NAD                  |
| Location: 1st Fl., Room 1R01 - Yellow 12" x 12" Floor Tile           |                  |         |                      |                          |                          |                                    |                         |                      |
| 64                                                                   | 2017.286.013-29B | 29      | 0.289                | 16.3                     | 82.0                     | 1.8                                | NAD                     | NAD                  |
| Location: 1st Fl., Room 1R01 - Yellow 12" x 12" Floor Tile           |                  |         |                      |                          |                          |                                    |                         |                      |

Table I  
Summary of Bulk Asbestos Analysis Results

2017.286.013; R. McElhiney Arch.; Ward Center NYS Consortium Research Renovation Project Bulk Sampling

| 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 |
|------------------------------------------------------------------|------------------|---------|----------------------|--------------------------|--------------------------|------------------------------------|-------------------------|----------------------|
| 65                                                               | 2017.286.013-30A | 30      | 0.285                | 16.4                     | 82.2                     | 1.4                                | NAD                     | NAD                  |
| Location: 1st Fl., Room 1R01 - Blue Mottled 12" x 12" Floor Tile |                  |         |                      |                          |                          |                                    |                         |                      |
| 66                                                               | 2017.286.013-30B | 30      | 0.291                | 17.4                     | 81.5                     | 1.1                                | NAD                     | NAD                  |
| Location: 1st Fl., Room 1R01 - Blue Mottled 12" x 12" Floor Tile |                  |         |                      |                          |                          |                                    |                         |                      |
| 67                                                               | 2017.286.013-31A | 31      | 0.208                | 55.5                     | 19.6                     | 25.0                               | NAD                     | NAD                  |
| Location: 1st Fl. - Mastic From 27A                              |                  |         |                      |                          |                          |                                    |                         |                      |
| 68                                                               | 2017.286.013-31B | 31      | 0.203                | 38.4                     | 35.0                     | 26.6                               | NAD                     | NAD                  |
| Location: 1st Fl. - Mastic From 28B                              |                  |         |                      |                          |                          |                                    |                         |                      |
| 69                                                               | 2017.286.013-32A | 32      | 0.194                | 90.0                     | 3.8                      | 6.2                                | NAD                     | NAD                  |
| Location: 2nd Fl., Room 2R05 - Carpet Square Mastic              |                  |         |                      |                          |                          |                                    |                         |                      |
| 70                                                               | 2017.286.013-32B | 32      | 0.206                | 89.8                     | 5.3                      | 4.9                                | NAD                     | NAD                  |
| Location: 2nd Fl., Room 2R01 - Carpet Square Mastic              |                  |         |                      |                          |                          |                                    |                         |                      |
| 71                                                               | 2017.286.013-33A | 33      | 0.154                | 39.6                     | 24.2                     | 36.2                               | NAD                     | NAD                  |
| Location: 2nd Fl., 200CB - Brown Epoxy Flooring                  |                  |         |                      |                          |                          |                                    |                         |                      |
| 72                                                               | 2017.286.013-33B | 33      | 0.173                | 36.9                     | 24.4                     | 38.7                               | NAD                     | NAD                  |
| Location: 2nd Fl., 200CB - Brown Epoxy Flooring                  |                  |         |                      |                          |                          |                                    |                         |                      |
| 73                                                               | 2017.286.013-34A | 34      | 0.162                | 25.5                     | 73.6                     | 0.9                                | NAD                     | NAD                  |
| Location: 1st Fl., 100CB - Grey Interior Window Glazing Compound |                  |         |                      |                          |                          |                                    |                         |                      |
| 74                                                               | 2017.286.013-34B | 34      | 0.104                | 26.9                     | 63.1                     | 10.0                               | NAD                     | NAD                  |
| Location: 1st Fl., 100CB - Grey Interior Window Glazing Compound |                  |         |                      |                          |                          |                                    |                         |                      |
| 75                                                               | 2017.286.013-35A | 35      | 0.257                | 28.8                     | 58.9                     | 9.8                                | Chrysotile 2.4          | NA                   |
| Location: 1st Fl. - Grey Exterior Window Frame Caulk             |                  |         |                      |                          |                          |                                    |                         |                      |
| 76                                                               | 2017.286.013-35B | 35      | 0.228                | 36.3                     | 52.5                     | 11.2                               | NA/PS                   | NA                   |
| Location: 1st Fl. - Grey Exterior Window Frame Caulk             |                  |         |                      |                          |                          |                                    |                         |                      |

Table I  
Summary of Bulk Asbestos Analysis Results

2017.286.013; R. McElhiney Arch.; Ward Center NYS Consortium Research Renovation Project Bulk Sampling

| 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 |
|-------------------|----------------|---------|----------------------|--------------------------|--------------------------|------------------------------------|-------------------------|----------------------|
|-------------------|----------------|---------|----------------------|--------------------------|--------------------------|------------------------------------|-------------------------|----------------------|

Analyzed by: Marwan A. Alahiri  
Date: 8/25/2024



Reviewed by: Marwan A. Alahiri



\*\*Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H600-Noran 7 System, Microscope, Serial #: 600-27-6. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; 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): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

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).



|                                                                                      |                                        |                                  |
|--------------------------------------------------------------------------------------|----------------------------------------|----------------------------------|
| <b>Client:</b> R. McElhiney Arch.                                                    | <b>Delta Project No.:</b> 2017.286.013 | <b>Date:</b> 8/22/2024           |
| <b>Project:</b> Ward Center NYS Consortium Research Renovation Project Bulk Sampling | <b>Client Project No.:</b>             | <b>Turnaround Time:</b> 48 Hours |
| <b>Collected By:</b> Thomas Ferro                                                    |                                        |                                  |

| Sample Number      | Material Type | Material Condition | Floor | Description / Sample Location                |
|--------------------|---------------|--------------------|-------|----------------------------------------------|
| 2017.286 013 - 01A | Misc.         | Intact             | Bsmt  | Sink Countertop, Room B01                    |
| 2017.286 013 - 01B | Misc.         | Intact             | Bsmt  | Sink Countertop, Room B02A                   |
| 2017.286 013 - 02A | Misc.         | Intact             | Bsmt  | Sink Countertop Backsplash Mastic, Room B01  |
| 2017.286 013 - 02B | Misc.         | Intact             | Bsmt  | Sink Countertop Backsplash Mastic, Room B02A |
| 2017.286 013 - 03A | Misc.         | Intact             | Bsmt  | Black Sink Undercoating, Room B02A           |
| 2017.286 013 - 03B | Misc.         | Intact             | Bsmt  | Black Sink Undercoating, Room B01            |
| 2017.286 013 - 04A | Misc.         | Intact             | Bsmt  | Tan Mottled 12" x 12" Floor Tile, Room B04   |
| 2017.286 013 - 04B | Misc.         | Intact             | Bsmt  | Tan Mottled 12" x 12" Floor Tile, Room B04   |

**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@delta-eas.com](mailto:wjohnson@delta-eas.com), [sprislupsky@delta-eas.com](mailto:sprislupsky@delta-eas.com), [rcherevko@delta-eas.com](mailto:rcherevko@delta-eas.com)

**Notes:**

**Submitted By:** Thomas Ferro

**Date:** 8/22/2024

**Received By:** Alexcano

**Date:** 8/23/24 10:05

224083504

(Signature)

|                                                                                      |                                        |                                  |
|--------------------------------------------------------------------------------------|----------------------------------------|----------------------------------|
| <b>Client:</b> R. McElhiney Arch.                                                    | <b>Delta Project No.:</b> 2017.286.013 | <b>Date:</b> 8/22/2024           |
| <b>Project:</b> Ward Center NYS Consortium Research Renovation Project Bulk Sampling | <b>Client Project No.:</b>             | <b>Turnaround Time:</b> 48 Hours |
| <b>Collected By:</b> Thomas Ferro                                                    |                                        |                                  |

| Sample Number      | Material Type | Material Condition | Floor | Description / Sample Location                                |
|--------------------|---------------|--------------------|-------|--------------------------------------------------------------|
| 2017.286.013 - 05A | Misc.         | Intact             | Bsmt  | Mastic from HA 04A                                           |
| 2017.286.013 - 05B | Misc.         | Intact             | Bsmt  | Mastic from HA 04A                                           |
| 2017.286.013 - 06A | Misc.         | Intact             | Bsmt  | Grey Stone Patterned Sheet Flooring, Room B08                |
| 2017.286.013 - 06B | Misc.         | Intact             | Bsmt  | Grey Stone Patterned Sheet Flooring, Room B08                |
| 2017.286.013 - 07A | Misc.         | Intact             | Bsmt  | Mastic from HA 06A                                           |
| 2017.286.013 - 07B | Misc.         | Intact             | Bsmt  | Mastic from HA 06B                                           |
| 2017.286.013 - 08A | Misc.         | Intact             | Bsmt  | Green Mottled 12" x 12" Floor Tile, Room B08A                |
| 2017.286.013 - 08B | Misc.         | Intact             | Bsmt  | Green Mottled 12" x 12" Floor Tile, Room B08A                |
| 2017.286.013 - 09A | Misc.         | Intact             | Bsmt  | Mastic from HA 08A                                           |
| 2017.286.013 - 09B | Misc.         | Intact             | Bsmt  | Mastic from HA 08B                                           |
| 2017.286.013 - 10A | Misc.         | Intact             | Bsmt  | Grey Epoxy Flooring, Room BR10                               |
| 2017.286.013 - 10B | Misc.         | Intact             | Bsmt  | Grey Epoxy Flooring, Room BR03                               |
| 2017.286.013 - 11A | Misc.         | Intact             | Bsmt  | White w/ Grey Mottled 12" x 12" Floor Tile, Room B05         |
| 2017.286.013 - 11B | Misc.         | Intact             | Bsmt  | White w/ Grey Mottled 12" x 12" Floor Tile, Room B05         |
| 2017.286.013 - 12A | Misc.         | Intact             | Bsmt  | Mastic from HA 11A                                           |
| 2017.286.013 - 12B | Misc.         | Intact             | Bsmt  | Mastic from HA 11B                                           |
| 2017.286.013 - 13A | Misc.         | Intact             | Bsmt  | Grout/ Mud Set from Tan 4' x 4" Ceramic Wall Tile, Room B00T |
| 2017.286.013 - 13B | Misc.         | Intact             | Bsmt  | Grout/ Mud Set from Tan 4' x 4" Ceramic Wall Tile, Room B00T |

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|                                                                                      |                                        |                                  |
|--------------------------------------------------------------------------------------|----------------------------------------|----------------------------------|
| <b>Client:</b> R. McElhiney Arch.                                                    | <b>Delta Project No.:</b> 2017.286.013 | <b>Date:</b> 8/22/2024           |
| <b>Project:</b> Ward Center NYS Consortium Research Renovation Project Bulk Sampling | <b>Client Project No.:</b>             | <b>Turnaround Time:</b> 48 Hours |
| <b>Collected By:</b> Thomas Ferro                                                    |                                        |                                  |

| Sample Number      | Material Type | Material Condition | Floor | Description / Sample Location                                            |
|--------------------|---------------|--------------------|-------|--------------------------------------------------------------------------|
| 2017.286.013 - 14A | Misc.         | Intact             | Bsmt  | Grout/ Mud Set from Grey Multi Sized Ceramic Floor Tile, Room B00T       |
| 2017.286.013 - 14B | Misc.         | Intact             | Bsmt  | Grout/ Mud Set from Grey Multi Sized Ceramic Floor Tile, Room B00T       |
| 2017.286.013 - 15A | Misc.         | Intact             | Bsmt  | Door Slab Core Material, Algoma Grade 3/4 Hour Fire Rating, Room B01     |
| 2017.286.013 - 15B | Misc.         | Intact             | Bsmt  | Door Slab Core Material, Algoma Grade 3/4 Hour Fire Rating, Room B06     |
| 2017.286.013 - 16A | Misc.         | Intact             | Bsmt  | Interior Door Frame caulk, Room B08A                                     |
| 2017.286.013 - 16B | Misc.         | Intact             | Bsmt  | Exterior Door Frame caulk, Room B08A                                     |
| 2017.286.013 - 17A | Surfacing     | Intact             | Bsmt  | Top Coat Wall Plaster, Room B00T                                         |
| 2017.286.013 - 17B | Surfacing     | Intact             | Bsmt  | Top Coat Wall Plaster, Room B00T                                         |
| 2017.286.013 - 17C | Surfacing     | Intact             | Bsmt  | Top Coat Ceiling Plaster, Room B00T                                      |
| 2017.286.013 - 18A | Surfacing     | Intact             | Bsmt  | Base Coat Wall Plaster, Room B00T                                        |
| 2017.286.013 - 18B | Surfacing     | Intact             | Bsmt  | Base Coat Wall Plaster, Room B00T                                        |
| 2017.286.013 - 18C | Surfacing     | Intact             | Bsmt  | Base Coat Ceiling Plaster, Room B00T                                     |
| 2017.286.013 - 19A | TSI           | Intact             | Bsmt  | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room B08A |
| 2017.286.013 - 19B | TSI           | Intact             | Bsmt  | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, B00CA     |
| 2017.286.013 - 19C | TSI           | Intact             | Bsmt  | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room B03  |
| 2017.286.013 - 20A | TSI           | Intact             | 1     | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room 1R07 |
| 2017.286.013 - 20B | TSI           | Intact             | 1     | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room 111  |
| 2017.286.013 - 20C | TSI           | Intact             | 1     | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room 111  |
| 2017.286.013 - 21A | TSI           | Intact             | 2     | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room 2R01 |
| 2017.286.013 - 21B | TSI           | Intact             | 2     | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, 200CB     |

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|                                                                                      |                                        |                                  |  |
|--------------------------------------------------------------------------------------|----------------------------------------|----------------------------------|--|
| <b>Client:</b> R. McElhiney Arch.                                                    | <b>Delta Project No.:</b> 2017.286.013 | <b>Date:</b> 8/22/2024           |  |
| <b>Project:</b> Ward Center NYS Consortium Research Renovation Project Bulk Sampling | <b>Client Project No.:</b>             | <b>Turnaround Time:</b> 48 Hours |  |
| <b>Collected By:</b> Thomas Ferro                                                    |                                        |                                  |  |

| Sample Number      | Material Type | Material Condition | Floor | Description / Sample Location                                            |
|--------------------|---------------|--------------------|-------|--------------------------------------------------------------------------|
| 2017.286.013 - 21C | TSI           | Intact             | 2     | Hard Packed Elbow Insulation on In-Line Fiberglass Insulation, Room 2R02 |
| 2017.286.013 - 22A | Misc.         | Intact             | Bsmt  | Wall Seam Caulk, Room BR03                                               |
| 2017.286.013 - 22B | Misc.         | Intact             | 1     | Wall Seam Caulk, Room 109                                                |
| 2017.286.013 - 22C | Misc.         | Intact             | 2     | Wall Seam Caulk, Room 2R05                                               |
| 2017.286.013 - 23A | Misc.         | Intact             | 1     | Red Fire Stop, Wall, Room 1R07                                           |
| 2017.286.013 - 23B | Misc.         | Intact             | 1     | Red Fire Stop, Wall, Room 1R07                                           |
| 2017.286.013 - 24A | Misc.         | Intact             | 1     | Carpet Square Mastic, Room 109                                           |
| 2017.286.013 - 24B | Misc.         | Intact             | 1     | Carpet Square Mastic, Room 101                                           |
| 2017.286.013 - 25A | Misc.         | Intact             | 1     | Carpet Square Mastic, Room 111                                           |
| 2017.286.013 - 25B | Misc.         | Intact             | 1     | Carpet Square Mastic, Room 111                                           |
| 2017.286.013 - 26A | Misc.         | Intact             | 1     | Duct Mastic from Fiberglass Duct Wrap, Room 1R03                         |
| 2017.286.013 - 26B | Misc.         | Intact             | 1     | Duct Mastic from Fiberglass Duct Wrap, Room 1R03                         |
| 2017.286.013 - 27A | Misc.         | Intact             | 1     | Red 12" x 12" Floor Tile, Room 1R01                                      |
| 2017.286.013 - 27B | Misc.         | Intact             | 1     | Red 12" x 12" Floor Tile, Room 1R01                                      |
| 2017.286.013 - 28A | Misc.         | Intact             | 1     | Black w/ White 12" x 12" Floor Tile, Room 1R01                           |
| 2017.286.013 - 28B | Misc.         | Intact             | 1     | Black w/ White 12" x 12" Floor Tile, Room 1R01                           |
| 2017.286.013 - 29A | Misc.         | Intact             | 1     | Yellow 12" x 12" Floor Tile, Room 1R01                                   |
| 2017.286.013 - 29B | Misc.         | Intact             | 1     | Yellow 12" x 12" Floor Tile, Room 1R01                                   |
| 2017.286.013 - 30A | Misc.         | Intact             | 1     | Blue Mottled 12" x 12" Floor Tile, Room 1R01                             |
| 2017.286.013 - 30B | Misc.         | Intact             | 1     | Blue Mottled 12" x 12" Floor Tile, Room 1R01                             |

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|                                                                                      |                                        |                                  |
|--------------------------------------------------------------------------------------|----------------------------------------|----------------------------------|
| <b>Client:</b> R. McElhiney Arch.                                                    | <b>Delta Project No.:</b> 2017.286.013 | <b>Date:</b> 8/22/2024           |
| <b>Project:</b> Ward Center NYS Consortium Research Renovation Project Bulk Sampling | <b>Client Project No.:</b>             | <b>Turnaround Time:</b> 48 Hours |
| <b>Collected By:</b> Thomas Ferro                                                    |                                        |                                  |

| Sample Number      | Material Type | Material Condition | Floor | Description / Sample Location               |
|--------------------|---------------|--------------------|-------|---------------------------------------------|
| 2017.286.013 - 31A | Misc.         | Intact             | 1     | Mastic from HA 27A                          |
| 2017.286.013 - 31B | Misc.         | Intact             | 1     | Mastic from HA 28B                          |
| 2017.286.013 - 32A | Misc.         | Intact             | 2     | Carpet Square Mastic, Room 2R05             |
| 2017.286.013 - 32B | Misc.         | Intact             | 2     | Carpet Square Mastic, Room 2R01             |
| 2017.286.013 - 33A | Misc.         | Intact             | 2     | Brown Epoxy Flooring, 200CB                 |
| 2017.286.013 - 33B | Misc.         | Intact             | 2     | Brown Epoxy Flooring, 200CB                 |
| 2017.286.013 - 34A | Misc.         | Intact             | 1     | Grey Interior Window Glazing Copound, 100CB |
| 2017.286.013 - 34B | Misc.         | Intact             | 1     | Grey Interior Window Glazing Copound, 100CB |
| 2017.286.013 - 35A | Misc.         | Intact             | 1     | Grey Exterior Window Frame Caulk            |
| 2017.286.013 - 35B | Misc.         | Intact             | 1     | Grey Exterior Window Frame Caulk            |

224083504

**AmeriSci New York**

117 EAST 30TH ST.  
NEW YORK, NY 10016  
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## PLM Bulk Asbestos Report

Delta Engineers  
Attn: Stephen Prislupsky  
860 Hooper Road

Endwell, NY 13760

**Date Received** 10/28/24 **AmeriSci Job #** 224103092  
**Date Examined** 10/28/24 **P.O. #**  
**ELAP #** 11480 **Page** 1 of 1  
**RE:** 2017.286.012; R. McElhiney Arch.; Ward Center NYS  
Consortium Research Renovation Project Confirmatory Bulk  
Sampling

| Client No. / HGA                                                                                                                                | Lab No.                                                                     | Asbestos Present | Total % Asbestos                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------|-------------------------------------------------------------|
| 2017.286.013-36A<br>36                                                                                                                          | 224103092-01<br><b>Location:</b> Bsmt Floor Room BR10 - Grey Epoxy Flooring | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Kensen Caro<br>on 10/28/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 33.7% |                                                                             |                  |                                                             |
| 2017.286.013-36B<br>36                                                                                                                          | 224103092-02<br><b>Location:</b> Bsmt Floor Room BR03 - Grey Epoxy Flooring | <b>No</b>        | NAD<br>(by NYS ELAP 198.6)<br>by Kensen Caro<br>on 10/28/24 |
| <b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 33.3% |                                                                             |                  |                                                             |

**Reporting Notes:**

Analyzed by: Kensen Caro  
Date: 10/28/2024

Reviewed by: Karol H. Lu

\*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229003, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); 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. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

\_\_\_\_\_END OF REPORT\_\_\_\_\_

Table I  
Summary of Bulk Asbestos Analysis Results

2017.286.012; R. McElhiney Arch.; Ward Center NYS Consortium Research Renovation Project Confirmatory Bulk Sampling

| 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                                                   | 2017.286.013-36A | 36      | 0.257                | 51.2                     | 15.1                     | 33.7                               | NAD                     | NAD                  |
| Location: Bsmt Floor Room BR10 - Grey Epoxy Flooring |                  |         |                      |                          |                          |                                    |                         |                      |
| 02                                                   | 2017.286.013-36B | 36      | 0.185                | 52.3                     | 14.4                     | 33.3                               | NAD                     | NAD                  |
| Location: Bsmt Floor Room BR03 - Grey Epoxy Flooring |                  |         |                      |                          |                          |                                    |                         |                      |

Analyzed by: Khaalid W. Perine  
Date: 10/29/2024



Reviewed by: Karol H. Lu



\*\*Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; 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): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

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).



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224103092

|                                                                       |                                        |                                        |
|-----------------------------------------------------------------------|----------------------------------------|----------------------------------------|
| <b>Client:</b> <u>R. McElhiney Arch.</u>                              | <b>Delta Project No.:</b> 2017.286.012 | <b>Date:</b> 10/24/2024                |
| <b>Project:</b> <u>Ward Center NYS Consortium Research Renovation</u> | <b>Client Project No.:</b>             | <b>Turnaround Time:</b> <b>24 hour</b> |
| <u>Project Confirmatory Bulk Sampling</u>                             |                                        |                                        |
| <b>Collected By:</b> Thomas Ferro                                     |                                        |                                        |

[illegible]

**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@delta-eas.com](mailto:wjohnson@delta-eas.com), [sprislupsky@delta-eas.com](mailto:sprislupsky@delta-eas.com), [rcherevko@delta-eas.com](mailto:rcherevko@delta-eas.com)

**Notes:**

Submitted By:

Thomas Ferro

Thomas Ferro  
(Signature)

Date: 10/24/2024

Received By:

Justin Herditch 1

15

Date: 10/28/21 8:55

(Signature)



**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** 2/12/2025 **AmeriSci Job #** 225021756  
**Date Examined** 02/12/25 **P.O. #**  
**ELAP #** 11480 **Page** 1 of 2  
**RE:** 2017.286.013; R. McElhiney Arch; Ward Center NYS Consortium  
Research Renovation Project Supplemental Bulk Sampling

| Client No. / HGA                                                                                                                                                                                                                            | Lab No.      | Asbestos Present | Total % Asbestos                                                                 | Notes |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|----------------------------------------------------------------------------------|-------|
| 2017.286 013 - 37A<br>37<br><b>Location:</b> Bsmt - Grey Epoxy Flooring, Room BR10<br><b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 38%         | 225021756-01 | No               | Inconclusive - NAD<br>(NOB by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 02/12/25 | 1     |
| 2017.286 013 - 37B<br>37<br><b>Location:</b> Bsmt - Grey Epoxy Flooring, Room BR10<br><b>Analyst Description:</b> Gray, Homogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 49%         | 225021756-02 | No               | Inconclusive - NAD<br>(NOB by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 02/12/25 | 1     |
| 2017.286 013 - 38A<br>38<br><b>Location:</b> Bsmt - White Floor Coating, Room BR10<br><b>Analyst Description:</b> White/Gray, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 50% | 225021756-03 | No               | Inconclusive - NAD<br>(NOB by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 02/12/25 | 1     |
| 2017.286 013 - 38B<br>38<br><b>Location:</b> Bsmt - White Floor Coating, Room BR10<br><b>Analyst Description:</b> White/Gray, Heterogeneous, Non-Fibrous, Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b> Non-fibrous 49% | 225021756-04 | No               | Inconclusive - NAD<br>(NOB by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 02/12/25 | 1     |
| 2017.286 013 - 39A<br>39<br><b>Location:</b> Ext - Tar Membrane Behind Brick<br><b>Analyst Description:</b> Black, Homogeneous, Fibrous, Bulk Material<br><b>Asbestos Types:</b> Chrysotile 3.7%<br><b>Other Material:</b> Non-fibrous 43%  | 225021756-05 | Yes              | 3.7%<br>(NOB by NYS ELAP 198.6)<br>by Valeriu Voicu<br>on 02/12/25               |       |
| 2017.286 013 - 39B<br>39<br><b>Location:</b> Ext - Tar Membrane Behind Brick<br><b>Analyst Description:</b> Bulk Material<br><b>Asbestos Types:</b><br><b>Other Material:</b>                                                               | 225021756-06 |                  | N/A/PS                                                                           |       |

See Reporting notes on last page

## PLM Bulk Asbestos Report

2017.286.013; R. McElhiney Arch; Ward Center NYS Consortium  
Research Renovation Project Supplemental Bulk Sampling

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### Reporting Notes:

- (1) NAD results by NYS 198.6 are inconclusive and are not considered non-ACM

Analyzed by: Valeriu Voicu

Date: 2/12/2025



Reviewed by: Bo Sun



\*NAD/NSD =no asbestos detected; NA =not analyzed; NAP/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229915, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); 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. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

\_\_\_\_\_END OF REPORT\_\_\_\_\_

Client Name: Delta Engineers

Table I

## Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4

2017.286.013; R. McElhiney Arch; Ward Center NYS Consortium Research Renovation Project Supplemental Bulk Sampling

| 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                | 2017.286 013 - 37A                    | 37      | 0.335                    | 42.3                         | 19.4                         | 38.3                                   | NAD                     | NAD                  |
| Location:         | BSmt - Grey Epoxy Flooring, Room BR10 |         |                          |                              |                              |                                        |                         |                      |
| 02                | 2017.286 013 - 37B                    | 37      | 0.266                    | 33.0                         | 17.7                         | 49.4                                   | NAD                     | NAD                  |
| Location:         | BSmt - Grey Epoxy Flooring, Room BR10 |         |                          |                              |                              |                                        |                         |                      |
| 03                | 2017.286 013 - 38A                    | 38      | 0.173                    | 41.2                         | 8.4                          | 50.2                                   | NAD                     | Chrysotile <1.0      |
| Location:         | BSmt - White Floor Coating, Room BR10 |         |                          |                              |                              |                                        |                         |                      |
| 04                | 2017.286 013 - 38B                    | 38      | 0.245                    | 42.1                         | 8.6                          | 49.2                                   | NAD                     | Chrysotile <1.0      |
| Location:         | BSmt - White Floor Coating, Room BR10 |         |                          |                              |                              |                                        |                         |                      |
| 05                | 2017.286 013 - 39A                    | 39      | 0.292                    | 36.4                         | 16.9                         | 43.1                                   | Chrysotile 3.7          | NA                   |
| Location:         | Ext - Tar Membrane Behind Brick       |         |                          |                              |                              |                                        |                         |                      |
| 06                | 2017.286 013 - 39B                    | 39      | 0.279                    | 43.0                         | 18.9                         | 38.1                                   | NA/PS                   | NA                   |
| Location:         | Ext - Tar Membrane Behind Brick       |         |                          |                              |                              |                                        |                         |                      |

Analyzed by: Bo Sun

Date: 2/12/2025



Reviewed by: Bo Sun



\*\*Quantitative Analysis (Semi/Full): Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = < 1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; 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): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

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).



ENGINEERS, ARCHITECTS, & LAND SURVEYORS

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|                                                                                                      |                                        |                              |
|------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------------|
| <b>Client:</b> R. McElhiney Arch.                                                                    | <b>Delta Project No.:</b> 2017.286.013 | <b>Date:</b> 2/11/2025       |
| <b>Project:</b> Ward Center NYS Consortium Research Renovation<br>Project Supplemental Bulk Sampling | <b>Client Project No.:</b>             | <b>Turnaround Time:</b> RUSH |
| <b>Collected By:</b> Stephen Prislupsky                                                              |                                        |                              |

| Sample Number      | Material Type | Material Condition | Floor | Description / Sample Location  |
|--------------------|---------------|--------------------|-------|--------------------------------|
| 2017.286 013 - 37A | Misc.         | Intact             | Bsmt  | Grey Epoxy Flooring, Room BR10 |
| 2017.286 013 - 37B | Misc.         | Intact             | Bsmt  | Grey Epoxy Flooring, Room BR10 |
| 2017.286 013 - 38A | Misc.         | Intact             | Bsmt  | White Floor Coating, Room BR10 |
| 2017.286 013 - 38B | Misc.         | Intact             | Bsmt  | White Floor Coating, Room BR10 |
| 2017.286 013 - 39A | Misc.         | Intact             | Ext   | Tar Membrane behind Brick      |
| 2017.286 013 - 39B | Misc.         | Intact             | Ext   | Tar Membrane behind Brick      |
|                    |               |                    |       |                                |
|                    |               |                    |       |                                |

**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@delta-eas.com](mailto:wjohnson@delta-eas.com), [sprislupsky@delta-eas.com](mailto:sprislupsky@delta-eas.com), [rcherevko@delta-eas.com](mailto:rcherevko@delta-eas.com)

**Notes:**

|                                                           |                            |
|-----------------------------------------------------------|----------------------------|
| <b>Submitted By:</b> Stephen Prislupsky                   | <b>Date:</b> 2/11/2025     |
| <b>Received By:</b> <i>Stephen Prislupsky</i> (Signature) | <b>Date:</b> 2/12/25 10:13 |

## **APPENDIX C**

### **Delta Engineers, Architects, & Land Surveyors Company and Personnel Certifications**





**WE ARE YOUR DOL**



DIVISION OF SAFETY & HEALTH LICENSE AND CERTIFICATE UNIT, STATE OFFICE CAMPUS, BLDG. 12, ALBANY, NY 12226

# ASBESTOS HANDLING LICENSE

Delta Engineers, Architects, Land Surveyors, & Landscape, Architects, D.P.C.  
860 Hooper Road, Endwell, NY, 13760

License Number: 29322

License Class: RESTRICTED

Date of Issue: 10/10/2023

Expiration Date: 10/31/2024

Duly Authorized Representative: Stephen Prislupsky

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

**WE ARE YOUR DOL**



DIVISION OF SAFETY & HEALTH LICENSE AND CERTIFICATE UNIT, STATE OFFICE CAMPUS, BLDG. 12, ALBANY, NY 12226

## ASBESTOS HANDLING LICENSE

Delta Engineers, Architects, Land Surveyors, & Landscape, Architects, D.P.C.  
860 Hooper Road, Endwell, NY, 13760

License Number: 29322

License Class: RESTRICTED

Date of Issue: 10/22/2024

Expiration Date: 10/31/2025

Duly Authorized Representative: Stephen Prislupsky

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



STATE OF NEW YORK - DEPARTMENT OF LABOR  
ASBESTOS CERTIFICATE



**THOMAS P FERRO**

CLASS(EXPIRES)

C ATEC (12/25) D INSP (12/25)

H PM (12/25)

CERT# 25-6IU5N-SHAB  
DMV# 404844888

**MUST BE CARRIED ON ASBESTOS PROJECTS**



IF FOUND, RETURN TO:  
NYSDOL - L&C UNIT  
ROOM 161A BUILDING 12  
STATE OFFICE CAMPUS  
ALBANY NY 12226



01213 007425535 79

STATE OF NEW YORK - DEPARTMENT OF LABOR  
ASBESTOS CERTIFICATE



JOSEPH F SEYMOUR

CLASS(EXPIRES)

C ATEC (04/25) D INSP (04/25)

H PM (04/25)

CERT# 24-6ZS7V-SHAB  
DMV# 344867125

MUST BE CARRIED ON ASBESTOS PROJECTS



01213 00719950 27

IF FOUND, RETURN TO:

NYSDEL - L&C UNIT

ROOM 161A BUILDING 12

STATE OFFICE CAMPUS

ALBANY NY 12226

STATE OF NEW YORK - DEPARTMENT OF LABOR  
ASBESTOS CERTIFICATE



**STEPHEN M. PRISLUPSKY**  
CLASS(EXPIRES)  
C ATEC (11/25) D INSP (11/25)  
H PM (11/25) I PD (11/25)

CERT# 24-6L43B-SHAB  
DMV# 793406449

**MUST BE CARRIED ON ASBESTOS PROJECTS**

STATE OF NEW YORK - DEPARTMENT OF LABOR



IF FOUND, RETURN TO:  
NYSDEL - L&C UNIT  
ROOM 161A BUILDING 12  
STATE OFFICE CAMPUS  
ALBANY NY 12226



## **APPENDIX D**

### **Laboratory Certifications**



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*

**MS. KAROL H. LU**  
**AMERICA SCIENCE TEAM NEW YORK, INC**  
**117 EAST 30TH ST**  
**NEW YORK, NY 10016**

**NY Lab Id No: 11480**

*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<br>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                      |

**Serial No.: 68795**

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](mailto:elap@health.ny.gov).

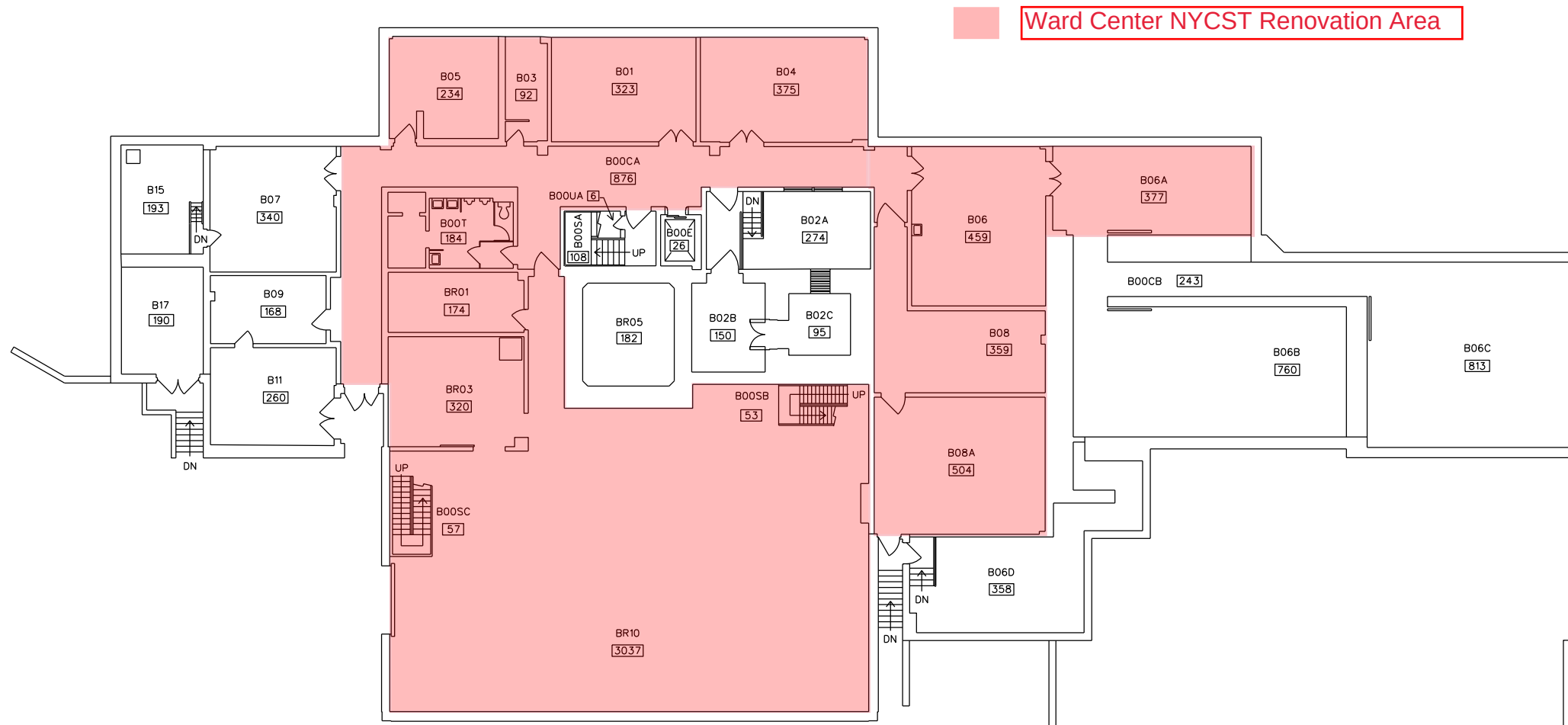




## **APPENDIX E**

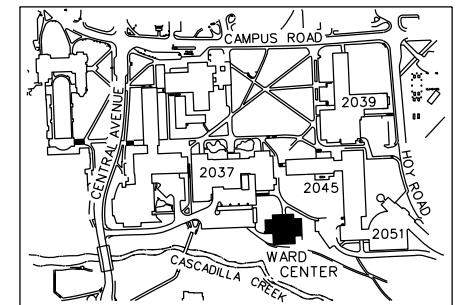
### **Survey Locations and Bulk Sample Location Drawings**





Ward Center NYCST Renovation Area

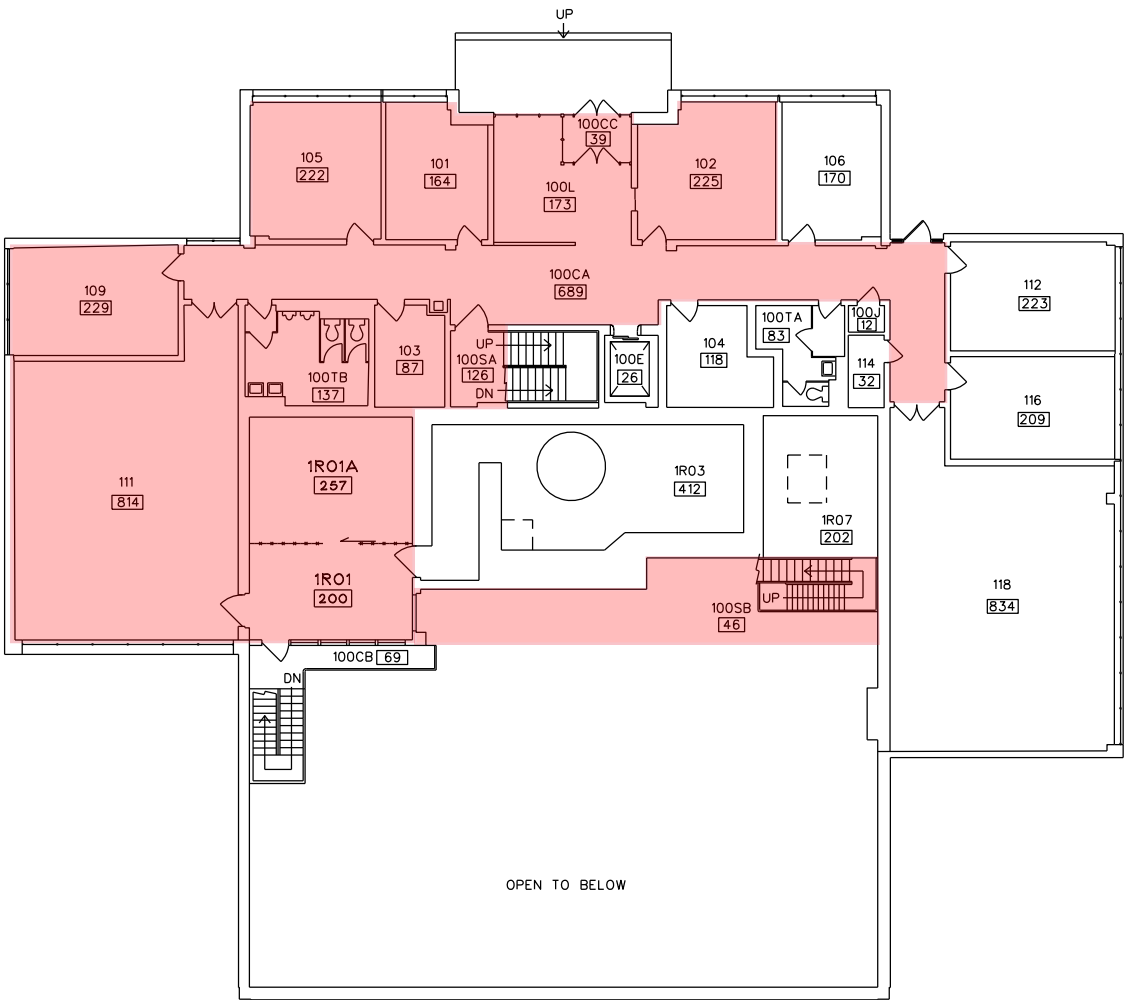
**2061 BASEMENT FLOOR PLAN**  
GROSS AREA = 13,918 SQ. FT.



|                                                                                                                                                                                                                                                                                                                                        |                              |                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------------|
| BLDG NAME:<br><b>WARD CENTER</b>                                                                                                                                                                                                                                                                                                       |                              | BLDG NO:<br><b>2061</b> |
| PLAN LEVEL: <b>B</b>                                                                                                                                                                                                                                                                                                                   | GROSS SQ. FT.: <b>25,225</b> |                         |
| DRAWING NO: 1 OF 3<br>DATE: 6/4/98<br>CHECKED: A.E.<br>DRAWN BY: NED SAMPSON                                                                                                                                                                                                                                                           |                              |                         |
| REVISIONS:<br>IGI 1/01, 8/04 EQ, 1/11 EQ                                                                                                                                                                                                                                                                                               |                              |                         |
| <b>DRAWING DISCLAIMER</b><br>These drawings, and their associated electronic files have been produced for the purpose of space inventory campus buildings. Features shown are incidental to this purpose and depict conditions at the time the drawings were produced. These drawings should not be relied upon for any other purpose. |                              |                         |
| <b>FACILITIES INVENTORY</b><br><b>CORNELL UNIVERSITY</b><br>ITHACA, NY 14853                                                                                                                                                                                                                                                           |                              |                         |



Ward Center NYCST Renovation Area

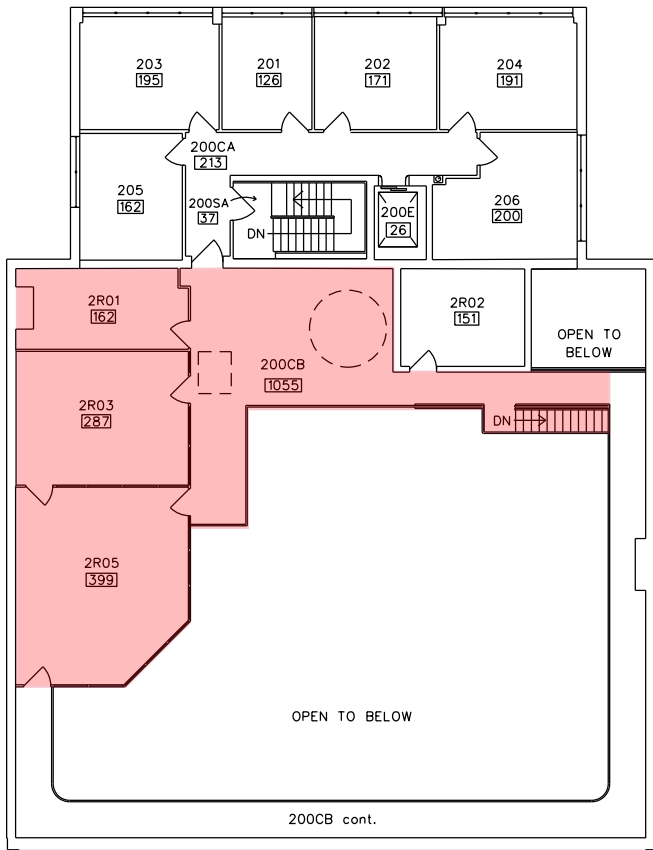


**2061 FIRST FLOOR PLAN**  
GROSS AREA = 7,176 SQ. FT.

|                                                                                                                                                                                                                                                                                                                                        |  |                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------|
| BLDG NAME:<br><b>WARD CENTER</b>                                                                                                                                                                                                                                                                                                       |  | BLDG NO:<br><b>2061</b>            |
| PLAN LEVEL: 1                                                                                                                                                                                                                                                                                                                          |  | GROSS SQ. FT.:                     |
| DRAWING NO: 2 OF 3<br>DATE: 6/4/98<br>CHECKED: A.E.<br>DRAWN BY: NED SAMPSON                                                                                                                                                                                                                                                           |  | 0 5 10 20 feet<br>SCALE: 1/8" = 1' |
| REVISIONS:<br>IGI 1/01, 1/11 EQ, 5/15 SV, 8/17 SV                                                                                                                                                                                                                                                                                      |  |                                    |
| <b>DRAWING DISCLAIMER</b><br>These drawings, and their associated electronic files have been produced for the purpose of space inventory campus buildings. Features shown are incidental to this purpose and depict conditions at the time the drawings were produced. These drawings should not be relied upon for any other purpose. |  |                                    |
| <b>FACILITIES INVENTORY</b><br><b>CORNELL UNIVERSITY</b><br>ITHACA, NY 14853                                                                                                                                                                                                                                                           |  |                                    |



Ward Center NYCST Renovation Area



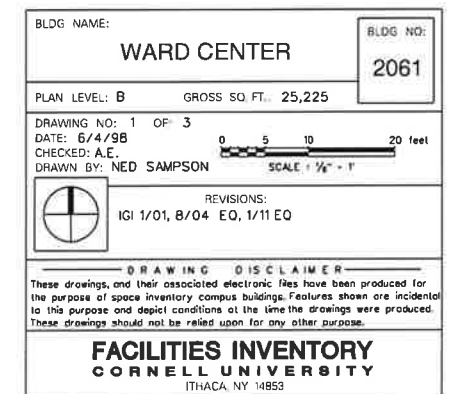
**2061 SECOND FLOOR PLAN**  
GROSS AREA = 4,131 SQ. FT.

|                                                                                                                                                                                                                                                                                                                                        |  |                       |  |              |  |                  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--|--------------|--|------------------|--|
| BLDG NAME:                                                                                                                                                                                                                                                                                                                             |  | WARD CENTER           |  | BLDG NO:     |  | 2061             |  |
| PLAN LEVEL: 2                                                                                                                                                                                                                                                                                                                          |  | GROSS SQ. FT.:        |  |              |  |                  |  |
| DRAWING NO: 3                                                                                                                                                                                                                                                                                                                          |  | OF: 3                 |  | DATE: 6/4/98 |  |                  |  |
| CHECKED: A.E.                                                                                                                                                                                                                                                                                                                          |  | DRAWN BY: NED SAMPSON |  |              |  | SCALE: 1/8" = 1' |  |
| REVISIONS:                                                                                                                                                                                                                                                                                                                             |  | IGI 1/01, 1/11 EQ     |  |              |  |                  |  |
| <b>DRAWING DISCLAIMER</b><br>These drawings, and their associated electronic files have been produced for the purpose of space inventory campus buildings. Features shown are incidental to this purpose and depict conditions at the time the drawings were produced. These drawings should not be relied upon for any other purpose. |  |                       |  |              |  |                  |  |
| <b>FACILITIES INVENTORY</b><br><b>CORNELL UNIVERSITY</b><br>ITHACA, NY 14853                                                                                                                                                                                                                                                           |  |                       |  |              |  |                  |  |









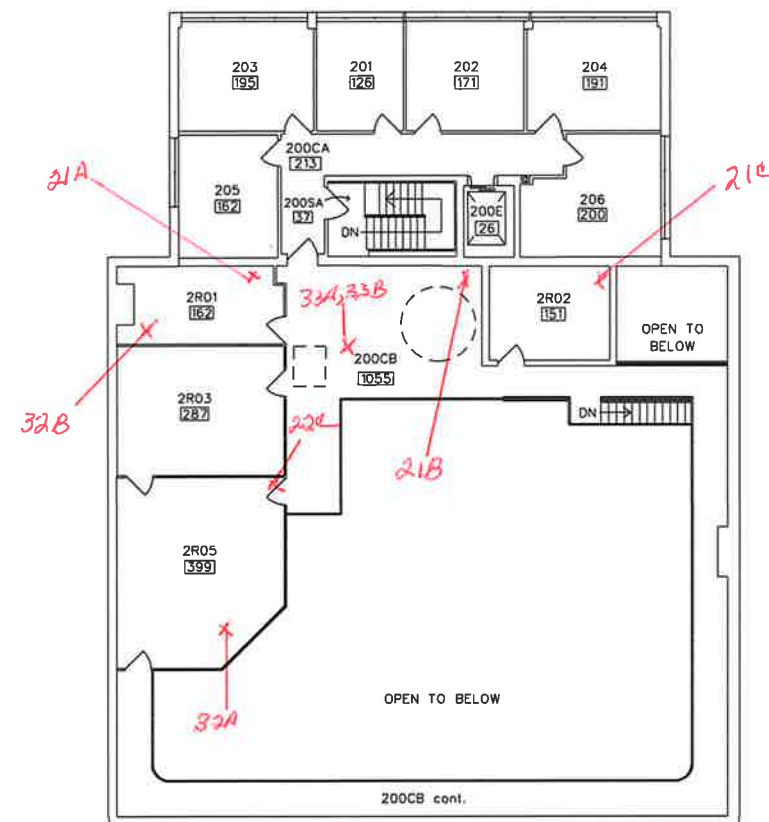




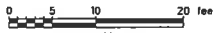
**D R A W I N G   D I S C L A I M E R**

These drawings, and their associated electronic files have been produced for the purpose of space inventory campus buildings. Features shown are incidental to this purpose and depict conditions at the time the drawings were produced. These drawings should not be relied upon for any other purpose.





**2061 SECOND FLOOR PLAN**  
GROSS AREA = 4,131 SQ. FT.

|                                                                                                                                                                                                                                                                                                                                                       |               |                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------|
| BLDG NAME:<br><b>WARD CENTER</b>                                                                                                                                                                                                                                                                                                                      |               | BLDG NO:<br><b>2061</b>                                                                                   |
| PLAN LEVEL: 2                                                                                                                                                                                                                                                                                                                                         | GROSS SQ. FT. |                                                                                                           |
| DRAWING NO: 3 OF 3<br>DATE: 6/4/98<br>CHECKED: A.E.<br>DRAWN BY: NED SAMPSON                                                                                                                                                                                                                                                                          |               |                                                                                                           |
|                                                                                                                                                                                                                                                                  |               | <br>SCALE: 1/8" = 1' |
| REVISIONS:<br>IGI 1/01, 1/11 EQ                                                                                                                                                                                                                                                                                                                       |               |                                                                                                           |
| <b>DRAWING DISCLAIMER</b><br><small>These drawings, and their associated electronic files have been produced for the purpose of space inventory campus buildings. Features shown are incidental to this purpose and depict conditions at the time the drawings were produced. These drawings should not be relied upon for any other purpose.</small> |               |                                                                                                           |
| <b>FACILITIES INVENTORY</b><br><b>CORNELL UNIVERSITY</b><br><small>ITHACA, NY 14853</small>                                                                                                                                                                                                                                                           |               |                                                                                                           |





**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. Contractor's Waste Material Disposal Plan.

**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 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

**1.6 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.

**1.7 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. Damaging vegetation beyond the extent necessary for construction.
  - 2. 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.
  - 3. Burning trash, project debris, or waste materials.
- B. Take all necessary precautions to prevent 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.

**1.8 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.

**1.9 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.

**1.10 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>  
  
<https://ehs.cornell.edu/sites/default/files/FRM-CWMDP-Contractor-Waste-Material-Disposal-Plan-IPDF.pdf>
- 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”<sup>2</sup> 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.

<sup>(1)</sup>*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.

<sup>(2)</sup>*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.
  - 1. City of Ithaca building permit applications shall be presented for review at the regularly scheduled Owner's meeting with the Authority Having Jurisdiction (AHJ).
  - 2. **The Owner has purchased the initial building permit for this project.** All other required are the responsibility of the Contractor.
- 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 and Occupancy permits shall be issued and maintained through the City of Ithaca.
- D. Ithaca Fire Department Permitting:
  - 1. A permit is required from the Ithaca Fire Department to install or substantially repair a fire suppression, fire detection, or fire alarm system as such as defined under the Uniform Code of New York State.
  - 2. If the scope of work is classified under the Existing Building Code of NYS as Alteration –Level 1; Alteration – Level 2; Alteration – Level 3; or Addition; a permit from the Ithaca Fire Department is required for all work affecting the fire suppression, fire detection, or fire alarm system for that building. A building permit is also required for this type of work.
  - 3. Work classified as a 'Repair' under the Existing Building Code of NYS does not require a permit from the Ithaca Fire Department.

**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. Any additional associated fees for permitting and regulatory fees due to changes in the Work shall be reconciled upon project completion per General Conditions Article 4 – Changes In 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:
  - 2. 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
  - 3. NYS Energy Code
    - a. International Energy Conservation Code
    - b. ASHRAE 90.1
    - c. Energy Code Supplement
  - 4. National Electric Code
  - 5. Occupational Safety and Health Administration (OSHA).
  - 6. Life Safety Code NFPA 101.
  - 7. All local ordinances

8. 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;

#### **1.4 OWNER AGREEMENTS**

- A. Cornell University and the Tompkins-Cortland Counties Building Trades Council, Maintenance Division have entered into an agreement. The local unions which are members of the Tompkins-Cortland Counties Building Trades Council, Maintenance Division are as follows:

Local #241 - International Brotherhood of Electrical Workers  
Local #267 - United Association of Plumbers and Steamfitters  
Local #281 - United Brotherhood of Carpenters  
Local #3NY - International Union of Bricklayers and Allied Craftworkers  
Local #178 - International Union of Painters and Allied Trades  
Local #112 - International Brotherhood of Sheetmetal Workers  
Local #785 - Laborers International Union of North America

The definition of craft maintenance as applied to this agreement shall be as follows:

All work associated with the demolition, repair, replacement, improvement to or construction of equipment, buildings, structures, utilities, and/or system or components thereof. Craft maintenance for trades assistants shall be limited to work assigned to individuals employed as building trade laborers and which directly assists the craft work performed by other employees covered by this agreement; the Employer is free to assign such work; provided, however, such assignment does not fall within the craft performed by other employees covered by this agreement.

#### **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)<br>Architectural Barriers Act (ABA)<br>Accessibility Guidelines for Buildings and Facilities<br>Available from Access Board<br><a href="http://www.access-board.gov">www.access-board.gov</a>                                                                                                                                                                                                                                                         | (800) 872-2253<br>(202) 272-0080                                                   |
| CFR   | Code of Federal Regulations<br>Available from Government Printing Office<br><a href="http://www.gpoaccess.gov/cfr/index.html">www.gpoaccess.gov/cfr/index.html</a>                                                                                                                                                                                                                                                                                                                          | (866) 512-1800<br>(202) 512-1800                                                   |
| FS    | Federal Specification<br>Available from Department of Defense Single Stock Point<br><a href="http://dodssp.daps.dla.mil">http://dodssp.daps.dla.mil</a><br><br>Available from Defense Standardization Program<br><a href="http://www.dps.dla.mil">www.dps.dla.mil</a><br><br>Available from General Services Administration<br><a href="http://www.gsa.gov">www.gsa.gov</a><br><br>Available from National Institute of Building Sciences<br><a href="http://www.nibs.org">www.nibs.org</a> | (215) 697-6257<br><br><br><br><br><br><br>(202) 619-8925<br><br><br>(202) 289-7800 |
| UFAS  | Uniform Federal Accessibility Standards<br>Available from Access Board<br><a href="http://www.access-board.gov">www.access-board.gov</a>                                                                                                                                                                                                                                                                                                                                                    | (800) 872-2253<br>(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)<br><a href="http://www.aluminum.org">www.aluminum.org</a>               | (703) 358-2960 |
| AAADM | American Association of Automatic Door Manufacturers<br><a href="http://www.aaadm.com">www.aaadm.com</a> | (216) 241-7333 |
| AABC  | Associated Air Balance Council<br><a href="http://www.aabchq.com">www.aabchq.com</a>                     | (202) 737-0202 |

|        |                                                                                                 |                                  |
|--------|-------------------------------------------------------------------------------------------------|----------------------------------|
| AAMA   | American Architectural Manufacturers Association<br>www.aamanet.org                             | (847) 303-5664                   |
| AASHTO | American Association of State Highway and<br>Transportation Officials<br>www.transportation.org | (202) 624-5800                   |
| AATCC  | American Association of Textile Chemists and Colorists (The)<br>www.aatcc.org                   | (919) 549-8141                   |
| ABAA   | Air Barrier Association of America<br>www.airbarrier.org                                        | (866) 956-5888                   |
| ABMA   | American Bearing Manufacturers Association<br>www.abma-dc.org                                   | (202) 367-1155                   |
| ACI    | ACI International<br>(American Concrete Institute)<br>www.aci-int.org                           | (248) 848-3700                   |
| ACPA   | American Concrete Pipe Association<br>www.concrete-pipe.org                                     | (972) 506-7216                   |
| AEIC   | Association of Edison Illuminating Companies, Inc. (The)<br>www.aeic.org                        | (205) 257-2530                   |
| AF&PA  | American Forest & Paper Association<br>www.afandpa.org                                          | (800) 878-8878<br>(202) 463-2700 |
| AGA    | American Gas Association<br>www.aga.org                                                         | (202) 824-7000                   |
| AGC    | Associated General Contractors of America (The)<br>www.agc.org                                  | (703) 548-3118                   |
| AHAM   | Association of Home Appliance Manufacturers<br>www.aham.org                                     | (202) 872-5955                   |
| AI     | Asphalt Institute<br>www.asphaltinstitute.org                                                   | (859) 288-4960                   |
| AIA    | American Institute of Architects (The)<br>www.aia.org                                           | (800) 242-3837<br>(202) 626-7300 |
| AISC   | American Institute of Steel Construction<br>www.aisc.org                                        | (800) 644-2400<br>(312) 670-2400 |
| AISI   | American Iron and Steel Institute<br>www.steel.org                                              | (202) 452-7100                   |
| AITC   | American Institute of Timber Construction<br>www.aitc-glulam.org                                | (303) 792-9559                   |



|        |                                                                                                    |                                  |
|--------|----------------------------------------------------------------------------------------------------|----------------------------------|
| ALCA   | Associated Landscape Contractors of America<br>(Now PLANET - Professional Landcare Network)        |                                  |
| ALSC   | American Lumber Standard Committee, Incorporated<br>www.alsc.org                                   | (301) 972-1700                   |
| AMCA   | Air Movement and Control Association International, Inc.<br>www.amca.org                           | (847) 394-0150                   |
| ANSI   | American National Standards Institute<br>www.ansi.org                                              | (202) 293-8020                   |
| AOSA   | Association of Official Seed Analysts, Inc.<br>www.aosaseed.com                                    | (505) 522-1437                   |
| APA    | APA - The Engineered Wood Association<br>www.apawood.org                                           | (253) 565-6600                   |
| APA    | Architectural Precast Association<br>www.archprecast.org                                           | (239) 454-6989                   |
| API    | American Petroleum Institute<br>www.api.org                                                        | (202) 682-8000                   |
| ARI    | Air-Conditioning & Refrigeration Institute<br>www.ari.org                                          | (703) 524-8800                   |
| ARMA   | Asphalt Roofing Manufacturers Association<br>www.asphaltroofing.org                                | (202) 207-0917                   |
| ASCE   | American Society of Civil Engineers<br>www.asce.org                                                | (800) 548-2723<br>(703) 295-6300 |
| ASHRAE | American Society of Heating, Refrigerating and<br>Air-Conditioning Engineers<br>www.ashrae.org     | (800) 527-4723<br>(404) 636-8400 |
| ASME   | ASME International<br>(The American Society of Mechanical Engineers International)<br>www.asme.org | (800) 843-2763<br>(973) 882-1170 |
| ASSE   | American Society of Sanitary Engineering<br>www.asse-plumbing.org                                  | (440) 835-3040                   |
| ASTM   | ASTM International<br>(American Society for Testing and Materials International)<br>www.astm.org   | (610) 832-9585                   |
| AWI    | Architectural Woodwork Institute<br>www.awinet.org                                                 | (800) 449-8811<br>(703) 733-0600 |

|       |                                                                         |                                  |
|-------|-------------------------------------------------------------------------|----------------------------------|
| AWPA  | American Wood-Preservers' Association<br>www.awpa.com                   | (334) 874-9800                   |
| AWS   | American Welding Society<br>www.aws.org                                 | (800) 443-9353<br>(305) 443-9353 |
| AWWA  | American Water Works Association<br>www.awwa.org                        | (800) 926-7337<br>(303) 794-7711 |
| BHMA  | Builders Hardware Manufacturers Association<br>www.buildershardware.com | (212) 297-2122                   |
| BIA   | Brick Industry Association (The)<br>www.bia.org                         | (703) 620-0010                   |
| BICSI | BICSI<br>www.bicsi.org                                                  | (800) 242-7405<br>(813) 979-1991 |
| BISSC | Baking Industry Sanitation Standards Committee<br>www.bissc.org         | (866) 342-4772                   |
| CCC   | Carpet Cushion Council<br>www.carpetcushion.org                         | (203) 637-1312                   |
| CDA   | Copper Development Association<br>www.copper.org                        | (800) 232-3282<br>(212) 251-7200 |
| CGA   | Compressed Gas Association<br>www.cganet.com                            | (703) 788-2700                   |
| CIMA  | Cellulose Insulation Manufacturers Association<br>www.cellulose.org     | (888) 881-2462<br>(937) 222-2462 |
| CISCA | Ceilings & Interior Systems Construction Association<br>www.cisca.org   | (630) 584-1919                   |
| CISPI | Cast Iron Soil Pipe Institute<br>www.cispi.org                          | (423) 892-0137                   |
| CLFMI | Chain Link Fence Manufacturers Institute<br>www.chainlinkinfo.org       | (301) 596-2583                   |
| CPA   | Composite Panel Association<br>www.pbmdf.com                            | (301) 670-0604                   |
| CPPA  | Corrugated Polyethylene Pipe Association<br>www.cppa-info.org           | (800) 510-2772<br>(202) 462-9607 |
| CRI   | Carpet & Rug Institute (The)<br>www.carpet-rug.com                      | (800) 882-8846<br>(706) 278-3176 |

|       |                                                                                                      |                                  |
|-------|------------------------------------------------------------------------------------------------------|----------------------------------|
| CRSI  | Concrete Reinforcing Steel Institute<br><a href="http://www.crsi.org">www.crsi.org</a>               | (847) 517-1200                   |
| CSI   | Cast Stone Institute<br><a href="http://www.caststone.org">www.caststone.org</a>                     | (770) 972-3011                   |
| CSI   | Construction Specifications Institute (The)<br><a href="http://www.csinet.org">www.csinet.org</a>    | (800) 689-2900<br>(703) 684-0300 |
| CSSB  | Cedar Shake & Shingle Bureau<br><a href="http://www.cedarbureau.org">www.cedarbureau.org</a>         | (604) 820-7700                   |
| CTI   | Cooling Technology Institute<br><a href="http://www.cti.org">www.cti.org</a>                         | (281) 583-4087                   |
| DHI   | Door and Hardware Institute<br><a href="http://www.dhi.org">www.dhi.org</a>                          | (703) 222-2010                   |
| EIA   | Electronic Industries Alliance<br><a href="http://www.eia.org">www.eia.org</a>                       | (703) 907-7500                   |
| EIMA  | EIFS Industry Members Association<br><a href="http://www.eima.com">www.eima.com</a>                  | (800) 294-3462<br>(770) 968-7945 |
| EJCDC | Engineers Joint Contract Documents Committee<br><a href="http://www.ejdc.org">www.ejdc.org</a>       | (703) 295-5000                   |
| EJMA  | Expansion Joint Manufacturers Association, Inc.<br><a href="http://www.ejma.org">www.ejma.org</a>    | (914) 332-0040                   |
| ESD   | ESD Association<br><a href="http://www.esda.org">www.esda.org</a>                                    | (315) 339-6937                   |
| FMG   | FM Global<br><a href="http://www.fmglobal.com">www.fmglobal.com</a>                                  | (401) 275-3000                   |
| FSA   | Fluid Sealing Association<br><a href="http://www.fluidsealing.com">www.fluidsealing.com</a>          | (610) 971-4850                   |
| FSC   | Forest Stewardship Council<br><a href="http://www.fsc.org">www.fsc.org</a>                           | 49 228 367 66 0                  |
| GA    | Gypsum Association<br><a href="http://www.gypsum.org">www.gypsum.org</a>                             | (202) 289-5440                   |
| GANA  | Glass Association of North America<br><a href="http://www.glasswebsite.com">www.glasswebsite.com</a> | (785) 271-0208                   |
| GS    | Green Seal<br><a href="http://www.greenseal.org">www.greenseal.org</a>                               | (202) 872-6400                   |

|       |                                                                                                                 |                                  |
|-------|-----------------------------------------------------------------------------------------------------------------|----------------------------------|
| GSI   | Geosynthetic Institute<br><a href="http://www.geosynthetic-institute.org">www.geosynthetic-institute.org</a>    | (610) 522-8440                   |
| HI    | Hydraulic Institute<br><a href="http://www.pumps.org">www.pumps.org</a>                                         | (888) 786-7744<br>(973) 267-9700 |
| HI    | Hydronics Institute<br><a href="http://www.gamanet.org">www.gamanet.org</a>                                     | (908) 464-8200                   |
| HPVA  | Hardwood Plywood & Veneer Association<br><a href="http://www.hpva.org">www.hpva.org</a>                         | (703) 435-2900                   |
| HPW   | H. P. White Laboratory, Inc.<br><a href="http://www.hpwhite.com">www.hpwhite.com</a>                            | (410) 838-6550                   |
| IBR   | Institute of Boiler & Radiation Manufacturers                                                                   |                                  |
| ICEA  | Insulated Cable Engineers Association, Inc.<br><a href="http://www.icea.net">www.icea.net</a>                   | (770) 830-0369                   |
| ICRI  | International Concrete Repair Institute, Inc.<br><a href="http://www.icri.org">www.icri.org</a>                 | (847) 827-0830                   |
| IEC   | International Electrotechnical Commission<br><a href="http://www.iec.ch">www.iec.ch</a>                         | 41 22 919 02 11                  |
| IEEE  | Institute of Electrical and Electronics Engineers, Inc. (The)<br><a href="http://www.ieee.org">www.ieee.org</a> | (212) 419-7900                   |
| IESNA | Illuminating Engineering Society of North America<br><a href="http://www.iesna.org">www.iesna.org</a>           | (212) 248-5000                   |
| IEST  | Institute of Environmental Sciences and Technology<br><a href="http://www.iest.org">www.iest.org</a>            | (847) 255-1561                   |
| IGCC  | Insulating Glass Certification Council<br><a href="http://www.igcc.org">www.igcc.org</a>                        | (315) 646-2234                   |
| IGMA  | Insulating Glass Manufacturers Alliance<br><a href="http://www.igmaonline.org">www.igmaonline.org</a>           | (613) 233-1510                   |
| ILI   | Indiana Limestone Institute of America, Inc.<br><a href="http://www.iliai.com">www.iliai.com</a>                | (812) 275-4426                   |
| ISO   | International Organization for Standardization<br><a href="http://www.iso.ch">www.iso.ch</a>                    | 41 22 749 01 11                  |
|       | Available from ANSI<br><a href="http://www.ansi.org">www.ansi.org</a>                                           | (202) 293-8020                   |

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|-------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| ISSFA | International Solid Surface Fabricators Association<br><a href="http://www.issfa.net">www.issfa.net</a>                             | (877) 464-7732<br>(702) 567-8150 |
| ITS   | Intertek<br><a href="http://www.intertek.com">www.intertek.com</a>                                                                  | (800) 345-3851<br>(713) 407-3500 |
| ITU   | International Telecommunication Union<br><a href="http://www.itu.int/home">www.itu.int/home</a>                                     | 41 22 730 51 11                  |
| KCMA  | Kitchen Cabinet Manufacturers Association<br><a href="http://www.kcma.org">www.kcma.org</a>                                         | (703) 264-1690                   |
| LMA   | Laminating Materials Association<br>(Now part of CPA)                                                                               |                                  |
| LPI   | Lightning Protection Institute<br><a href="http://www.lightning.org">www.lightning.org</a>                                          | (800) 488-6864<br>(804) 314-8955 |
| MBMA  | Metal Building Manufacturers Association<br><a href="http://www.mbma.com">www.mbma.com</a>                                          | (216) 241-7333                   |
| MFMA  | Maple Flooring Manufacturers Association, Inc.<br><a href="http://www.maplefloor.org">www.maplefloor.org</a>                        | (847) 480-9138                   |
| MFMA  | Metal Framing Manufacturers Association<br><a href="http://www.metalframingmfg.org">www.metalframingmfg.org</a>                     | (312) 644-6610                   |
| MHIA  | Material Handling Industry of America<br><a href="http://www.mhia.org">www.mhia.org</a>                                             | (800) 345-1815<br>(704) 676-1190 |
| MIA   | Marble Institute of America<br><a href="http://www.marble-institute.com">www.marble-institute.com</a>                               | (440) 250-9222                   |
| MPI   | Master Painters Institute<br><a href="http://www.paintinfo.com">www.paintinfo.com</a>                                               | (888) 674-8937                   |
| MSS   | Manufacturers Standardization Society of The Valve and Fittings Industry Inc.<br><a href="http://www.mss-hq.com">www.mss-hq.com</a> | (703) 281-6613                   |
| NAAMM | National Association of Architectural Metal Manufacturers<br><a href="http://www.naamm.org">www.naamm.org</a>                       | (312) 332-0405                   |
| NACE  | NACE International<br>(National Association of Corrosion Engineers International)<br><a href="http://www.nace.org">www.nace.org</a> | (800) 797-6623<br>(281) 228-6200 |
| NADCA | National Air Duct Cleaners Association<br><a href="http://www.nadca.com">www.nadca.com</a>                                          | (202) 737-2926                   |

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| NAIMA | North American Insulation Manufacturers Association<br>www.naima.org  | (703) 684-0084                   |
| NBGQA | National Building Granite Quarries Association, Inc.<br>www.nbgqa.com | (800) 557-2848                   |
| NCAA  | National Collegiate Athletic Association (The)<br>www.ncaa.org        | (317) 917-6222                   |
| NCMA  | National Concrete Masonry Association<br>www.ncma.org                 | (703) 713-1900                   |
| NCPI  | National Clay Pipe Institute<br>www.ncpi.org                          | (262) 248-9094                   |
| NCTA  | National Cable & Telecommunications Association<br>www.ncta.com       | (202) 775-3550                   |
| NEBB  | National Environmental Balancing Bureau<br>www.nebb.org               | (301) 977-3698                   |
| NECA  | National Electrical Contractors Association<br>www.necanet.org        | (301) 657-3110                   |
| NeLMA | Northeastern Lumber Manufacturers' Association<br>www.nelma.org       | (207) 829-6901                   |
| NEMA  | National Electrical Manufacturers Association<br>www.nema.org         | (703) 841-3200                   |
| NETA  | International Electrical Testing Association<br>www.netaworld.org     | (888) 300-6382<br>(303) 697-8441 |
| NFHS  | National Federation of State High School Associations<br>www.nfhs.org | (317) 972-6900                   |
| NFPA  | NFPA<br>(National Fire Protection Association)<br>www.nfpa.org        | (800) 344-3555<br>(617) 770-3000 |
| NFRC  | National Fenestration Rating Council<br>www.nfrc.org                  | (301) 589-1776                   |
| NGA   | National Glass Association<br>www.glass.org                           | (866) 342-5642<br>(703) 442-4890 |
| NHLA  | National Hardwood Lumber Association<br>www.natlhardwood.org          | (800) 933-0318<br>(901) 377-1818 |
| NLGA  | National Lumber Grades Authority<br>www.nlga.org                      | (604) 524-2393                   |

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| NOFMA  | NOFMA: The Wood Flooring Manufacturers Association<br><a href="http://www.nofma.org">www.nofma.org</a>              | (901) 526-5016                   |
| NRCA   | National Roofing Contractors Association<br><a href="http://www.nrca.net">www.nrca.net</a>                          | (800) 323-9545<br>(847) 299-9070 |
| NRMCA  | National Ready Mixed Concrete Association<br><a href="http://www.nrmca.org">www.nrmca.org</a>                       | (888) 846-7622<br>(301) 587-1400 |
| NSF    | NSF International<br>(National Sanitation Foundation International)<br><a href="http://www.nsf.org">www.nsf.org</a> | (800) 673-6275<br>(734) 769-8010 |
| NSSGA  | National Stone, Sand & Gravel Association<br><a href="http://www.nssga.org">www.nssga.org</a>                       | (800) 342-1415<br>(703) 525-8788 |
| NTMA   | National Terrazzo & Mosaic Association, Inc. (The)<br><a href="http://www.ntma.com">www.ntma.com</a>                | (800) 323-9736<br>(540) 751-0930 |
| NYBFU  | New York Board of Fire Underwriters<br><a href="http://www.nybfu.org">www.nybfu.org</a>                             | (212) 227-3700                   |
| PCI    | Precast/Prestressed Concrete Institute<br><a href="http://www.pci.org">www.pci.org</a>                              | (312) 786-0300                   |
| PDCA   | Painting & Decorating Contractors of America<br><a href="http://www.pdca.com">www.pdca.com</a>                      | (800) 332-7322<br>(314) 514-7322 |
| PDI    | Plumbing & Drainage Institute<br><a href="http://www.pdionline.org">www.pdionline.org</a>                           | (800) 589-8956<br>(978) 557-0720 |
| PGI    | PVC Geomembrane Institute<br><a href="http://pgi-tp.ce.uiuc.edu">http://pgi-tp.ce.uiuc.edu</a>                      | (217) 333-3929                   |
| PLANET | Professional Landcare Network<br><a href="http://www.landcarenetwork.org">www.landcarenetwork.org</a>               | (800) 395-2522                   |
| PTI    | Post-Tensioning Institute<br><a href="http://www.post-tensioning.org">www.post-tensioning.org</a>                   | (602) 870-7540                   |
| RCSC   | Research Council on Structural Connections<br><a href="http://www.boltcouncil.org">www.boltcouncil.org</a>          | (800) 644-2400<br>(312) 670-2400 |
| RFCI   | Resilient Floor Covering Institute<br><a href="http://www.rfci.com">www.rfci.com</a>                                | (301) 340-8580                   |
| RIS    | Redwood Inspection Service<br><a href="http://www.calredwood.org">www.calredwood.org</a>                            | (888) 225-7339<br>(415) 382-0662 |

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|--------|-----------------------------------------------------------------------------------------|----------------------------------|
| SAE    | SAE International<br>www.sae.org                                                        | (877) 606-7323<br>(724) 776-4841 |
| SBI    | Steel Boiler Institute                                                                  |                                  |
| SDI    | Steel Deck Institute<br>www.sdi.org                                                     | (847) 458-4647                   |
| SDI    | Steel Door Institute<br>www.steeldoor.org                                               | (440) 899-0010                   |
| SEFA   | Scientific Equipment and Furniture Association<br>www.sefalabs.com                      | (516) 294-5424                   |
| SGCC   | Safety Glazing Certification Council<br>www.sgcc.org                                    | (315) 646-2234                   |
| SIA    | Security Industry Association<br>www.siaonline.org                                      | (703) 683-2075                   |
| SJI    | Steel Joist Institute<br>www.steeljoist.org                                             | (843) 626-1995                   |
| SMA    | Screen Manufacturers Association<br>www.smacentral.org                                  | (561) 533-0991                   |
| SMACNA | Sheet Metal and Air Conditioning Contractors'<br>National Association<br>www.smacna.org | (703) 803-2980                   |
| SMPTE  | Society of Motion Picture and Television Engineers<br>www.smpte.org                     | (914) 761-1100                   |
| SPFA   | Spray Polyurethane Foam Alliance<br>www.sprayfoam.org                                   | (800) 523-6154                   |
| SPIB   | Southern Pine Inspection Bureau (The)<br>www.spib.org                                   | (850) 434-2611                   |
| SPRI   | Single Ply Roofing Industry<br>www.spri.org                                             | (781) 647-7026                   |
| SSINA  | Specialty Steel Industry of North America<br>www.ssina.com                              | (800) 982-0355<br>(202) 342-8630 |
| SSPC   | SSPC: The Society for Protective Coatings<br>www.sspc.org                               | (877) 281-7772<br>(412) 281-2331 |
| STI    | Steel Tank Institute<br>www.steeltank.com                                               | (847) 438-8265                   |



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| SWI     | Steel Window Institute<br>www.steelwindows.com                                              | (216) 241-7333                   |
| SWRI    | Sealant, Waterproofing, & Restoration Institute<br>www.swrionline.org                       | (816) 472-7974                   |
| TCA     | Tile Council of America, Inc.<br>www.tileusa.com                                            | (864) 646-8453                   |
| TIA/EIA | Telecommunications Industry Association/Electronic Industries Alliance<br>www.tiaonline.org | (703) 907-7700                   |
| TMS     | The Masonry Society<br>www.masonrysociety.org                                               | (303) 939-9700                   |
| TPI     | Truss Plate Institute, Inc.<br>www.tpinst.org                                               | (703) 683-1010                   |
| TPI     | Turfgrass Producers International<br>www.turfgrasssod.org                                   | (847) 649-5555                   |
| TRI     | Tile Roofing Institute<br>www.tilerroofing.org                                              | (312) 670-4177                   |
| UFPO    | Underground Facilities Protective Organization<br>www.ufpo.org                              | (800) 962-7962<br>(800) 962-7811 |
| UL      | Underwriters Laboratories Inc.<br>www.ul.com                                                | (877) 854-3577<br>(847) 272-8800 |
| UNI     | Uni-Bell PVC Pipe Association<br>www.uni-bell.org                                           | (972) 243-3902                   |
| USGBC   | U.S. Green Building Council<br>www.usgbc.org                                                | (202) 828-7422                   |
| WASTEC  | Waste Equipment Technology Association<br>www.wastec.org                                    | (800) 424-2869<br>(202) 244-4700 |
| WCSC    | Window Covering Safety Council<br>www.windowcoverings.org                                   | (800) 506-4636                   |
| WDMA    | Window & Door Manufacturers Association<br>www.wdma.com                                     | (800) 223-2301                   |
| WI      | Woodwork Institute<br>www.wicnet.org                                                        | (916) 372-9943                   |
| WMMPA   | Wood Moulding & Millwork Producers Association<br>www.wmmpa.com                             | (800) 550-7889<br>(530) 661-9591 |

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|-------|-----------------------------------------------------------------|----------------------------------|
| WSRCA | Western States Roofing Contractors Association<br>www.wsrca.com | (800) 725-0333<br>(650) 570-5441 |
| WWPA  | Western Wood Products Association<br>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<br>www.iapmo.org | (909) 472-4100                   |
| ICC    | International Code Council<br>www.iccsafe.org                                   | (888) 422-7233<br>(703) 931-4533 |
| ICC-ES | ICC Evaluation Service, Inc.<br>www.icc-es.org                                  | (800) 423-6587<br>(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<br>www.usace.army.mil        |                                  |
| CPSC | Consumer Product Safety Commission<br>www.cpsc.gov   | (800) 638-2772<br>(301) 504-7923 |
| DOC  | Department of Commerce<br>www.commerce.gov           | (202) 482-2000                   |
| DOD  | Department of Defense<br>http://.dodssp.daps.dla.mil | (215) 697-6257                   |
| DOE  | Department of Energy<br>www.energy.gov               | (202) 586-9220                   |
| EPA  | Environmental Protection Agency<br>www.epa.gov       | (202) 272-0167                   |
| FAA  | Federal Aviation Administration<br>www.faa.gov       | (866) 835-5322                   |

|       |                                                                 |                                  |
|-------|-----------------------------------------------------------------|----------------------------------|
| FCC   | Federal Communications Commission<br>www.fcc.gov                | (888) 225-5322                   |
| FDA   | Food and Drug Administration<br>www.fda.gov                     | (888) 463-6332                   |
| GSA   | General Services Administration<br>www.gsa.gov                  | (800) 488-3111                   |
| HUD   | Department of Housing and Urban Development<br>www.hud.gov      | (202) 708-1112                   |
| LBL   | Lawrence Berkeley National Laboratory<br>www.lbl.gov            | (510) 486-4000                   |
| NCHRP | National Cooperative Highway Research Program<br>(See TRB)      |                                  |
| NIST  | National Institute of Standards and Technology<br>www.nist.gov  | (301) 975-6478                   |
| OSHA  | Occupational Safety & Health Administration<br>www.osha.gov     | (800) 321-6742<br>(202) 693-1999 |
| PBS   | Public Building Service<br>(See GSA)                            |                                  |
| PHS   | Office of Public Health and Science<br>www.osophs.dhhs.gov/ophs | (202) 690-7694                   |
| RUS   | Rural Utilities Service<br>(See USDA)                           | (202) 720-9540                   |
| SD    | State Department<br>www.state.gov                               | (202) 647-4000                   |
| TRB   | Transportation Research Board<br>www.nas.edu/trb                | (202) 334-2934                   |
| USDA  | Department of Agriculture<br>www.usda.gov                       | (202) 720-2791                   |
| USPS  | Postal Service<br>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 29 TESTING LABORATORY SERVICES**

**1.0 GENERAL**

**1.1 DESCRIPTION**

- A. The Owner will employ and pay for the services of an Independent Testing Laboratory to perform specified services.
  - 1. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.
  - 2. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.
- B. Testing Laboratory services are specified in connection with work including but not limited to the following:
  - 1. New York State Building Code, Chapter 17, Special Inspections
  - 2. Section 014533 Special Inspections & Structural Testing

**1.2 QUALIFICATIONS OF LABORATORY**

- A. Meet "Recommended Requirements for Independent Laboratory Qualification", latest edition, published by American Council of Independent Laboratories.
- B. Meet basic requirements of ASTM E329-05b, "Standard Specification for Agencies Engaged in Construction Inspection and/or Testing".
- C. Authorized to operate in the State of New York.
- D. Testing and inspections shall be performed under the direction of Licensed Professional Engineer registered in the State of New York who shall be responsible for administering all testing and inspections and shall certify any local agency requirements.
- E. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during the most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.
- F. Testing Equipment:
  - 1. Calibrated at maximum 12 month intervals by devices of accuracy traceable to either:
    - a. National Bureau of Standards
    - b. Accepted values of natural physical constants.
  - 2. Submit copy of certificate of calibration made by accredited calibration agency.

**1.3     LABORATORY DUTIES**

- A. Cooperate with Owner, Architect and Contractor; provide qualified personnel promptly on notice.
- B. Perform specified inspections, sampling and testing of materials and methods of construction.
  - 1. Comply with specified standards, ASTM, other recognized authorities, and as specified.
  - 2. Ascertain compliance of materials with requirements of Contract Documents.
- C. Promptly notify Owner, Architect and Contractor of observed irregularities or deficiencies of work or products.
- D. Should Laboratory tests of material performed at specified intervals of time indicate that strengths do not meet Specification requirements, the Inspection Agency and Geotechnical Engineer shall IMMEDIATELY notify the Owner, Contractor, and Architect. The Architect shall determine whether remedial action is necessary.
- E. Promptly submit written report of each test and inspection; one copy each to Architect, Owner, Contractor, and one copy to Record Documents File. Each report shall include:
  - 1. Date issued.
  - 2. Project title and number.
  - 3. Testing laboratory name, address and telephone number.
  - 4. Name and signature of laboratory inspector.
  - 5. Date and time of sampling or inspection.
  - 6. Record of temperature and weather conditions.
  - 7. Date of test.
  - 8. Identification of product and specification section.
  - 9. Location of sample or test in the Project.
  - 10. Type of inspection or test.
  - 11. Observations on compliance with Contract Documents.
- F. Prepare a summary report for each category of inspection certifying that the work has been inspected and meets the Contract Documents. Specifically list all discrepancies found which have not yet been repaired or resolved.
- G. Perform additional tests as required by Architect or the Owner.

**1.4 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY**

- A. Laboratory is not authorized to:
  - 1. Release, revoke, alter or enlarge on requirements of Contract Documents.
  - 2. Approve or accept any portion of the Work.
  - 3. Perform any duties of the Contractor.

**1.5 CONTRACTOR'S RESPONSIBILITIES**

- A. Cooperate with laboratory personnel. Provide access to Work, and Manufacturer's operations.
- B. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and for which testing is specified.
- C. Provide to the laboratory the approved design mixes proposed to be used for concrete, and other material mixes which require control by the testing laboratory.
- D. Furnish copies of Products test reports as required.
- E. Furnish incidental labor and facilities:
  - 1. To provide access to work to be tested.
  - 2. To obtain and handle samples at the Project site or at the source of the product to be tested.
  - 3. To facilitate inspections and tests.
  - 4. For Laboratory's exclusive use for storage and curing of test samples.
- F. Notify laboratory a minimum of 24 hours in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
  - 1. When tests or inspections cannot be performed after such notice, reimburse laboratory for personnel and travel expenses incurred due to Contractor's responsibility.
- G. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.
- H. Employ and pay for the services of a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required when initial tests indicate work does not comply with Contract Documents.

**2.0 PRODUCTS – NOT USED**

**3.0 EXECUTION – NOT USED**

**\*\*\*END OF SECTION 01 45 29\*\*\***



**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.
  - 1. Refer to the following for list of required inspections:
    - a. Drawing S-002 Special Inspections

**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

Design Professional Seal  
or Certification

**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

Professional Seal

**\*\*\*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 TEMPORARY ENCLOSURES**

- A. Provide temporary weather-tight enclosure for building exterior, maintain in-place until installation of permanent enclosures. Provide temporary weather-tight enclosure of exterior walls as work progresses for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities, and as necessary to provide acceptable working conditions, provide weather protection for interior materials, provide weather protection for occupied areas, allow for effective temporary heating, and to prevent entry of unauthorized persons.
  - 1. Provide temporary exterior doors with self-closing hardware and padlocks or locksets.
  - 2. Other enclosures shall be removable as necessary for work and for handling of materials.
  - 3. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
  - 4. Coordinate enclosure with ventilation requirements, material drying or curing requirements, and specified environmental limitations to avoid dangerous or detrimental conditions and effects.
- B. Provide temporary enclosures to separate work areas from areas of the existing building occupied by Owner; to prevent penetration of dust or moisture into occupied areas, to prevent damage to existing equipment, and to protect Owner's employees and operations from construction work.
  - 1. Temporary partition and ceiling enclosures: Framing and sheet materials which comply with structural and fire rating requirements of applicable codes and standards.
    - a. Close joints between sheet materials, and seal edges and intersections with existing surfaces, to prevent penetration of dust or moisture.
    - b. In locations where fire protection is required, paint both sides of partitions and ceilings with fire-retardant paint as required by local fire regulations.
  - 2. Do not remove existing exterior enclosure systems until new exterior enclosure systems are ready for installation. Complete removal of existing exterior enclosure systems as soon as possible. Immediately after completing removal, install new exterior enclosure systems and complete installation as soon as possible.

3. Do not remove existing HVAC systems connected to louvers at existing exterior enclosure systems until new HVAC systems and louvers at exterior enclosure systems are ready for installation. Complete removal of existing HVAC systems and louvers as soon as possible. Immediately after completing removal, install new HVAC systems and new louvers and complete installation as soon as possible.

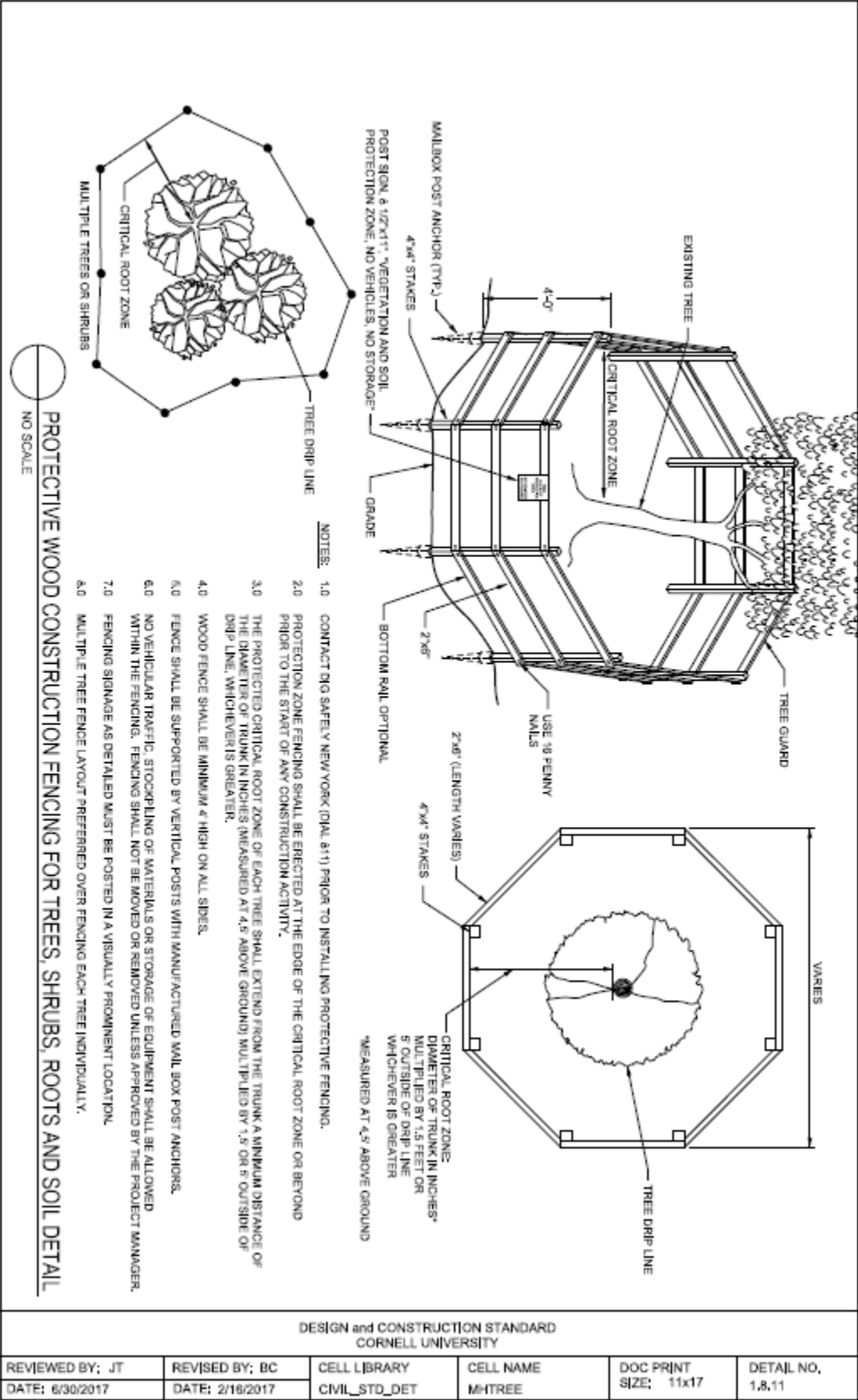
## **2.7 TEMPORARY WATER CONTROL**

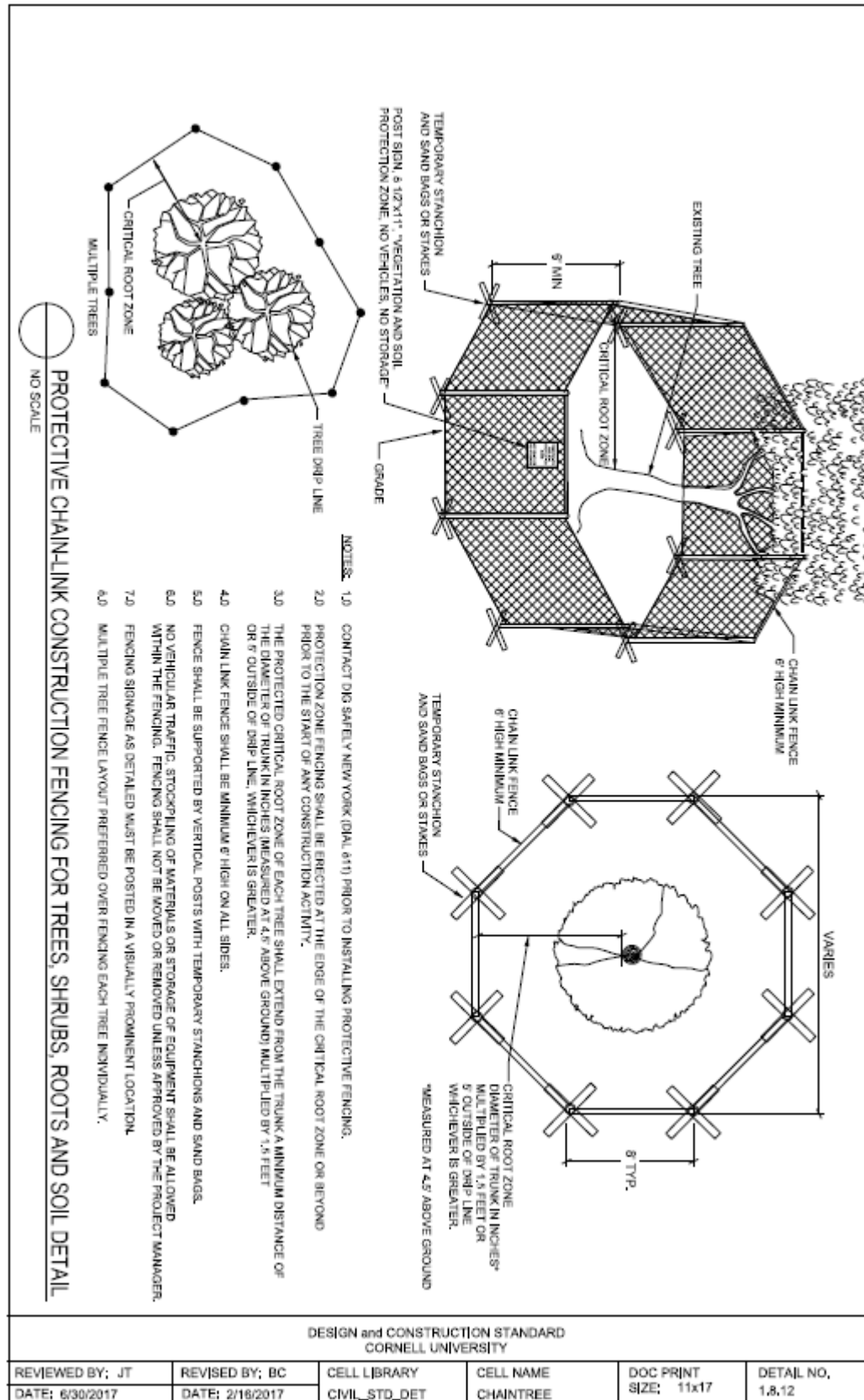
- A. The Contractor shall provide, maintain and operate pumps required to keep the Work free of water at all times.
- B. Dispose of all water with due care and shall not infringe on the rights of others on the Site, of adjacent property owners and of the public. All cost in connection with the removal of such water shall be paid by the Contractor.

## **2.8 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.





**2.9 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.

**2.10 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.

**2.11 PROJECT IDENTIFICATION AND SIGNS**

- A. No Contractor signs to be displayed at the project site, unless authorized by the Owner.

**2.12 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.

**2.13 FIELD OFFICES**

- A. The Owner shall designate a space within the facility to serve as a field office for the use of the Contractor.

**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.

**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 Existing Elevator
  - 1. If the Contractor elects to use the existing elevator equipment, the Contractor shall:
    - a. Provide adequate protection for such equipment and shall operate such equipment within a capacity not to exceed that allowed by law, rule or regulation.

- b. Provide for the maintenance and cleaning of the elevator equipment as approved by the Owner's Representative.
- c. Prior to start of construction, accurately record the condition of the existing elevator. Promptly repair or replace items that are damaged as a result of Contractor's use. Service calls that arise as a result of Contractor misuse will be charged to the Contractor. At Substantial Completion, restore elevators to condition existing before initial use.
- d. Use only elevators designated by Owner's Representative at dates and times designated by Owner's Representative. Dates and times available for Contractor's use shall be scheduled with, and at the convenience of, the Owner, and may vary during the course of the Project.
- e. Owner will not provide elevator operators or other monitoring of elevator use.
- f. Do not load elevators beyond their rated weight capacity.
- g. Provide code compliant protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator maintenance contractor to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- h. Procure and coordinate the elevator maintenance contractor to gain access to the elevator shaft as required to complete the Work

#### **2.4 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.

#### **2.5 TEMPORARY SANITARY FACILITIES**

- A. The Owner shall designate sanitary facilities to be utilized by the Contractor during construction. The Contractor shall maintain neat, clean and sanitary conditions. The Contractor shall be responsible for costs associated with excessive custodial services associated with such usage.

### **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 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 toothing-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 toothing-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 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.

**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 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 completed data in final form twenty (20) calendar days prior to the Acceptance Phase (final Payment Application) of the Project.

#### **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 or 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.

**\*\*\*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.
  - 1. Provide files and racks for storage of documents.
  - 2. Provide cabinet or storage space for storage of samples.
- 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. All significant changes in foundations, columns, beams, openings, concrete reinforcing, lintels, concealed anchorages and "knock-out" panels made during construction.
  - e. Items that will require future maintenance
  - f. 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.
- 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. After completion of Punchlist, 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\*\*\***

**TECHNICAL SPECIFICATIONS**

**FOR**

**WARD CENTER NEW YORK CONSORTIUM  
FOR SPACE TECHNOLOGY**

**CORNELL UNIVERSITY  
ITHACA, NEW YORK**



SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

SCHEDULE 0 - RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

SCHEDULE 1 - SUMMARY

- A. This Section includes the following:
  - 1. Demolition and removal of selected portions of a building or structure.
  - 2. Repair procedures for selective demolition operations.
  - 3. Related Sections include the following:

SCHEDULE 2 - DEFINITIONS

- B. Remove/Demolish: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- C. Remove and Salvage: Detach items from existing construction, prepare them for reuse, reinstall them where indicated.
- D. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- E. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled.

SCHEDULE 3 - MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

#### SCHEDULE 4 - SUBMITTALS

- A. 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.
- B. Proposed Dust-Control and Noise Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- C. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Provide Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted to greatest extent possible.
  - 2. Interruption of utility services.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Use of elevator and stairs.
  - 5. Locations of temporary partitions and means of egress.
  - 6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- E. Predemolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

#### SCHEDULE 5 - QUALITY ASSURANCE

- A. Masonry Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

- C. Standards: Comply with ANSI A10.6 and NFPA 241.
- D. Predemolition Conference: Conduct conference at Project site. Review methods and procedures related to selective demolition including, but not limited to, the following:
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

#### SCHEDULE 6 - PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than seven days notice to Owner of activities that will affect Owner's operations.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
  - 1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for condition of areas to be selectively demolished.
  - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: Hazardous materials are present on-site. Remove per drawings and specifications.
  - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify the Owner. Storage or sale of removed items or materials on-site will not be permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

## 1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

## D. PRODUCTS

### 1.9 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
- B. Comply with material and installation requirements specified in individual Specifications Sections.

## PART 2 - EXECUTION

### 2.1 EXAMINATION

- A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- B. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- D. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

### 2.2 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
  - 1. Provide at least seven days notice to Owner if shutdown of service is required during changeover.



## 2.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternative routes around closed or obstructed traffic ways if required by governing regulations.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  2. Protect walls, ceilings, floors and other existing finish work that are to remain or that are exposed during selective demolition operations.
  3. Cover and protect furniture, furnishings, and equipment that have not been removed.
- C. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

## 2.4 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding or pollutions.
  2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective operations began.

## 2.5 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows.
1. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  2. Dispose of demolished items and materials promptly.
  3. Return elements of construction and surfaces that are to remain condition existing before selective demolition operation began.
- B. Existing Facilities: Comply with building manager's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
- C. Removed and Reinstalled Items: Comply with the following:
1. Clean and repair items to functional condition adequate for intended reuse.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in *original* locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.
- E. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

## 2.6 PATCHING AND REPAIRS

1. General: Promptly repair damage to adjacent construction caused by selective demolition operations.

## 2.7 DISPOSAL OF DEMOLISHED MATERIALS

1. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
2. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION



## **SPECIFICATION SECTION 028213**

Asbestos Abatement  
at  
Cornell University Ward Center  
for the  
Ward Center Renovation  
New York Consortium for Space Technology (NYCST)

Prepared for:  
Cornell University  
Facilities and Campus Services  
Humphreys Service Building  
Ithaca, NY 14853

Prepared by:



860 Hooper Road  
Endwell, NY 13760  
Phone: 607-231-6600  
Fax: 607-231-6640  
Delta Project No. 2017.286.013

Asbestos Design Prepared By:  
Stephen Prislupsky, Director of Environmental Services  
NYS DOL Certified Asbestos Project Designer  
Certificate No. 24-6L43B-SHAB

Construction Documents  
March 7, 2025

## SECTION 028213

### ASBESTOS ABATEMENT

#### PART 1 GENERAL

##### 1.1 GENERAL REQUIREMENTS AND RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

##### 1.2 SCOPE OF WORK

- A. This asbestos abatement Project will consist of the removal and disposal of non-asbestos materials, asbestos containing materials and asbestos contaminated materials throughout the Ward Center Basement Level, 1<sup>st</sup> Floor, and Exterior Renovation Areas.
- B. Reference Drawings AR-101 and AR-102 for asbestos abatement notes, locations, quantities, and details. Reference specification section 01 35 29 – “General Health and Safety Requirements” for the Pre-Renovation Asbestos Survey Report and XRF Lead Paint Report.

- C. Asbestos containing materials, asbestos contaminated materials and other items to be removed as a part of abatement operations shall include the following:

1. Asbestos Containing Floor Tile: All colors / patterns of 9" x 9" floor tile are asbestos containing (VAT), with their associated mastics being non-asbestos. VAT removal shall be performed in the following locations:
  - Room 103 – Remove approximately 10 sf in the S/E Corner of the room as shown on Drawing AR-102. Removal of the existing wall base plate shall also be performed as a part of abatement operations to address any floor tile that may be present beneath.
  - Stairwell 100SA 1<sup>st</sup> Floor Landing - Remove approximately 10 sf in the S/E Corner of the room as shown on Drawing AR-102.
  - Corridor 100CA at location of New Exterior Entry Door - Remove approximately 10 sf along the wall beneath the window units to be removed for the new entry door as shown on Drawing AR-102.
  - Corridor B00CA - Remove approximately 16 sf along the Men’s Room B00T Shower Wall for floor slab opening as shown on Drawing AR-101.

VAT removals shall be performed within negative pressure minor-project tent work areas having attached airlock systems as per the requirements of 12 NYCRR Part 56-11.1 for In-Plant Operations / 11.3 for Minor Asbestos Projects.

2. Windows with Exterior Asbestos Containing Glazing Compound and Frame Caulk: Remove the window units and associated exterior asbestos containing glazing compound (48 LF / 2 SF) and frame caulk (24 LF / 1 SF) located in Corridor 100CA adjacent to Room 109 as shown on Drawing AR-102. Window and associated ACM glazing compound / caulk removal shall be performed from the exterior of the building within an exterior regulated abatement work area as per the requirements of 12 NYCRR Part 56-11.1 for In-Plant Operations / 11.6 for Exterior NOB’s.

3. Wallboard with Asbestos Containing Adhesive: Remove the wall mounted board and its associated asbestos containing mastic (8 SF) present on the West Wall in Room B05 as shown on Drawing AR-101. Removal shall be performed within a negative pressure minor-project tent work area having attached airlock system as per the requirements of 12 NYCRR Part 56-11.1 for In-Plant Operations / 11.3 for Minor Asbestos Projects.
  4. Asbestos Wall Joint Caulk: Remove the asbestos caulk present in the Stairwell 100SA 1<sup>st</sup> Floor Landing S/W corner at the location of the new opening and Room 103 S/E Corner (36 LF / 2.5 SF) as shown on drawing AR-102 . Caulk Removal shall be performed within negative pressure work areas having attached airlock systems for work area access/egress as per the requirements of 12 NYCRR Part 56-11.1 for In-Plant Operations / 11.3 for Minor Asbestos Projects.
  5. Asbestos Containing Exterior Wall Tar / Felt Membrane: Exterior Tar / Felt Membrane removal shall be performed in the following locations:
    - Basement Elevation – Remove approximately 32 sf on the West Elevation at the location of the new door opening to be installed as shown on Drawing AR-101. The material is present beneath the exterior brick finish and shall be removed down to bare concrete using mechanical methods (i.e. HEPA-shrouded grinders) within a negative pressure small-project tent work area having attached small-project decontamination unit.
    - 1<sup>st</sup> Floor Elevation - Remove approximately 24 sf on the North Elevation at the location of the new door opening to be installed as shown on Drawing AR-102. The material is present beneath the exterior Llenroc finish and shall be removed down to bare concrete using mechanical methods (i.e. HEPA-shrouded grinders) within a negative pressure small-project tent work area having attached small-project decontamination unit.
- D. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work.
- E. All Work shall be performed in strict accordance with the Project Documents and all governing codes, rules, and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent shall apply.

### 1.3 SPECIAL JOB CONDITIONS

- A. The Contractor may submit for a Site-Specific Variance to accomplish the Project. Variance petition shall be submitted to the Owners Representative for review and approval prior to submission to the New York State Department of Labor (NYS DOL).
- B. Work shifts and working hours shall be as necessary to complete the project in the required time frame and shall be submitted to the Owner's Representative for review/approval. The Contractor shall coordinate and schedule all Work with the facility, the Owner and the Owner's representative.
- C. Contractor to submit manpower and work schedule with bid.

- D. Owner will provide a tie-in location for electric and water source. The contractor will be responsible for providing GFCI electrical panel(s) and connecting to the building system as necessary for project power.
- E. Any air sampling necessary to meet OSHA requirements will be the responsibility of the Asbestos Contractor.
- F. Waste Dumpster locations shall be approved by the Facility Representative. All dumpsters receiving RACM Waste shall be enclosed and lockable (i.e. no open-to dumpsters).

#### 1.4 PERMITS AND COMPLIANCE

- A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the site, persons, and property adjacent to the Work.
- B. Perform asbestos related Work in accordance with New York State Industrial Code Rule 56 (herein referred to as Code Rule 56), 40 CFR 61, 29 CFR 1926, and as specified herein. Where more stringent requirements are specified, adhere to the more stringent requirements.
- C. The Contractor must maintain current licenses pursuant to New York State Department of Labor and Department of Environmental Conservation for all Work related to this Project, including the removal, handling, transport, and disposal of asbestos containing materials.
- D. The Contractor must have and submit proof upon request that any persons employed by the Contractor to engage in or supervise Work on any asbestos Project have a valid NYS asbestos handling certificate pursuant to Code Rule 56.
- E. Failure to adhere to the Project Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.
- F. The contractor shall be responsible for any waste water permits required to perform his work under this contract. Any cost associated with waste water permits shall be included in his Bid.
- G. The contractor shall be responsible for any Local City and/or State building permits required to perform his work. Any cost associated with building permits shall be included in his Bid.

#### 1.5 SUBMITTALS

- A. Reference the Front-end and Division 01 Documents for eBuilder Submittal procedures and requirements.
- B. Pre-Work Submittals: Within 7 days prior to the pre-construction conference, the Contractor shall submit the documents listed below for review and approval prior to the commencement of asbestos abatement activities:
  - 1. Contractor license issued by New York State Department of Labor.
  - 2. Progress Schedule:
    - a. Show the complete sequence of abatement activities and the sequencing of Work for each floor.
    - b. Show the dates for the beginning and completion of each major element of Work for each Work Area.



3. Project Notifications: As required by Federal and State regulatory agencies together with proof of transmittal (i.e. certified mail return receipt).
  4. Building Occupant Notification: As required by regulatory agencies.
  5. Abatement Work Plan: Provide plans that clearly indicate the following:
    - a. All Work Areas/containments numbered sequentially.
    - b. Proposed locations and types of all decontamination enclosures.
    - c. Location of water and electrical connections to building services.
    - d. Waste transport routes through the building to the waste storage container.
  6. Disposal Site/Landfill Permit from applicable regulatory agency.
  7. NYS Department of Environmental Conservation Waste Transporter Permit.
- B. On-Site Submittals: Refer to Part 3.01.D for all submittals, documentation, and postings required to be maintained on-site during abatement activities.
- C. Project Close-out Submittals: Within 15 days of project completion, the Contractor shall submit an electronic pdf format copy of the documents listed below for review and approval prior to the Contractor's final payment.
1. OSHA compliance air monitoring records conducted during the Work.
  2. Daily progress log, including the entry/exit log.
  3. A list of all Workers used in the performance of the Project, including name, NYS DOL certification number and type of certification (i.e. supervisor, asbestos handler, etc.).
- D. Fully executed/signed **Originals** of all waste disposal manifests shall be submitted as per applicable State and Federal Regulations and time frame requirements.
- E. The contractor shall also be responsible for completing and submitting the Owner's "Contractor Waste Material Disposal Plan" form included in the front-end Bid Documents. This form shall be submitted and approved by the Cornell Project Manager prior to the Owner issuing any payment for the project.

#### 1.6 PRE-BID MEETING

- A. Bidders shall attend a pre-bid meeting. Bidding Contractors will be notified in advance of the meeting.
- B. Contractors shall familiarize themselves with the Contract Documents prior to attending the conference.

#### 1.7 APPLICABLE STANDARDS AND REGULATIONS

- A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:
- B. Federal Regulations:
  1. 29 CFR 1910.1001, "Asbestos" (OSHA)
  2. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
  3. 29 CFR 1910.134, "Respiratory Protection" (OSHA)
  4. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)
  5. 29 CFR 1926, "Construction Industry" (OSHA)
  6. 29 CFR 1926.1101, "Asbestos, Tremolite, Anthophyllite, and Actinolite" (OSHA)
  7. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)

8. 40 CFR 61, Subpart A, "General Provisions" (EPA)
  9. 40 CFR 61, Subpart M, "National Emission Standard for Asbestos" (EPA)
  10. 49 CFR 171-172, Transportation Standards (DOT)
- C. New York State Regulations:
1. 12 NYCRR, Part 56, "Asbestos", Industrial Code Rule 56 (DOL).
  2. 6 NYCRR, Parts 360, 364, Disposal and Transportation (DEC)
  3. 10 NYCRR, Part 73, "Asbestos Safety Program Requirements" (DOH)
- D. Standards and Guidance Documents:
1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
  2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
  3. EPA 560/585-024, Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book)
  4. EPA 530-SW-85-007, Asbestos Waste Management Guidance
  5. ASTM Standard E1368 "Standard Practice for Visual Inspection of Asbestos Abatement Projects."

## 1.8 NOTICES

- A. Where applicable, the Contractor shall provide notification of intent to commence asbestos abatement activities as indicated below.
1. At least ten (10) Working days prior to beginning abatement activities, send written notification to:

U.S. Environmental Protection Agency  
National Emissions Standards for Hazardous Air Pollutants (NESHAPS) Coordinator  
26 Federal Plaza  
New York, NY 10007.

2. At least ten (10) days prior to beginning abatement activities send written notification to:

New York State Department of Labor  
Division of Safety and Health, Asbestos Control Program.  
State Office Campus  
Building 12 - Room 454  
Albany, NY 12240

- B. The Contractor is required to send EPA notification to regulatory agencies via mail or package delivery service that will provide proof of delivery and receipt.
- C. The Contractor shall post and/or provide Building Occupant Notification at least 10 days prior to beginning abatement activities as required by Code Rule 56.

## 1.9 PROJECT MONITORING AND AIR SAMPLING

- A. The Owner shall engage the services of an Environmental Consultant (the Consultant) who shall provide Project Monitoring and Air Sampling for the project.

- B. The Contractor is required to ensure cooperation of its personnel with the Consultant for the air sampling and Project monitoring functions described in this section. The Contractor shall comply with all direction given by the Consultant during the course of the Project.
- C. The Consultant shall provide the following administrative services:
  - 1. Review and approve or disapprove all onsite submittals as required by section 3.01.
- D. The Consultant shall staff the Project with a trained and certified person(s). This individual shall be designated as the Asbestos Project Monitor (APM).
  - 1. The APM shall be on-site at all times the Contractor is on-site for large-project work areas. The Contractor shall not be permitted to conduct any Work unless the APM is on-site (except for inspection of barriers and negative air system during non-working days).
  - 2. The APM shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the Project documents and all regulations. The APM shall have the authority to Stop Work when gross Work practice deficiencies or unsafe practices are observed, or when ambient fiber concentrations outside the removal area exceed .01 f/cc or background level.
    - a. Such Stop Work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.
    - b. Standby time required to resolve the situation shall be at the Contractor's expense.
  - 3. The APM shall provide the following services:
    - a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications.
    - b. Provide abatement Project air sampling as required by applicable regulations and the Owner's requirements. Sampling will include background, work area preparation, asbestos handling, and final cleaning and clearance air sampling.
    - c. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.
    - d. Monitor the progress of the Contractor's Work and report any deviations from the schedule to the Owner's Representative.
    - e. Monitor, verify, and document all waste load-out operations.
    - f. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
    - g. The APM shall maintain a log on site that documents all project related and Consultant and Contractor actions, activities, and occurrences.
  - 4. The following minimum inspections shall be conducted by the APM. Additional inspections shall be conducted as required by Project conditions. Progression from one phase of Work to the next by the Contractor is only permitted with the written approval of the APM.
    - a. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the Work Areas and to document these conditions.
    - b. Pre-Abatement Inspection: The purpose of this inspection is to verify the integrity of each containment system prior to disturbance of any asbestos containing material. This inspection shall take place only after the Work Area is fully prepped for removal.

- c. **Work In-Progress Inspections:** The purpose of this inspection is to monitor the Work practices and procedures employed on the Project and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the APM during all preparation, removal, and cleaning activities at least twice every Work shift. Additional inspections shall be conducted as warranted.
  - d. **Visual Clearance Inspection:** The purpose of this inspection is to verify that: all materials in the scope of work have been properly removed; no visible asbestos debris/residue remains; no pools of liquid or condensation remains; and all required cleanings are complete. This inspection shall be conducted before final air clearance testing.
  - e. **Post-Clearance Inspection:** The purpose of this inspection is to ensure the complete removal of ACM, including debris, from the Work Area after satisfactory final clearance sampling and removal of all isolation and critical barriers and equipment from the Work Area.
- E. The Consultant shall provide abatement Project air sampling and analysis as required by applicable regulations (New York State and/or AHERA). Sampling will include background, work area preparation, asbestos handling, and final cleaning and clearance air sampling.
  - 1. Unless otherwise directed by the Owner, the Consultant shall have samples analyzed by Phase Contrast Microscopy (PCM). If TEM clearance is required by the Owner, AHERA protocols/methodology shall be followed.
  - 2. Samples shall be collected as required by applicable regulations (New York State and/or AHERA) and these specifications. If Transmission Electron Microscopy (TEM) clearance air sampling is utilized by the owner, the clearance criteria and sampling protocols must be in compliance with AHERA. If PCM air sample analysis results exceed the satisfactory clearance criteria, then TEM analysis of the entire set of clearance air samples may be used, provided that a standard NIOSH/ELAP accepted laboratory analysis method is utilized that shall report each air sample result in fibers per cubic centimeter.
  - 3. If the air sampling during any phase of the abatement project reveals airborne fiber levels at or above .01 fibers/cc or the established background level, whichever is greater, outside the regulated Work Area, Work shall stop immediately and corrective measures required by Code Rule 56 shall be initiated. Notify all employers and occupants in adjacent areas. The Contractor shall bear the burden of any and all costs incurred by this delay.
  - 4. The Environmental Consultant shall submit copies of all elevated air sampling results collected during abatement and all final air clearance results to the Commissioner of Labor.

#### 1.10 CONTRACTOR AIR SAMPLING

- A. In addition to the requirements of OSHA 1926.1101, the Contractor shall be required to perform personal air monitoring every Work shift in each Work Area during which abatement activities occur in order to determine that appropriate respiratory protection is being worn and utilized.

- B. The Contractor shall conduct air sampling that is representative of both the 8-hour time weighted average and 30-minute short-term exposures to indicate compliance with the permissible exposure and excursion limits.
- C. The Contractor's laboratory analysis of air samples shall be conducted by an NYS DOH ELAP approved laboratory, subject to approval of the Owner's Representative.
- D. Results of personnel air sample analyses shall be available, verbally, within twenty-four (24) hours of sampling and shall be posted upon receipt. Written laboratory reports shall be delivered and posted at the Work site within five (5) days. Failure to comply with these requirements may result in all work being stopped until compliance is achieved.

#### 1.11 PROJECT SUPERVISOR

- A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
  - 1. The Project Supervisor shall hold New York State certification as an Asbestos Supervisor.
  - 2. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.1101 and shall have a minimum of one year experience as a supervisor.
  - 3. The Project Supervisor must be able to read and write English fluently, as well as communicate in the primary language of the Workers.
- B. If the Project Supervisor is not on-site at any time whatsoever, all Work shall be stopped. The Project Supervisor shall remain on-site until the Project is complete. The Project Supervisor cannot be removed from the Project without the written consent of the Owner. The Project Supervisor shall be removed from the Project if so requested by the Owner.
- C. The Project Supervisor shall maintain the bound Daily Project Log that also includes the entry/exit logs as required by New York State Department of Labor and section 2.03 of the specifications and the Waste Disposal Log required by section 4.04 of the specifications.
- D. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Asbestos Project Monitor.

#### 1.12 MEDICAL REQUIREMENTS

- A. Before exposure to airborne asbestos fibers, provide Workers with a comprehensive medical examination as required by 29 CFR 1910.1001, and 29 CFR 1926.1101.
  - 1. This examination is not required if adequate records show the employee has been examined as required by 29 CFR 1910.1001, and 29 CFR 1926.1101 within the past year.
  - 2. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos fibers and within thirty (30) calendar days before or after the termination of employment in such occupations.
  - 3. Medical Examination records shall be maintained on site for each employee.

### 1.13 TRAINING

- A. As required by applicable regulations, prior to assignment to asbestos Work instruct each employee with regard to the hazards of asbestos, safety and health precautions, and the use and requirements of protective clothing and equipment.
- B. Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134, and 29 CFR 1926.1101. Provide respirator training and fit testing.
- C. An onsite "tool box talk" is mandatory for all Contractor field personnel before the asbestos removal can begin. This talk will review Cornell University practices and procedures pertaining to asbestos control. Workers not complying with these specifications or Cornell University practices and procedures will be asked to leave the job.

### 1.14 RESPIRATORY PROTECTION

- A. Select respirators from those approved by the Mine Safety and Health Administration (MSHA), and the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.
- B. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist on a yearly basis. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual. Fit-test records shall be maintained on site for each employee.
- C. Where fiber levels permit, and in compliance with regulatory requirements, Powered Air Purifying Respirators (PAPR) are the minimum allowable respiratory protection permitted to be utilized during gross removal operations of OSHA Class I or OSHA Class II friable ACM.
- D. No respirators shall be issued to personnel without such personnel participating in a respirator training program.
- E. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.1101.
- F. A storage area for respirators shall be provided by the Contractor in the clean room side of the personnel decontamination enclosure where they will be kept in a clean environment.
- G. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day. Filters will be removed and discarded during the decontamination process. Filters cannot be reused. Filters must be changed if breathing becomes difficult.
- H. Filters used with negative pressure air purifying respirators shall not be used any longer than one eight (8) hour work day.
- I. Any authorized visitor, Worker, or supervisor found in the Work Area not wearing the required respiratory protection shall be removed from the Project site and not be permitted to return.

- J. The Contractor shall have at least two (2) Powered Air Purifying Respirators stored on site designated for authorized visitors use. Appropriate respirator filters for authorized visitors shall be made available by the Contractor.

#### 1.15 DELIVERY AND STORAGE

- A. Deliver all materials to the job site in original packages with containers bearing manufacturer's name and label.
- B. Store all materials at the job site in a suitable and designated area.
  - 1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
  - 2. Protect materials from unintended contamination and theft.
  - 3. Storage areas shall be kept clean and organized.
- C. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris as herein specified.

#### 1.16 TEMPORARY UTILITIES

- A. Temporary shutdown of HVAC and lock out of electric power to abatement work areas shall be the responsibility of the contractor and shall be coordinated with the owner. If electrical circuits, machinery and other electrical systems in or passing through a given regulated abatement work area must stay in operation, the contractor shall isolate/seal the live electric as per the requirements of 12 NYCRR Part 56 Subpart 56-7.7.
- B. The Owner will provide a tie-in location to building power for the Contractor's GFCI electric panel for project power. All temporary power to the work areas shall be brought in from outside the work area through a ground-fault circuit interrupter at the source. The contractor will be responsible for all temporary power (including the power required by the owner's representative for air sampling equipment). All operations associated with electrical service work (i.e. lockout, temporary power hook-up, etc.) shall be performed by a licensed electrician.
- C. Provide temporary lighting with "weatherproof" fixtures for all Work Areas including decontamination chambers.
  - 1. The entire Work Area shall be kept illuminated at all times.
  - 2. Provide lighting as required by the Environmental Consultant for the purposes of performing required inspections.
- D. All temporary devices and wiring used in the Work Area shall be capable of decontamination procedures including HEPA vacuuming and wet-wiping.
- E. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

## PART 2 PRODUCTS

### 2.1 PROTECTIVE CLOTHING

- A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.
- B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing abatement Work.
- C. Eye protection and hard hats shall be provided and made available for all personnel entering any Work Area.
- D. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area.

### 2.2 SIGNS AND LABELS

- A. Provide warning signs and barrier tapes at all approaches to asbestos Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area.
  - 1. Provide danger signs in vertical format conforming to 29 CFR 1926.1101, minimum 20" x 14" displaying the following legend.

DANGER  
ASBESTOS CANCER AND LUNG DISEASE  
HAZARD  
AUTHORIZED PERSONNEL ONLY  
RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA

- 2. Provide 3" wide yellow barrier tape printed with black lettered, "DANGER ASBESTOS REMOVAL". Locate barrier tape across all corridors, entrances and access routes to asbestos Work Area. Install tape 3' to 4' AFF.
- B. Provide asbestos danger labels affixed to all asbestos materials, scrap, waste, debris and other products contaminated with asbestos.
  - 1. Provide asbestos danger labels of sufficient size to be clearly legible, displaying the following legend:

DANGER  
CONTAINS ASBESTOS FIBERS  
AVOID CREATING DUST  
CANCER AND LUNG DISEASE HAZARD

- 2. Provide the following asbestos labels, of sufficient size to be clearly legible, for display on waste containers (bags or drums) which will be used to transport asbestos contaminated material in accordance with United States Department of Transportation 49 CFR Parts 171 and 172:



RQ HAZARDOUS  
SUBSTANCE  
SOLID, NOS  
ORM-E, NA 9188  
ASBESTOS

3. Generator identification information shall be affixed to each waste container indicating the following printed in indelible ink:

Generator Name  
Facility Name  
Facility Address

2.3 DAILY PROJECT LOG

- A. Provide a Daily Project Log. The log shall contain on title page the Project name, name, address and phone number of Owner; name, address and phone number of Owner's Representative; name, address and phone number of Environmental Consultant; name, address and phone number of Abatement Contractor; emergency numbers including, but not limited to local Fire/Rescue department and all other New York State Department of Labor requirements.
- B. All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted.
- C. All persons entering and exiting the Work Area shall sign the log and include name, social security number, and time.
- D. The Project Supervisor shall document all Work performed daily and note all inspections required by Code Rule 56, i.e. testing and inspection of barriers and enclosures.

2.4 SCAFFOLDING AND LADDERS

- A. Provide all scaffolding and/or staging as necessary to accomplish the Work of this Contract. Scaffolding may be of suspension type or standing type such as metal tube and coupler, tubular welded frame, pole or outrigger type or cantilever type. The type, erection and use of all scaffolding and ladders shall comply with all applicable OSHA construction industry standards.
- B. Provide scaffolding and ladders as required by the Environmental Consultant for the purposes of performing required inspections.

2.5 SURFACTANT (AMENDED WATER)

- A. Wet all asbestos-containing materials prior to removal with surfactant mixed and applied in accordance with manufacturer's printed instructions.
- B. Approved Manufacturer:
1. International Protective Coatings Corp.: Serpiflex Shield
  2. American Coatings Corp.: EPA 55 Asbestos Removal Agent
  3. Certified Technologies: CerTane 2075 Penetrating Surfactant

## 2.6 ENCAPSULANT

- A. Encapsulant shall be tinted or pigmented so that application when dry is readily discernible.

## 2.7 DISPOSAL BAGS, DRUMS, AND CONTAINERS

- A. Provide 6 mil polyethylene disposal bags printed with asbestos caution labels. Bags shall also be imprinted with U.S. Department of Transportation required markings.
- B. Provide 30 or 55 gallon capacity fiber, plastic, or metal drums capable of being sealed air and water tight if asbestos waste has the potential to damage or puncture disposal bags. Affix asbestos caution labels on lids and at one-third points around drum circumference to assure ready identification.
- C. Containers and bags must be labeled in accordance with 40 CFR Part 61 NESHAPS and Code Rule 56. When the bags/containers are moved to the lockable hardtop dumpster from the waste decontamination system washroom, the bags must also be appropriately labeled with the date they are moved on the bag/container in waterproof markings.
- D. Labeled ACM waste containers or bags shall not be used for non-ACM waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as ACM waste.

## 2.8 HEPA VACUUM EQUIPMENT

- A. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Absolute (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.
- B. Provide tools and specialized equipment including scraping nozzles with integral vacuum hoods connected to a HEPA vacuum with flexible hose.

## 2.9 POWER TOOLS

- A. Any power tools used to drill, cut into, or otherwise disturb asbestos material shall be manufacturer equipped with HEPA filtered local exhaust ventilation.

## 2.10 POLYETHYLENE SHEETING

- A. All polyethylene (plastic) sheeting used on the Project (including but not limited to sheeting used for critical and isolation barriers, fixed objects, walls, floors, ceilings, waste container) shall be at least 6 mil fire retardant sheeting.
- B. Decontamination enclosure systems shall utilize at least 6 mil opaque fire retardant plastic sheeting. At least 2 layers of 6 mil reinforced fire retardant plastic sheeting shall be used for the flooring.

## PART 3 EXECUTION

### 3.1 GENERAL REQUIREMENTS

- A. Should visible emissions or water leaks be observed outside the Work Area, immediately stop Work and institute emergency procedures per Code Rule 56. Should there be elevated fiber levels outside the Work Area, immediately stop Work, institute emergency procedures per Code Rule 56, and notify all employers and occupants in adjacent areas. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.
- B. Medical approval, fit test reports, and NYS DOL certificates shall be on site prior to admittance of any Contractor's employees to the asbestos Work Area.
- C. The following submittals, documentation, and postings shall be maintained on-site by the Contractor during abatement activities at a location approved by the Abatement Project Monitor:
  - 1. Contractor license issued by New York State Department of Labor.
  - 2. Certification, Worker Training, Medical Surveillance:
    - a. New York State Asbestos Handler certification cards for each person employed in the removal, handling, or disturbance of asbestos.
    - b. Evidence that Workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.
    - c. Documentation that Workers have been fit tested specifically for respirators used on the Project.
  - 3. Daily OSHA personal air monitoring results.
  - 4. NYS Department of Health ELAP certification for the laboratory that will be analyzing the OSHA personnel air samples.
  - 5. NYS Department of Environmental Conservation Waste Transporter Permit.
  - 6. Project documents (specifications and drawings.)
  - 7. Notifications and variances (site specific and applicable.) Ensure that the most up-to-date notifications and variances are on-site.
  - 8. Applicable regulations.
  - 9. Material Safety Data Sheets of supplies/chemicals used on the Project.
  - 10. Approved Abatement Work Plan.
  - 11. List of emergency telephone numbers.
  - 12. Magnahelic manometer semi-annual calibration certification.
  - 13. Daily Project Log.
- D. The following documentation shall be maintained on-site by the Abatement Project Monitor during abatement activities:
  - 1. Contractor license issued by New York State Department of Labor.
  - 2. Air Sample Log.
  - 3. Air sample results.
  - 4. Project Monitor Daily Log
  - 5. Asbestos Survey Report.
  - 6. A copy of ASTM Standard E1368 "Standard Practice for Visual Inspection of Asbestos Abatement Projects."
- E. The Work Area must be vacated by building occupants prior to decontamination enclosure construction and Work Area preparation.

- F. All demolition necessary to access asbestos containing materials for removal must be conducted within negative pressure enclosures by licensed asbestos handlers. Demolition debris may be disposed of as construction and demolition debris provided the Abatement Project Monitor determines that it is not contaminated with asbestos and there has been no disturbance of ACM within the enclosure. If the demolition debris is determined to be contaminated or ACM has been disturbed, it must be disposed of as asbestos waste.

### 3.2 PERSONNEL DECONTAMINATION ENCLOSURE

- A. Where applicable, provide a personnel decontamination enclosure system. The system shall be contiguous to the Work Area unless the use of a remote unit is permitted by Code Rule 56 or a Site Specific Variance. The decontamination enclosure shall not be located within the work area unless isolation barriers are installed. If the decontamination unit is accessible to the public, it shall be fully framed and sheathed to prevent unauthorized entry.
- B. For attached Unit, access to the Work Area will be from the clean room through an air-lock to the shower and through an air lock to the equipment room. Each airlock shall be a minimum of three feet from door to door. Additional air locks shall be provided as required by Code Rule 56 for remote decontamination enclosures.
- C. The decontamination enclosure ceiling and walls shall be covered with one layer of opaque 6 mil polyethylene sheeting. Two layers of reinforced polyethylene sheeting shall be used to cover the floor.
- D. The entrance to the clean room shall have a lockable door. Provide suitable lockers for storage of Worker's street clothes. Storage for respirators along with replacement filters and disposable towels shall also be provided.
- E. Provide a temporary shower with individual hot and cold water supplies and faucets. Provide a sufficient supply of soap and shampoo. There shall be one shower for every six Workers. The shower room shall be constructed in such a way so that travel through the shower chamber shall be through the shower. The shower shall not be able to be bypassed.
- F. Shower water shall be drained, collected and filtered through a system with at least a 5.0 micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be discharged in accordance with applicable codes and the contaminated filters disposed of as asbestos waste.
- G. The equipment room shall be used for the storage of tools and equipment. A walk-off pan filled with water shall be located in the Work Area outside the equipment room for Workers to clean foot coverings when leaving the Work Area. A labeled 6 mil plastic ACM waste bag for collection of contaminated clothing shall be located in this room.
- H. The personal decontamination enclosure shall be cleaned and disinfected minimally at the end of each Work shift and as otherwise directed by the Asbestos Project Monitor.

### 3.3 WASTE DECONTAMINATION ENCLOSURE

- A. Where applicable, provide a waste decontamination enclosure system. The system shall be contiguous to the Work Area unless the use of a remote unit is permitted by Code Rule 56 or a

Site Specific Variance. The decontamination enclosure shall not be located within the work area unless isolation barriers are installed. If the Unit is accessible to the public, it shall be fully framed and sheathed to prevent unauthorized entry.

- B. The waste decontamination enclosure system shall consist of a holding area, air lock and washroom. The airlock shall be a minimum of three feet from door to door. The entrance to the holding area shall have a lockable door.
- C. The decontamination enclosure ceiling and walls shall be covered with one layer of opaque 6 mil polyethylene sheeting on walls and ceiling. Two layers of reinforced polyethylene sheeting shall be used to cover the floor.
- D. Where there is only one egress from the Work Area, the holding area of the waste decontamination enclosure system may branch off from the personnel decontamination enclosure equipment room, which then serves as the waste wash room.
- E. The waste wash room water shall be drained, collected, and filtered through a system with at least a 5.0 micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be discharged in accordance with applicable codes and the contaminated filters disposed of as asbestos waste.
- F. In small asbestos Projects where only one egress from the Work Area exists, the shower room may be used as a waste washroom. In this instance, the clean room shall not be used for waste storage, but shall be used for waste transfer to carts, which shall immediately be removed from this enclosure.

### 3.4 WORK AREA ENTRY AND EXIT PROCEDURES

- A. Access to and from the asbestos Work Area is permitted only through the personnel decontamination enclosure or airlock system (for remote decontamination units and In-Plant Operations Projects) unless otherwise stipulated in a Site Specific Variance.
- B. Workers shall sign the entry/exit log upon every entry and exit.
- C. The following procedures shall be followed when entering the Work Area:
  - 1. Before entering the Work Area, Workers shall proceed to the clean room, remove all street clothes, and don protective clothing, equipment, and respirators.
  - 2. Workers shall proceed from the clean room through the shower room and the equipment room and into the Work Area.
- D. The following procedures shall be followed when exiting the Work Area:
  - 1. Before leaving the Work Area, gross asbestos contamination will be removed by brushing, wet cleaning and/or HEPA vacuuming.
  - 2. In the equipment room, Workers shall remove disposable clothing, but not respirators, and shall place clothing in plastic disposal bags for disposal as contaminated debris prior to entering the shower room.
  - 3. Workers shall shower thoroughly while wearing respirators, then wash respirator with soap and water prior to removal.

4. Upon exiting the shower, Workers shall don new disposable clothing if the Work shift is to continue or street clothes to exit area. Under no circumstances shall Workers enter public non-Work Areas in disposable protective clothing.
- E. If remote decontamination enclosures are permitted by Code Rule 56 or a Site-Specific Variance, workers shall wear two disposable suits for all phases of Work. Workers exiting the work area shall HEPA vacuum the outer suit, enter the airlock, remove the outer suit and then place it back into the Work Area. A clean second suit shall be donned before exiting the airlock and proceeding to the decontamination enclosure or another work area via the designated pathway required by Code Rule 56.

### 3.5 NEGATIVE AIR PRESSURE FILTRATION SYSTEM

- A. For Minor Project negative pressure tent work areas, a HEP-vacuum shall be utilized for negative air as per 12 NYCRR Part 56-11.3
- B. For small-project and large-project work areas, provide a portable asbestos filtration system that develops a minimum pressure differential of negative 0.02 in. of water column within all full enclosure areas relative to adjacent unsealed areas and that provides a minimum of 4 air changes per hour in the Work Area during abatement and 6 air changes for non-friable flooring and/or mastic removal.
- C. Such filtration systems must be made operational after critical and isolation barriers are installed but before wall, floor, and ceilings are plasticized and shall be operated 24 hours per day during the entire Project until the final cleanup is completed and satisfactory results of the final air samples are received from the laboratory.
- D. The system shall include a series of pre-filters and filters to provide High Efficiency Particulate Air (HEPA) filtration of particles down to 0.3 microns at 100% efficiency and below 0.3 microns at 99.9% efficiency. Provide sufficient replacement filters to replace pre-filters every 2 hours, secondary pre-filters every 24 hours, and primary HEPA filters every 600 hours of operation.
- E. A minimum of one additional filtration unit of at least the same capacity as the primary unit(s) shall be installed and fully functional to be used during primary unit (s) filter changing and in case of primary failure.
- F. At no time will the unit exhaust indoors, within 15 feet of a receptor, including but not limited to windows and doors, or adversely affect the air intake of the building. Exhaust ducting shall not exceed 25' in length unless the conditions of AV-A-2 are utilized. Provide construction fencing at ground level exhaust termination locations per Code Rule 56.
- G. Upon electric power failure or shut-down of any filtration unit, all abatement activities shall stop immediately and only resume after power is restored and all filtration units are fully operating. For shut-downs longer than one hour, all openings into the Work Area, including the decontamination enclosures, shall be sealed.
- H. The Contractor shall provide a manometer to verify negative air pressure. Manometers shall be read twice daily and recorded within the Daily Project Log.
- I. There shall be at least a 4 hour settling period after the Work Area is fully prepared and the negative filtration units have been started to ensure integrity of the barriers.

- J. Once installed and operational, the Contractor's Supervisor shall conduct daily inspections of the Work Area to ensure the airtight integrity of the enclosure and operation of the negative air system. Findings shall be recorded within the Daily Project Log. Inspections shall also be conducted on days when no abatement activities are in progress per Code Rule 56 (i.e. weekends).

### 3.6 REMOVAL OF ASBESTOS CONTAINING MATERIALS

- A. Asbestos-containing materials shall be removed in accordance with the Contract Documents and the approved Asbestos Work Plan. Only one type of ACM shall be abated at a time within a Work Area. Where there are multiple types of ACM requiring abatement, Code Rule 56 procedures for sequential abatement shall be followed.
- B. Sufficiently wet asbestos materials with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material that does not display evidence of saturation.
- C. One Worker shall continuously apply amended water while ACM is being removed.
- D. Perform cutting, drilling, abrading, or any penetration or disturbance of asbestos containing material in a manner to minimize the dispersal of asbestos fibers into the air. Use equipment and methods specifically designed to limit generation of airborne asbestos particles. All power operated tools used shall be provided with HEPA equipped filtered local exhaust ventilation.
- E. Upon removal of ACM from the substrate, the newly exposed surfaces shall be HEPA vacuumed and/or wet cleaned. Surfaces must be thoroughly cleaned using necessary methods and any required solvents to completely remove any adhesive, mastic, etc.
- F. All removed material shall be placed into 6 mil plastic disposal bags or other suitable container upon detachment from the substrate. Cleanup of accumulations of loose debris or waste shall be performed whenever there is enough accumulation to fill a single bag or container and minimally at the end of each workshift.
- G. Large components shall be wrapped in two layers of 6 mil polyethylene sheeting. Sharp components likely to tear disposal bags shall be placed in fiber drums or boxes and then wrapped with sheeting.
- H. Power or pressure washers are not permitted for asbestos removal or clean-up procedures unless approved in a Site Specific Variance.
- I. All open ends of pipe and duct insulation not scheduled for removal shall be encapsulated using lag cloth.
- J. All construction and demolition debris determined by the Environmental Consultant to be contaminated with asbestos shall be handled and disposed of as asbestos waste.
- K. The use of metal shovels, metal dust pans, etc. are not permitted inside the work area.

### 3.7 EQUIPMENT AND WASTE CONTAINER DECONTAMINATION AND REMOVAL PROCEDURES

- A. External surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and/or HEPA vacuuming in the Work Area before moving such items into the waste

decontamination enclosure system airlock by persons assigned to this duty. The persons in the Work Area shall not enter the airlock. No gross removal operations are permitted when waste transfer is in progress.

- B. The containers and equipment shall be removed from the airlock by persons stationed in the washroom during waste removal operations. The external surfaces of containers and equipment shall be cleaned a second time by wet cleaning.
- C. The cleaned containers of asbestos material and equipment are to be dried of any excessive pooled or beaded liquid, placed in uncontaminated 6 mil plastic bags or sheeting, as the item's physical characteristics demand, and sealed airtight.
- D. The clean recontainerized items shall be moved into the airlock that leads to the holding area. Workers in the washroom shall not enter this airlock.
- E. Containers and equipment shall be moved from the airlock and into the holding area by persons dressed in clean personal protective equipment, who have entered from the holding area.
- F. The cleaned containers of asbestos material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.
- G. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.
- H. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.

### 3.8 INTERIOR NON-FRIABLE ORGANICALLY BOUND (NOB) FLOOR TILE, WALL-MOUNTED BOARD MASTIC & WALL JOINT CAULK REMOVALS

- A. The following procedures may only be used for the removal of non-friable organically bound (NOB) asbestos materials following 12 NYCRR Part 56 11.1 – In-Plant Operations.
- B. The Contractor shall restrict access to the immediate areas where In-Plant removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.
- C. Remote personnel and waste decontamination enclosures may be utilized and shall be constructed at a location in accordance with the approved Work Plan. At a minimum, an airlock system shall be utilized for access / egress for all In-Plant Operations Negative Pressure Work Areas.
- D. The Work Area shall consist of a single-layer minor-project negative pressure tent enclosure.
- E. Negative air shall be maintained at four (4) air changes per hour.
- F. OSHA compliance air monitoring is required per section 1.10.



- G. ACM removal shall follow procedures defined in section 3.6.
- H. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed before being passed into the airlock for double- bagging. The bags or containers shall then be transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts.
- I. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.
  - 1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
  - 2. All surfaces in the Work Area shall be wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid, and shall be decontaminated prior to removal from the Work Area.
  - 3. The Asbestos Project Monitor shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.
  - 4. The Contractor shall then apply a thin coat of encapsulant to all non-removal surfaces covered with plastic in the Work Area. In no event shall encapsulant be applied to any surface that was the subject of removal prior to obtaining satisfactory air monitoring results. Encapsulants shall be pigmented or tinted to provide an indication for completeness of coverage. The Asbestos Project Monitor shall determine adequacy of coverage.
  - 5. After the encapsulant has been applied and the required waiting/settling and drying time has elapsed, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant.
  - 6. Upon receipt of satisfactory final clearance air sampling results, the isolation and critical barriers shall be removed. Following this, the decontamination enclosures shall be removed.

### 3.9 EXTERIOR NON-FRIABLE ORGANICALLY BOUND (NOB) ACM REMOVALS VIA MECHANICAL METHODS WITHIN TENT WORK AREAS

- A. Removal of the exterior wall tar / felt paper membrane present beneath Brick and Llenroc shall be performed within exterior 2-layer small-project negative pressure tent enclosures cover all surfaces except those to be abated. An attached small-project decontamination enclosure system shall be utilized. All power tools used for waterproofing removals shall be manufacturer equipped with HEPA-exhaust attachment, shall be utilized as per manufacturer's instructions, and shall be HEPA exhausted as per ICR 56- 7.2(o).
- B. Negative air shall be maintained at a minimum four (4) air changes per hour.
- C. OSHA compliance air monitoring is required per section 1.10.
- D. ACM removal shall follow procedures defined in section 3.6.
- E. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed before being passed into the airlock for double- bagging. The bags or containers shall then be

transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts.

- F. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.
1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
  2. All surfaces in the Work Area shall be wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid, and shall be decontaminated prior to removal from the Work Area.
  3. The Asbestos Project Monitor shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.
  4. After the required waiting/settling and drying time has elapsed, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant.
  5. Upon receipt of satisfactory final clearance air sampling results, the isolation and critical barriers shall be removed. Following this, the decontamination enclosures shall be removed.

### 3.10 REMOVALS OF EXTERIOR NON-FRIABLE WINDOW GLAZING COMPOUND / WINDOW FRAME CAULK

- A. Except as modified by this section, removal of exterior non-friable ACM (i.e. caulks / window glazing compound) shall conform to all provisions of this specification.
- B. Unless Site Specific Variances have been otherwise obtained, removals shall be conducted in accordance with the provisions of Code Rule 56-11.6.
- C. The "Active" Work Area shall be the area from which ACM materials are being removed and shall extend 25 feet from the perimeter of the removal area.
- D. Non-certified Workers are not allowed in the Work Area until the Work Area is cleared by the Asbestos Project Monitor.
- E. All openings (including but not limited to operable windows, doors, hatches, vents, ducts, and grilles) one story above, one story below, and within 25 feet of the work area shall be sealed with two layers of six mil polyethylene.
- F. Any windows on the floor below or above and within twenty-five (25) feet of the immediate work area shall be plasticized from inside the building/structure.
- G. Any fixed or non-operable windows on the floor below or above and within twenty-five (25) feet of the immediate work area need not to be plasticized, but shall be sealed using caulking or duct tape.
- H. The removal of the ACM may require the use of scrapers, solvents, mastic removal chemicals, or other methods/procedures to ensure complete removal.
- I. Dumpsters used for waste storage shall be lined with two layers of six mil polyethylene. Open-top dumpsters shall be secured/closed a minimum plywood cover and polyethylene flaps that are sealed at the end of each work shift.

- J. Personal protective equipment, including respirators, shall be utilized and worn during all removal operations until the Work Area is cleared by the Asbestos Project Monitor.
- K. The Owner may, at his discretion, choose to conduct air sampling. If air samples collected during abatement indicate any airborne asbestos fiber concentration(s) at or above 0.01 f/cc, Work shall be stopped immediately and Work methods shall be altered to reduce the airborne asbestos fiber concentration(s).
- L. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed:
  - 1. All surfaces in the Work Area shall be HEPA vacuumed and then wet cleaned.
  - 2. The Asbestos Project Monitor shall conduct a visual inspection of the Work Area for cleanliness.
  - 3. Upon satisfactory visual inspection results and subsequent new window unit installation, the critical barriers shall be removed.

### 3.11 TENT ENCLOSURES

- A. Tent enclosures may only be used where specifically permitted by Code Rule 56 or a Site Specific Variance issued by the NYS Department of Labor.
- B. The Contractor shall restrict access to the immediate area where tent removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.
- C. Remote personnel and waste decontamination enclosures shall be constructed when required, based on the scope of the tent work scope. Configuration shall be as required by Project size. For tent enclosures with gross abatement of friable materials, a contiguous decontamination system shall be constructed, maintained and utilized, except for minor size tent enclosure work areas where a remote decontamination enclosure is permitted by Code Rule 56.
- D. The Work Area shall be precleaned. All objects and equipment that will remain in the restricted area during abatement shall be sealed with two layers of six mil polyethylene and tape.
- E. The tent shall be a single use barrier constructed with a rigid frame and at least two layers of six mil polyethylene unless one layer of six mil polyethylene is otherwise permitted by Code Rule 56. Tents with twenty (20) square feet or less of floor space or no gross removal of friable ACM shall be constructed of one (1) layer of six mil polyethylene and shall include walls, ceilings and a floor (except portions of walls, floors and ceilings that are the removal surface) with double folded seams. All seams shall be sealed airtight using duct tape and/or spray adhesive.
- F. The tent shall be constructed with at least one airlock for worker/waste egress.
- G. A monometer shall be used for all OSHA Class I abatement.
- H. Negative air shall be maintained at four (4) air changes per hour for non-friable and glovebag abatement tent enclosure work areas. Eight (8) air changes shall be maintained for friable gross removal tent enclosure work areas. In a Minor size abatement tent enclosure work area a HEPA vacuum may be used to maintain the required air changes.

- I. OSHA compliance air monitoring is required per section 1.09.
- J. ACM removal shall follow procedures defined in section 3.07.
- K. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed and shall then be placed in a second bag/container before being transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.
- L. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.
  - 1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
  - 2. All surfaces in the Work Area shall be wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid, and shall be decontaminated prior to removal from the Work Area.
  - 3. The Asbestos Project Monitor shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.
  - 4. After the waiting/settling and drying time requirements have elapsed, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant.
  - 5. Upon receipt of satisfactory final clearance air sampling results, the tent shall be collapsed into itself, placed in suitable disposal bags, and transported to the waste Decontamination enclosure. Isolation and critical barriers shall then be removed.

### 3.12 RESTORATION OF FIRESTOPPING AND FINISHES

- A. Finishes damaged by asbestos abatement activities including, but not limited to, plaster/paint damage due to duct tape and spray adhesives, and floor tile lifted due to wet or humid conditions, shall be restored prior to final payment.
  - 1. Finishes unable to be restored shall be replaced under this Contract.
  - 2. All foam and expandable foam products and materials used to seal Work Area openings shall be completely removed upon completion of abatement activities.
- B. All penetrations (including, but not limited to, pipes, ducts, etc.) through fire rated construction shall be firestopped using materials and systems tested in accordance with ASTM E814 on Projects where reinsulation is part of the required work.

## PART 4 DISPOSAL OF ASBESTOS WASTE

### 4.1 TRANSPORTATION AND DISPOSAL SITE

- A. The Contractor's Hauler and Disposal Site shall be approved by the Owner's Representative.
- B. The Contractor shall give twenty-four (24) hour notification prior to removing any waste from the site. Waste shall be removed from the site only during normal working hours unless otherwise specified. No waste may be taken from the site unless the Contractor and Environmental Consultant are present and the Environmental Consultant authorizes the release of the waste as described herein.

- C. All waste generated as part of the asbestos project shall be removed from the site within ten (10) calendar days after successful completion of all asbestos abatement work.
- D. Upon arrival at the Project Site, the Hauler must possess and present to the Environmental Consultant a valid New York State Department of Environmental Conservation Part 364 Asbestos Hauler's Permit. The Environmental Consultant may verify the authenticity of the hauler's permit with the proper authority.
- E. The Hauler, with the Contractor and the Environmental Consultant, shall inspect all material in the transport container prior to taking possession and signing the Asbestos Waste Manifests.
- F. Unless specifically approved by the Owner, the Contractor shall not permit any off-site transfers of the waste or allow the waste to be transported or combined with any other off-site asbestos material. The Hauler must travel directly to the disposal site as identified on the notifications with no unauthorized stops.

#### 4.2 WASTE STORAGE CONTAINERS

- A. All waste containers shall be fully enclosed and lockable (i.e. enclosed dumpster, trailer, etc.). No open containers will be permitted on-site (i.e. open dumpster with canvas cover, etc.) unless specifically permitted by a Site Specific Variance.
- B. The Environmental Consultant shall verify that the waste storage container and/or truck tags (license plates) match that listed on the New York State Department of Environmental Conservation Part 364 permit. Any container not listed on the permit shall be removed from the site immediately.
- C. The container shall be plasticized and sealed with two (2) layers of 6 mil polyethylene. Once on site, it shall be kept locked at all times, except during load out. The waste container shall not be used for storage of equipment or contractor supplies.
- D. While on-site, the container shall be labeled with EPA Danger signage:

DANGER  
CONTAINS ASBESTOS FIBERS  
AVOID CREATING DUST  
CANCER AND LUNG DISEASE HAZARD

- E. The New York State Department of Environmental Conservation Asbestos Hauler's Permit number shall be stenciled on both sides and back of the container.
- F. The container is not permitted to be loaded unless it is properly plasticized, has the appropriate danger signage affixed, and has the permit number appropriately stenciled on the container.

#### 4.3 ASBESTOS WASTE MANIFESTS

- A. The proposed asbestos waste manifest shall be submitted to the Owner's Representative prior to the start of the project for review and approval.

- B. The Manifest shall be completed by the Contractor and verified by the Environmental Consultant that all the information and amounts are accurate and the proper signatures are in place.
- C. The Manifests shall have the appropriate signatures prior to any waste being removed from the site.
- D. Copies of the completed Manifest shall be retained by the Environmental Consultant and the Contractor and shall remain on site for inspection.
- E. Upon arrival at the Disposal Site, the Manifest shall be signed by the Disposal Facility operator to certify receipt of ACM covered by the manifest. The Disposal Facility operator shall return the original Manifest to the Contractor.
- F. The Contractor shall forward copies of the Manifest to the Owner's Representative within 14 days of the waste container being removed from the site. Failure to do so may result in payment being withheld from the Contractor.
- G. Originals of all waste disposal manifests shall be submitted by the Contractor to the Owner's Representative with the final close-out documentation.

END OF SECTION 028213

SECTION 030100

MAINTENANCE OF CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including general and supplementary conditions and Division 1 specification sections, apply to work of this section.
- B. Section 033000, Cast-in-Place Concrete.

1.2 DESCRIPTION OF WORK

- A. This section specifies concrete repair and restoration work including, preparation of surfaces, repair products, and curing.

1.3 DEFINITIONS

- A. Removals: Complete removal of materials in designated areas and legal disposal of existing items except those noted to remain property of Owner.
- B. Unsound Concrete: Existing concrete that exhibits one or more of the following characteristics:
  - 1. Incipient fractures present beneath delaminated or spalling surfaces.
  - 2. Honeycombing.
  - 3. Friable or punky.
  - 4. Deterioration from freeze-thaw action.
- C. Shallow Concrete Repair: Applies when, after concrete removal, less than half of the existing reinforcement bar diameter is exposed.
- D. Deep Concrete Repair: Applies when, after concrete removal, more than ½ of the existing reinforcement bar diameter is exposed, or the bar is severely corroded.
- E. Crack Injection: The process of installing repair products in existing concrete cracks through the use of ports and sealers that allow for the installation of the products under pressure.

1.4 SPECIAL INSPECTION

- A. Refer to Specification Section 014533 and Schedule of Special Inspections.

## 1.5 QUALITY ASSURANCE

- A. Field Supervision: Concrete-maintenance specialist firm shall maintain experienced full-time supervisors on Project site during times that concrete-maintenance work is in progress. Provide at least one person, present at all times during execution of the work of this section who is thoroughly familiar with the specified requirements and the materials and methods needed for their execution and who shall direct work performed under this section.
- B. Concrete-Maintenance Specialist Qualifications: Work shall be performed by a firm with minimum 5-years successful experience in comparable concrete repair projects and employing skilled personnel trained to use the repair products specified herein. All personnel performing work under this section shall demonstrate their proficiency by successfully completing work on approved preconstruction mockups. Experience in only installing or patching new concrete is insufficient experience for concrete-maintenance work.
- C. Company Field Advisor: Secure the services of a company field advisor from manufacturer of concrete-maintenance products including patching material, crack injection material, sealers, coatings, sealants, and membranes. Field advisor shall be certified in writing by the manufacturer to be technically qualified in installing the product. Personnel involved solely in sales do not qualify. Field Advisor shall be present at the beginning of product installation for two eight-hour work days and as required during duration of the project, but not less than five additional non-sequential eight-hour work days. Field Advisor presence is for the purpose of:
  - 1. Rendering technical assistance to the Contractor regarding installation procedures of the production to satisfy warrantee or guarantee requirements.
  - 2. Providing specialized training in use of product to the Contractor's personnel.
  - 3. Verifying surface preparation procedures and suitable substrates for material application.
  - 4. Verifying proper temperature and other environmental controls.
  - 5. Verifying proper temperature and other environmental controls.
  - 6. Verifying proper tools and application procedures.
  - 7. Verifying proper curing and protection of installed product.
  - 8. Familiarizing the Contractor, Owner, Architect, and Engineer with all aspects of the system including inspection techniques.
  - 9. Answering questions that may arise.
  - 10. Preparing a written report summarizing information listed above. Report shall be submitted to the Contractor, Owner, Architect, and Engineer.



- D. The Contractor shall be responsible for the field advisor's expenses.
- E. Preinstallation Meeting: Before work of this section proceeds, a meeting is required between the Owner's representative, Contractor, Engineer, and manufacturer's representatives (Company Field Advisor) to review pending repairs and repair procedures, mockup, sequence of work, site access/restrictions, and training.

## 1.6 SUBMITTALS

- A. Qualifications:
  - 1. Submit descriptions of projects completed within last ten years of similar scope and cost. Include project location and contact information.
  - 2. Submit project experience for person(s) responsible for work to be performed under this section.
  - 3. Submit written verification from product manufacturer that personnel performing this work have completed training from the Company Field Advisor, as specified in Quality Assurance Section, prior to start of work.
- B. Product Data: Submit manufacturer's technical data for each product indicated, including recommendations for its application and installation instructions. Include certifications substantiating product complies with requirements. Where restoration processes require multiple materials be used to complete the work, submittals shall demonstrate that these materials are compatible with each other.
- C. Cleaning Procedure: Proposed cleaning procedure for cleaning concrete including each step in the cleaning process, type, size, and location of equipment, and how cleaning debris will be handled to protect building occupants.
- D. Restoration and Reconstruction Quality-Control Program: Submit a written program for each phase of restoration and reconstruction process that details:
  - 1. The ability of personnel to properly perform the Work.
  - 2. Protection measures for surrounding materials during operations.
  - 3. Control measures for debris and runoff during the Work.
  - 4. The materials, methods, equipment, and sequence of operations to be used for each phase of the Work.

## 1.7 PREPARATION AND PROTECTION

- A. Preparation for Concrete Removal: Examine existing construction to determine best methods to safely and effectively perform concrete maintenance work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed in the course of repair.

- B. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- C. Take necessary precautions and protective measures to prevent injury to people and damage to property in areas adjacent to the work area:
  - 1. Protect persons and surrounding surfaces from harm resulting from concrete maintenance work.
  - 2. Use only proven protection methods appropriate to each area and surface being protected.
  - 3. Provide temporary barricades, barriers, and directional signage to exclude public from areas where concrete maintenance work is being performed.
- D. Make necessary provisions for the diversion and legal disposal of cleaning water, cleaning agents, and debris:
  - 1. Furnish pumps if required.
  - 2. Take precautions as required to prevent uncontrolled runoff that results in soil erosion, undermining of pavement and foundations, damage to landscaping, and water penetration into building interiors.
  - 3. Collect and neutralize alkaline and acid wastes for disposal off Owner's property.
- E. Make necessary provisions to contain dust and debris generated by concrete maintenance work and prevent it from impacting surrounding occupants, structures, and site features.
  - 1. Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.
  - 2. Provide for dust collection during concrete maintenance work in accordance with OSHA requirements for silica dust control.
- F. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Owner immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is in working order.
  - 1. Prevent solids such as aggregate or mortar residue from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from concrete maintenance work.
  - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to job site in original, new, and unopened packages and containers bearing the manufacturer's name and label.
- B. Protect concrete repair systems before, during, and after installation and protect the work and materials of other trades. In the event of damage, immediately make repairs and replacements necessary to the approval of the Owner and at no additional cost.

1.9 WORKMANSHIP

- A. Contractor shall be responsible for correction of concrete repair work not conforming to specified requirements, including preparation, material bond, and appearance.
- B. Remove work found to be defective. Replace with new acceptable work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Reinforcement: ASTM A 615, Grade 60 for uncoated deformed bars.
- B. Bonding Agent or Primers: Provide bonding agent or Primers as required by the manufacturer for Patching Materials and Coatings.
- C. Horizontal Patching Material for Shallow Repairs: Trowel grade, polymer-modified cementitious repair mortar with integral corrosion inhibitor: "Sika Top 122 Plus" by Sika Corporation; "Conpro Set" by Conproco Corporation, "MasterEmaco N 420 CI" by Master Builders Solutions; or accepted equivalent.
- D. Leveling/Pore Sealing Mortar for Slabs: "Sika Top 121 Plus" by Sika Corporation; "MasterEmaco N 300 CI" by Master Builders Solutions; "Strongcrete SW-83" by Strong Wall Systems; "Conpro One Shot" by Conproco Corporation; or accepted equivalent.
- E. Vertical Trowel Applied Patching Material for Shallow Repairs: Trowel grade, polymer-modified cementitious repair mortar with integral corrosion inhibitor "Sika Top 123 Plus" by Sika Corporation; "Conpro Set" by Conproco Corporation or accepted equivalent.
- F. Aggregate: Hard, sound, and durable pea gravel 1/4 to 3/8 inch.
- G. Crack Repair Material for Horizontal Surfaces: "Sikadur 35 Hi-Mod LV" by Sika; "Concresive Standard LVI", by Master Builders; "Euco Qwikstitch" by Euclid Chemical, accepted equivalent.
- H. Penetrating Crystalline Sealer, Densifier: A zero-VOC, silicate based penetrating crystalline sealer that internally strengthens, waterproofs and primes concrete. "MATRIX PRO" by Foxfire, "Sikafloor 956 LD", by Sika, "Consolideck LS/CS" by Prosoco or accepted equivalent masonry and cementitious materials. Matrix Pro® reacts with free calcium hydroxide forming a silica hydrogel that fills the capillaries within the matrix.

- I. Curing-Sheet Materials: One of the following moisture-retaining covers, complying with ASTM C 171. Waterproof paper, polyethylene film, or polyethylene-coated burlap.
- J. Clear Curing and Sealing Compound (VOC compliant): ASTM C 309, Type 1, Class B with minimum 25 percent solids content. Provide test data from an Independent Testing Laboratory indicating a maximum moisture loss of 0.030 grams per square centimeter in 72 hours when applied at a coverage rate of 300 square feet per gallon. Sodium silicate compounds are not permitted. Use "Super Diamond Clear VOX" by Euclid Chemical Co. or accepted equivalent.

### PART 3 - EXECUTION

#### 3.1 JOB CONDITIONS

- A. Examine conditions under which concrete shall be reconditioned. Do not proceed with work until unsatisfactory conditions are corrected.

#### 3.2 CLEANING

- A. Clean all concrete surfaces prior to patching and coating in accordance with manufacturer's instructions.

#### 3.3 SURFACE PREPARATION – VERTICAL PATCHES

- A. Saw cut perimeter of area to required depth without overrunning cuts at corners. Make shallow cuts inside area to be removed. This second cutting shall facilitate removal of concrete.
- B. After required concrete has been removed, clean surface by sandblasting or high- pressure water to remove loose materials.
- C. Prior to placing patching materials, air blast cavities clean to remove sand and debris.

#### 3.4 VERTICAL PATCHES - GENERAL

- A. Mix patching materials in accordance with the manufacturer's instructions.
- B. For applications that are more than 2 inches deep, enhance patching material with aggregate. Add aggregate at a rate of 15 pounds for a 50-pound bag of patching material or as recommended by material's manufacturer.
- C. Place/apply Vertical Trowel Applied Patching Material for Shallow Repairs immediately following bonding agent application.
- D. Use a trowel to consolidate the material. Apply patching compound in lifts according to the manufacturer's recommendations.
- E. Finish patches to match texture of adjoining concrete.
- F. Cure horizontal repairs by sheet cure.

- G. Cure vertical surfaces by sheet cure or application of a curing compound.
- H. Test patched areas after three days for soundness and delamination by sounding with a hammer. Repair all hollow-sounding areas by replacing the patch in the affected area at no cost to the Owner.
- I. Repair all areas that fail to meet the appearance criteria established by the approved mockups at no cost to the Owner.

### 3.5 SURFACE PREPARATION – HORIZONTAL SLAB PATCHING

- A. Slab Preparation: For slab areas that exhibit uneven, loose or delaminated concrete.
  - 1. Remove all deteriorated concrete, dirt, oil, grease and other bond inhibiting materials for the area to be repaired.
  - 2. Clean surface by scrubber, sandblasting or high- pressure water to remove loose materials.
  - 3. Sawcut perimeter of repair areas. Do not damage reinforcing.
  - 4. Provide surfaces with a fractured profile of at least 1/8 inch that are approximately perpendicular or parallel to original concrete surfaces. (CSP 5-6)
  - 5. Notify Engineer when removals have been completed so that they may be observed. Unsatisfactory preparation shall be corrected as required by Engineer.

### 3.6 SHALLOW HORIZONTAL SLAB PATCHING – GENERAL

- A. Substrate should be saturated surface dry (SSD).
- B. Mix patching materials in accordance with the manufacturer's instructions.
- C. Place/apply Horizontal Patching Material for Shallow Repairs immediately following scrub coat placement.
- D. Cure horizontal repairs by sheet cure.

### 3.7 CRACK REPAIR – GENERAL

- A. Perform crack repair on cracks 1/8" or greater.
- B. Prepare surface in accordance with manufacturer's instructions. Remove loose material from cracks and flush with water.
- C. Gravity feed or install sealers, ports, and crack repair material in accordance with manufacturer's instructions. Flush ports with water prior to injection to remove debris.
- D. Seal crack with non-staining clay, sealant, or mortar prior to installation of crack repair material.

- E. Do not overfill cracks.
- F. After installation, remove sealers from exposed locations, clean surface to remove sealer residue, and finish surface at the crack with grout as necessary to provide a uniform appearance.

3.8 RESURFACING CONCRETE SLABS – GENERAL

- A. After crack repairs and Horizontal slab repairs are complete, apply Leveling/Pore Sealing Mortar for Slabs to fill minor surface irregularities and pores.
- B. Apply by trowel or low pressure gun.
- C. Work into prepared surface to fill all pores and voids.
- D. Cure in accordance with manufacturer's recommendations.

3.9 PENETRATING CRYSTALLINE SEALER, DENSIFIER

- A. After Leveling/Pore Sealing Mortar application, install Penetrating Crystalline Sealer over entire slab within work area.
- B. Apply with low pressure sprayer in accordance with manufacturer's recommendations.
- C. Cure in accordance with manufacturer's recommendations.

END OF SECTION 030100

SECTION 033000

CAST-IN-PLACE CONCRETE (STRUCTURAL)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including general and supplementary conditions and Division 1 specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

- A. This section specifies cast-in-place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

1.3 QUALITY ASSURANCE

- A. Reference Standards:

1. ACI 117 "Specification for Tolerances for Concrete Construction and Materials"
2. ACI 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete."
3. ACI 301 "Specifications for Structural Concrete for Buildings."
4. ACI 303 "Guide to Cast-in-Place Architectural Concrete Practice."
5. ACI 304 "Guide for Measuring, Mixing, Transporting, and Placing Concrete"
6. ACI 305 "Hot-Weather Concreting."
7. ACI 306R "Cold-Weather Concreting."
8. ACI 311 "ACI Manual of Concrete Inspection" and "Guide for Concrete Plant Inspection and Testing of Ready-Mixed Concrete."
9. ACI 315 "Details and Detailing of Concrete Reinforcement."
10. ACI 318 "Building Code Requirements for Structural Concrete."
11. ACI 347 "Guide to Formwork for Concrete."
12. ACI SP-15 "Field Reference Manual." A copy of this publication shall be kept in the field office at all times during concrete construction.
13. AWS D1.4 "Structural Welding Code - Reinforcing Steel."
14. CRSI "Manual of Standard Practice."

15. NYSDOT "Standard Specification for Construction and Materials."

- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C 94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Source Limitations: To minimize irregularities in appearance or color, obtain cementitious materials of the same brand from the same manufacturer's plant. Obtain aggregates, admixtures, and water for each type of concrete construction exposed to view in completed project from same source for duration of that type of construction.

1.4 SPECIAL INSPECTIONS

- A. Refer to Specification Section 014533 and Schedule of Special Inspections.

1.5 MATERIAL EVALUATION/QUALITY CONTROL

- A. Preconstruction Testing: Contractor shall employ Testing Agency acceptable to Engineer and Architect to perform material evaluation tests and evaluate concrete mixes prior to submitting.
  - 1. Testing Agency shall be qualified according to ASTM C 1077 and ASTM E329.
- B. Submit concrete testing service qualifications demonstrating experience with similar projects.
- C. Require concrete supplier to provide delivery tickets for each truckload of concrete. Tickets shall be presented to and reviewed by Contractor and Special Inspector or Testing Agency prior to discharging concrete into structure.
  - 1. Tickets shall contain project identification name, name of Contractor, name of concrete supplier, location of batch plant, date and time of concrete batching, truck number, delivery ticket number, concrete type and class, concrete mix number, design compressive strength at 28 days, concrete mix proportions and materials, and amount of total mix design water that can be added at site prior to discharging into structure if total mix design water was not used when batched. See Part 3 of this section for maximum water amount that can be added at site.
- D. The Registered Design Professionals (RDPs) for Structural Engineering and Architecture and the Special Inspector will visit construction site at appropriate intervals to determine if work is in general conformance with Contract Documents and specifications. Notify RDPs 48 hours before anticipated time of completion of reinforcement for a given section of work so they may determine if site observations are required. If site observations are required, do not place concrete until RDPs have had opportunity to observe reinforcement.



- E. Concrete strength will be evaluated by compression testing in accordance with ASTM C39 as part of the Special Inspections. Test results shall be provided to the Contractor, Special Inspector, and Registered Design Professional (RDP) responsible for Structural Engineering. Evaluation and acceptance will be in accordance with the provisions of ACI 318, Section 26.12. Should evidence of low-strength concrete exist, or if test results indicate non-conformance with these specifications, additional investigation as outlined in ACI 318 Section 26.12.4 may be directed by the project Registered Design Professionals (RDP). All such investigation, including the cost of the Architect's and Engineer's time, shall be at the Contractor's expense.
- F. If, after additional investigation, evidence of low-strength concrete still exists, load tests in accordance with Chapter 27 of ACI 318 may be ordered by the project Registered Design Professionals (RDP). In the event the concrete is determined to be inadequate by the project Registered Design Professionals (RDP), the Contractor shall remove it from the Project and replace it with concrete conforming to these specifications, subject to project Special Inspections and testing requirements herein. All such remedial work shall be at the Contractor's expense.
- G. The Contractor shall be fully responsible for ensuring that all concrete and concrete placement are in accordance with the Project Specifications. Failure of project Registered Design Professionals (RDP) or Testing Laboratory to detect defective work, workmanship, or materials shall in no way prevent rejection and the Contractor taking accepted corrective action when such defects are discovered.

## 1.6 SUBMITTALS

- A. Shop Drawings:
  - 1. Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Show bar sizes, lengths, material grade, schedules, spacing, diagrams of bent bars, arrangements of reinforcement, splices and laps, mechanical connections, and supports for reinforcement. Include special reinforcement required for openings through concrete.
    - a. Show elevations of reinforcement for all members at minimum 1/4 inch = 1 foot scale.
    - b. Show locations of construction and control joints.
    - c. Reference Contract Drawing number and addendum number in each shop drawing.
    - d. Do not place reinforcing information from more than one design discipline (structural, civil, landscape) in each drawing.
- B. Mix Designs: Submit proposed mix designs for concrete 15 days minimum before start of concreting. Submittal must be in the Concrete Mix Design Submittal Form at end of this section for each class of concrete.

- C. Submit to Special Inspector and Engineer material certificates signed by manufacturers certifying each material complies with specifications. Submit proposed admixtures including chloride ion content prior to submitting mix design.
- D. Submit data and installation instructions for proprietary materials.
- E. Maintain copies of approved submittals on site and make available to Special Inspector and Authority having Jurisdiction for use in inspection of construction.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials so as to preserve their quality and fitness for work.
  - 1. Store reinforcement and formwork in manner to prevent bending, damage (including damage to coatings) and accumulation of dirt.
  - 2. Store waterstops in a manner to prevent exposure to moisture, sunlight, dirt, oil, and other contaminants.

#### 1.8 WORKMANSHIP

- A. Contractor shall be responsible for correction of concrete work not conforming to specified requirements, including strength, tolerances, and finishes. Correct deficient concrete as directed by Architect.
- B. Remove work found to be defective. Replace with new acceptable work.

### PART 2 - PRODUCTS

#### 2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed/plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown in drawings. Plywood materials shall be one of the following:
  - 1. Overlaid plywood complying with U.S. Product Standards PS 1 "A-C or B-B High Density Overlaid (HDO) Concrete Form," Class 1, exterior grade or better.
  - 2. Plywood complying with U.S. Product Standard PS 1 "B-B (Concrete Form) Plywood," Class 1, exterior grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch minimum.

- D. Form Release Agent: Provide commercial formulation form-coating compounds with maximum VOC of 450 g/l that will not bond with, stain, or adversely affect concrete surfaces or impair subsequent treatments of concrete surfaces requiring bond or adhesion or impede wetting of surfaces to be cured with water or curing compound.
  - 1. Formulate form release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off, metal form ties, designed to prevent form deflection and spalling concrete upon removal. Provide units that will leave no metal closer than 1 inch to exposed surface.
  - 1. Provide ties that will leave holes no larger than 1-inch diameter in concrete surface when removed.
  - 2. Furnish ties with integral water-barrier plates or washers to walls indicated to receive dampproofing or waterproofing.
  - 3. Unexposed concrete: "Type A-3 Snap Tie Standard" by Dayton Superior or accepted equivalent.
  - 4. Exposed concrete: "Type A-3 Snap Tie Heavy" by Dayton Superior or accepted equivalent.
  - 5. Internal wood spreaders are prohibited.

## 2.2 REINFORCING MATERIALS

- A. Deformed bars: ASTM A 615, Grade 60.
- B. Deformed bars to be welded, ASTM A 706.
- C. Deformed Epoxy-Coated Reinforcing Bars: ASTM A 775.
- D. Steel Wire: ASTM A 82, plain, cold-drawn steel.
- E. Epoxy-coated Wire: ASTM A 884.
- F. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775.
- G. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.
- H. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars in place. Use wire bar-type or all plastic-type supports complying with CRSI specifications. Use chairs with sand plates or horizontal runners where base material will not support chair legs.
  - 1. Concrete bricks may be used to support footing and pile cap reinforcing. Stagger brick locations on subgrade.

- a. Do not use clay bricks.
  - b. Do not use bricks to support epoxy-coated or galvanized reinforcing.
  - c. Do not locate bricks or other supports on ends of piles.
2. Supports for epoxy-coated reinforcing shall be either wire bar-type coated with epoxy, plastic, or vinyl compatible with concrete for a minimum distance of 2 inches from the point of contact with reinforcing or all plastic-type.
3. Supports for galvanized reinforcing shall be either galvanized wire bar-type or all-plastic type.
4. Finish (epoxy-coated or galvanized) for supports formed from reinforcing bars shall match the finish of the supported reinforcing.
5. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are plastic-protected (CRSI, Class 1) or stainless-steel protected (CRSI, Class 2).
- I. Minimum 16-gauge annealed tie wire, ASTM A 82.
  1. Provide coated tie wire for use with epoxy-coated or galvanized bars. Acceptable coatings include epoxy, nylon, or vinyl. Galvanized tie wire may be used with galvanized bars. Do not use plain tie wire.

## 2.3 CONCRETE MATERIALS

- A. Portland Cement:
  1. ASTM C 150, Type I or II.
  2. ASTM C595, Type IL (Blended Hydraulic Cement)
- B. Aggregates: NYSDOT-approved, Section 703 (normal weight), one source and as specified.
  1. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps, or other deleterious substances.
  2. Coarse Aggregate: Clean, uncoated, processed aggregate free from clay, mud, loam, or foreign matter.
    - a. Uniformly graded, clean, processed, crushed stone obtained from quarried bedrock with low absorption and free of flat/elongated particles. Gradation similar to blended NYSDOT Type CA 2 and size 1A or gradation conforming to ASTM C 33, size 57 and size 8, blended and modified as follows:

| Sieve Size | Percent Passing |
|------------|-----------------|
| 1 ½ inch   | 100             |
| 1 inch     | 95 to 100       |
| ¾ inch     | 82 to 94        |
| 1/2 inch   | 40 to 68        |
| 3/8 inch   | 20 to 44        |
| No. 4      | 0 to 10         |

- C. Water: ASTM C 94, clean, fresh, drinkable.
- D. Fly Ash: ASTM C 618, Type F, with a loss on ignition of less than 6 percent.
- E. Ground-Granulated, Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- F. Silica Fume: ASTM C1240

## 2.4 ADMIXTURES

- A. Air Entraining: ASTM C 260.
- B. Water-Reducing Admixture: "Eucon MR", "Eucon WR-75", or "Eucon WR-91" by Euclid Chemical Co.; "MasterPozzoloth 200" by Master Builders; or "Plastocrete 161" by Sika Chemical Corp. Admixture shall conform to ASTM C 494, Type A, and not contain more chloride ions than in municipal drinking water.
- C. Water-Reducing and Retarding Admixture: "Eucon Retarder-75" by Euclid Chemical Co.; "MasterSet R100" by Master Builders; or "Plastiment" by Sika Chemical Corp. Admixture shall conform to ASTM C 494, Type D, and not contain more chloride ions than in municipal drinking water.
- D. Noncorrosive, Nonchloride Accelerator: ASTM C 494, Type C or E, and not contain more chloride ions than in municipal drinking water.
- E. High-Range, Water-Reducing Admixture (Superplasticizer): "Eucon 37" by Euclid Chemical Co. or "Sikament SPMN" by Sika Chemical Corp. Admixture shall conform to ASTM C 494, Type F or G, and not contain more chloride ions than in municipal drinking water.
- F. Prohibited Admixtures: Calcium chloride, thiocyanates, and admixtures containing more than 0.05 percent water-soluble chloride ions by weight of cement or more than 0.3 percent thiocyanates by weight of cement shall not be permitted.
- G. Certification: Written conformance to the above-mentioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to mix design review by the Registered Design Professional responsible for Structural Engineering.

## 2.5 RELATED MATERIALS

- A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 ounces a square yard when dry and complying with AASHTO M 182, Class 2.
- B. Curing-Sheet Materials: One of the following moisture-retaining covers, complying with ASTM C 171. Waterproof paper, polyethylene film, or polyethylene-coated burlap.
- C. Clear Curing and Sealing Compound (VOC compliant): ASTM C 309, Type 1, Class B with minimum 25 percent solids content. Provide test data from an Independent Testing Laboratory indicating a maximum moisture loss of 0.030 grams per square centimeter in 72 hours when applied at a coverage rate of 300 square feet per gallon. Sodium silicate compounds are not permitted. Use "Super Diamond Clear VOX" by Euclid Chemical Co. or accepted equivalent.
- D. Horizontal Joint Sealants: "MasterSeal SL2" by Master Builders; "Sikaflex-2c SL" by Sika Corp.; "Eucolastic 1 SL" by Euclid Chemical Co.; or accepted equivalent.
- E. Vertical Joint Sealants: "Eucolastic 1 NS" by Euclid Chemical Co.; "MasterSeal NP2" by Master Builders; "Sikaflex-2c NS" by Sika Corporation; or accepted equivalent.
- F. Joint Filler: ASTM D 1751, ½-inch-thick, premolded, expansion and isolation joint filler strips.
- G. Backer Rod: Polyethylene closed-cell foam. "MasterSeal 920 or 921" by Master Builders or accepted equivalent.
- H. Chamfer Strips: Provide wood, metal, PVC, or rubber chamfer strips fabricated to provide 3/4-inch chamfer on exposed edges.
- I. Chemical Adhesive for Drilled and Doweled Reinforcement:
  - 1. Anchors to solid concrete, grouted CMU, solid brick, or stone:
    - a. Anchors for use when base material temperature is 0°F or greater: "HIT-Ice" by Hilti; "Epcon A7" by ITW Ramset/Red Head; "AC 100 + Gold" by Powers Fasteners; "AT-XP" by Simpson/Strong-Tie; or accepted equivalent.
    - b. Anchors for use when base material temperature is 40°F or greater; "HIT HY 200" by Hilti; "Epcon C6+" by ITW Ramset/Red Head; "PE 1000+" by Powers Fasteners; "ET-HP" by Simpson/Strong-Tie; or accepted equivalent.

## 2.6 PROPORTIONING AND MIX DESIGN

- A. Prepare design mixtures for type and strength of concrete in accordance with ACI 301, section 4.2.2 and these specifications. Use independent testing facility acceptable to Architect for preparing and reporting proposed mix designs.
- B. Where concrete production facility can establish uniformity of its production for concrete of similar strength and materials based on recent test data, the average strength

used as a basis for determining mix design proportions shall exceed specified design strength by requirements of ACI 301, Section 4.2.3.3(a).

- C. When a concrete production facility does not have field-test records for calculation of standard deviation, the required average strength shall be determined in accordance with ACI 301, Section 4.2.3.3(b).
- D. Documentation of average compressive strength shall comply with ACI 301, Section 4.2.3.4(a), 4.2.3.4(b), or 4.2.3.4(c). Submit sample standard deviation calculation and/or results of trial mixtures used as basis for determination of  $f'_{cr}$ . See Specification Section 1.6.B.
- E. Concrete Quality:

| Location                        | Exposure Category† | Maximum Aggregate Size | Required 28-day Compressive Strength psi | Maximum Water/Cement Ratio | Percent Entrained Air |
|---------------------------------|--------------------|------------------------|------------------------------------------|----------------------------|-----------------------|
| Slabs                           | F0, S0, W0, C0     | 1"                     | 4,000                                    | 0.45                       | N/A                   |
| Interior curbs, misc. concrete. | F0, S0, W0, C1     | 1 ½"                   | 3,000                                    | 0.55                       | N/A                   |
| Interior curbs, misc. concrete. | F0, S0, W0, C1     | 1 ½"                   | 3,000                                    | 0.55                       | N/A                   |

† ACI 318 Section 19.3.1

- F. Quantity of coarse aggregate in pounds must be in the range of 1.25 to 1.5 times quantity of fine aggregate in pounds.
- G. Admixtures: concrete shall contain the specified water-reducing admixture and/or high range water-reducing admixture (superplasticizer.) At the Contractor's option, both water-reducing admixtures may be included in the concrete mix. Pumped concrete, architectural concrete, and concrete with a water-cement ration less than 0.5 shall contain the specified high range water-reducing admixture (superplasticizer.)
- H. Slump:
  - 1. 3 inches to 5 inches.
  - 2. Concrete containing high-range, water-reducing admixture (superplasticizer) shall have a maximum slump of 9 inches unless otherwise accepted by Engineer.
  - 3. Type G superplasticizer may be added at plant if adequate quality control measures are implemented to verify slump and admixture quantities at plant before addition of superplasticizer. Concrete shall maintain required slump during transportation and placement. Quality control testing at plant shall be performed by an independent testing laboratory employed by Contractor and acceptable to Architect.

4. Ready-Mix Concrete: ASTM C 94.
  5. Provide batch ticket for each batch discharged and used in work indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.
- I. Pozzolans:
1. Pozzolans may be substituted for cement in normal-weight concrete, including fly ash, ground-granulated blast-furnace slag, and/or silica fume.
    - a. Substitution rate of Pozzolans for Portland Cement in concrete classified as Exposure Category F3 shall be limited to: fly ash, at a maximum rate of 25 percent by weight, ground-granulated blast-furnace slag at a maximum rate of 50 percent by weight, or silica fume at a maximum rate of 10 percent by weight.
    - b. Proposed concrete mix designs containing a combination of fly ash, ground-granulated blast-furnace slag, or silica fume shall comply with the substitution limitations indicated in Table 26.4.2.2(b) of ACI 318.
  2. Submittals shall include actual mix design, including percentage of pozzolans and test results showing mix meets specified 7-day compressive strength where indicated, 28-day compressive strength, and air content.
  3. Protect and heat concrete containing pozzolans during cold-weather conditions. Maintain protection and heat until 70 percent of specified design strength is achieved.
- J. Pumped concrete: Submit mix designs specifically prepared and used previously for pumping. Mix designs not previously used for anticipated pump line lengths shall be tested by Contractor to verify suitability for Project before use at site.

## 2.7 REINFORCING FABRICATION

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice." Fabricate bars to required lengths, shapes, and bends. Do not rebend or straighten reinforcement in manner that could weaken material.

## PART 3 - EXECUTION

### 3.1 JOB CONDITIONS

- A. Examine conditions under which concrete shall be placed. Do not proceed with work until unsatisfactory conditions are corrected.

### 3.2 FORMWORK INSTALLATION

- A. General: Design, erect, shore, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied until concrete



structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347 and ACI 117.

- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, sleeves, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent concrete mortar leakage.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, etc., for easy removal.
- D. Erect forms in logical sequence to allow placement and inspection of reinforcement and other embedded items.
- E. Chamfer exposed corners and edges as indicated using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- F. Fit corners and joints with gaskets or tape to prevent leakage.
- G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- H. Sleeves: Provide sleeves in concrete formwork for plumbing, electrical, and mechanical penetrations. Coordinate size and location of sleeves with Contractors and mechanical, electrical, and plumbing drawings.
  - 1. Accurately place and secure in forms.
  - 2. Coordinate sleeve locations with reinforcing bars.
  - 3. Penetrations shall not occur through footings, piers, columns, beams, joists, grade beams, or supported slabs unless shown in structural drawings.
- I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing before placing concrete as required to prevent mortar leaks and maintain proper alignment.
- J. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form-facing materials are not acceptable. Apply new form-release agent. When forms are reused for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure

joints to avoid offsets. Do not use patch forms for exposed concrete surfaces unless approved by Architect.

K. Clean and coat forms before erection. Do not coat forms in place.

L. Place concrete plugs in exposed holes left by form-tie cones.

### 3.3 STEEL REINFORCEMENT PLACEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Clean reinforcement of loose rust, mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, hangers, or concrete brick as required.

1. Wire-tie intersections as required to prevent displacement of reinforcement.

2. Do not wet set reinforcing bars. Wet setting is not permitted.

D. Place reinforcement to obtain at least minimum concrete coverages for protection of bars. Minimum required concrete cover is noted in drawings.

E. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

F. Use of nails in forms and use of clay brick to support reinforcement is prohibited.

G. Lap bar splices as indicated. Stagger splices in adjacent bars. Wire-tie splices.

H. At points where bars lap-splice, including distribution steel, provide wire-tied minimum lap of 30-bar diameters unless otherwise required.

I. Coordinate placement of reinforcement with openings, including sleeves and other embedded items. Where one or more bars are interrupted, provide additional reinforcement at openings. Additional reinforcement is noted in drawings.

J. Place concrete in manner to ensure alignment of elements remains unchanged.

K. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

L. Comply with manufacturer-recommended procedures for installing and anchoring of doweled reinforcement using chemical adhesives, including drilling and cleaning of holes and mixing and applying of adhesives.

### 3.4 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items including anchor rods, leveling plates, embedded plates, and angles required for other work attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.
- B. Do not wet set embedded items. Accurately position, support, and secure embedded items against displacing by formwork, construction, or concrete placement operations.
  - 1. Provide No. 3 rebar ties at top and bottom of anchor rods to maintain position or other accepted method.

### 3.5 PREPARATION OF FORM SURFACES

- A. General: Coat contact surfaces of forms with an accepted form-coating compound before placing reinforcement.
- B. Do not allow excess form-coating material to accumulate in forms or to come in contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
- C. Coat steel forms with a nonstaining, rust-preventive material. Rust-stained steel formwork is not acceptable.

### 3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and in compliance with construction documents and approved shop drawings, and required inspections have been performed.
  - 1. Notify other trades to permit installation of their work. Cooperate with other trades in setting work as required.
- B. General: Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete" and as specified.
- C. Deposit concrete within 1-1/2 hour after water is added to dry batching, or use retarding admixture if accepted by the registered design professional responsible for structural engineering.
  - 1. For miscellaneous concrete only: A maximum of 2 1/2 gallons for each cubic yard of total mix design water can be added in field. Water must be added prior to discharging and testing concrete. At no time shall total water exceed amount listed in accepted mix design.
  - 2. For slabs: Do not add water to concrete at job site without written consent of the Registered Design Professional responsible for Structural Engineering. Superplasticizer may be utilized, in approved quantities, to bring concrete to the

required slump at the jobsite. Additions must be made prior to discharging and testing concrete.

- D. Deposit concrete continuously in one layer or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within section. Provide construction joints if section cannot be placed continuously.
- E. Deposit concrete as nearly as practicable to its final location to avoid segregation caused by rehandling or flowing.
- F. Deposit concrete in forms in horizontal layers not deeper than 24 inches and in manner to avoid inclined construction joints.
- G. Keep excavations free of water. Do not deposit concrete in water, mud, snow, or on frozen ground.
- H. Maximum drop of concrete shall not exceed 5 feet. Use hopper and trunk for greater drops.
- I. Maintain reinforcing in proper position during concrete placement.
- J. Contractor shall be responsible for controlling the proper placing of embedded pipe, conduit, and other embedded items. See section "Installation of Non-Structural Embedded Items" for additional information.
- K. Pumping concrete is permitted only if mix designs specifically prepared and used previously for pumping are submitted. Pump line shall have 5-inch-minimum inside diameter and be used with 5-inch pumps.
- L. After placing concrete, screed to levels and slopes indicated. Do not use tamping tools to force aggregate away from surface. When the water sheen has disappeared, finish surface as indicated.

### 3.7 CONSOLIDATION

- A. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
- B. Do not use vibrators to transport concrete inside formwork.
- C. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Vibrators shall penetrate placed layer of concrete at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set.
- D. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

- E. Do not allow vibrator to come in contact with form.

### 3.8 SURFACE FINISHES

- A. See drawings for required formed concrete surface finish where applicable. Special requirements for materials and workmanship may be required. Acceptability of finish surface with respect to surface void ratio, color uniformity, surface irregularities, and construction and facing joint shall be in accordance with ACI 347.3R-13. The following categories are applicable:

| Formed Concrete Surface Category† | Description†                                                                                                           |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------|
| CSC 1*                            | <b>For foundation walls, basement walls, elevator shaft walls, and walls covered with subsequent finish materials.</b> |
| CSC 2                             | <b>For exposed walls in mechanical and storage rooms.</b>                                                              |
| CSC 3                             | <b>For exposed walls in other locations.</b>                                                                           |
| CSC 4                             | <b>For architecturally exposed concrete surfaces where noted in the Drawings.</b>                                      |

†ACI 347.3R-13 Table 3.1a

**\*Note: Remove fins greater than 1/4" where CSC 1 walls are to be covered with a membrane.**

- B. Rough-Form Finish: Provide as-cast, rough-form finish to formed concrete surfaces that shall be concealed in finished work or by other construction. Standard rough-form finish is concrete surface having texture imparted by form-facing material used, with tie holes and other defective areas repaired and patched, and fins or other projections exceeding 1/4 inch in height rubbed down or chipped off.
- C. Smooth-Form Finish: Provide smooth-form finish for formed concrete surfaces that shall be exposed to view or covered with material applied directly to concrete such as waterproofing, dampproofing, veneer plaster, painting, or other similar systems. Produce smooth-form finish by selecting form material to impart a smooth, hard, uniform texture and arranging them orderly and symmetrically with minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.
- E. Slab Float Finish: Apply power-float finish to slab surfaces that will subsequently be trowel-finished or covered with waterproofing membrane. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Using float blade or float shoes only, begin floating when surface water has disappeared, when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Check surface plane to overall tolerance

of FF 18 and minimum local tolerance of FF 13. Cut down high spots, and fill low spots. Uniformly slope surface to drains. Immediately after leveling, refloat surface to uniform, smooth, granular texture.

- F. Slab Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed to view and slab surfaces to be covered with other thin-film finish-coating system. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation. Surface shall be free of trowel marks, uniform in texture and appearance, and leveled to overall tolerance of FF 35 and minimum local tolerance of FF 25 for exposed slabs and other finishes. Grind smooth surface defects that would telegraph through applied floor-covering system. Exposed surfaces are to be overtrowelled to "burn" surface to dense, hard, dark finish.

- 1. Where test sample area includes multiple floor finishes, more stringent tolerances shall apply to entire test sample area.

- G. Do not use dry materials, such as sand and cement, on surfaces during finishing. Do not sprinkle water on plastic surface. Do not disturb slab surfaces before beginning final finishing operations.

### 3.9 CONCRETE PROTECTING AND CURING

- A. Protect freshly placed concrete from premature drying, excessive hot or cold temperature, and damage in accordance with provisions of ACI 306R for cold-weather protection and ACI 305, for hot-weather protection.

- B. Curing Methods: Perform concrete curing in accordance with ACI 308 by wet-curing or moisture-retaining cover curing or combinations thereof as specified.

- C. Provide wet-curing by following methods:

- 1. Keep concrete surface continuously wet by covering with water.
- 2. Use continuous water-fog spray.
- 3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges with 4-inch lap over adjacent absorptive covers.

- D. Provide moisture-retaining-cover curing as follows:

- 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair holes or tears during curing period using cover material and waterproof tape.

- E. Curing Vertical-Formed Surfaces:

1. Keep forms in place for minimum of 7 days, 14 days in cold weather or until concrete has achieved 70 percent of its design strength.
  2. If forms are removed before minimum time period, alternate methods of curing, wet-curing, moisture-retaining-cover curing, or liquid-membrane curing, are required.
    - a. Contractor shall submit procedures to Architect for review.
    - b. Forms shall remain in place for a minimum of 24 hours when alternating methods of curing are used. For placement during cold weather, the minimum time to form removal shall be extended based on expected weather conditions and Contractor's submitted procedures.
- F. Cure concrete placed under cold-weather conditions completely covering exposed surface of concrete with moisture-retaining cover completely sealed around edges. Cure concrete 14 days minimum with concrete temperature at or above 40 degrees F or 7 days minimum with concrete temperature at or above 70 degrees F.
- G. During hot weather after concrete has hardened, loosen form ties, keeping forms in place, and apply water to inside face of form to keep concrete continuously moist.

### 3.10 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after form removal when acceptable to Architect.
1. Cut out honeycombs, rock pockets, voids over 1/2 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but not to a depth of less than 1 inch. Make edges of cuts perpendicular to concrete surface. Thoroughly clean, dampen with water, and brush-coat area to be patched with bonding agent. Place patching mortar before bonding compound has dried.
  2. For exposed-to-view surfaces, blend white portland cement and standard portland cement so patching mortar will match surrounding color when dry. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
- B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. These include surface defects such as color, texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form-tie holes, and fill with dry-pack mortar or precast-cement cone plugs secured in place with bonding agent.
1. Where possible, repair concealed formed surfaces containing defects affecting concrete durability. If defects cannot be repaired, remove and replace concrete.

- C. Repair of Unformed Surfaces: Test unformed surfaces for smoothness, and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using template having required slope.
  - 1. Repair finished unformed surfaces containing defects affecting concrete durability. These include surface defects such as crazing, cracks, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
- D. Repair methods not specified above may be used subject to acceptance of Architect.

### 3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades unless otherwise shown or directed after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling required to complete work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

### 3.12 TOLERANCES

- A. Concrete Section/Placement/Formwork
  - 1. Dimensions of Beams, Columns, Walls, Footings, Pile Caps
    - a. 12 inches or less: + 3/8 inch or - 1/4 inch
    - b. 12 inches to 36 inches: + 1/2 inch or - 3/8 inch
    - c. thicker than 36 inches: + 1 inch or - 3/4 inch
  - 2. Dimension of Footing and Pile Cap in plan: +2 inch or -1/2 inch.
  - 3. Thickness of walls and elevated slab: + 1/2 inch or - 1/4 inch
  - 4. Deviation from elevation of top surface from lines parallel to specified grade lines:
    - a. of formed slabs before removal of supporting shores: +/- 1/2 inch.
    - b. of other formed surfaces before removal of shores: +/- 1/2 inch.
    - c. of bearing surface from specified elevation: +/- 1/2 inch.
    - d. Not to exceed 1/4 inch for adjacent members less than 20 feet apart or any wall length less than 20 feet; 1/2 inch for adjacent members 20 feet or more apart or any wall length of 20 feet and greater.
  - 5. Distance between adjacent elements sectioned by a vertical plane:
    - a. where specified 2 inches or less: +/- 1/8 inch
    - b. where specified 2 inches < x < 12 inches: +/- 1/4 inch
    - c. all other elements: +/- 1 inch



6. Horizontal deviation from location (center) specified in plan from straight lines parallel to specified linear building lines:
  - a.  $\pm 1/4$  inch for adjacent members less than 20 feet apart or any wall length less than 20 feet;  $1/2$  inch for adjacent members 20 feet or more apart or any wall length of 20 feet and greater.
  - b. other elements:  $\pm 1$  inch
  - c. edge location of all openings:  $\pm 1$  inch
7. Deviation from plumb:  $1/4$  inch for any 10 feet of height; 1 inch maximum for entire height.

B. Reinforcing

1. Concrete cover measured perpendicular to concrete surface
  - a. member depth (or thickness) 12 inches or less:  $- 3/8$  inch
  - b. member depth (or thickness) over 12 inches:  $- 1/2$  inch

In all cases the reduction in cover shall not exceed  $1/3$  the specified concrete cover.
2. Vertical or horizontal variation from specified in plan
  - a. member depth 4 inch or less:  $\pm 1/4$  inch
  - b. member depth (or thickness) over 4 inch but not over 12 inch:  $\pm 3/8$  inch
  - c. member depth (or thickness) over 12 inches:  $\pm 1/2$  inch
3. Spacing, measured long a line parallel to the specified spacing:
  - a. in slabs or walls:  $\pm 3$  inch
  - b. stirrups: lesser of  $\pm 3$  inches or  $\pm 1$  inch per foot of beam depth
  - c. ties: lesser of  $\pm 3$  inches or  $\pm 1$  inch per foot of least column width

In all cases the total number of bars shall not be less than that specified.
4. Longitudinal location of bends in bars and ends of bars:
  - a. at discontinuous ends of elements:  $\pm 1$  inch
  - b. at other locations:  $\pm 2$  inch

5. Length of bar lap for #3 to #11:  $-1$  inch

C. Anchor Rods and Sleeves:

1. Variation from specified location in plan: plus or minus  $1/4$  inch.
2. Variation from specified elevation: plus or minus  $1/2$  inch.

- D. Embedded Items (plates, angles, etc.) other than anchor rods and sleeves:
1. Variation from specified location in plan: plus or minus 1/4 inch.
  2. Variation from specified elevation: plus or minus 1/4 inch.

**CONCRETE MIX DESIGN SUBMITTAL FORM**

Submit separate form for each mix design

|                                                                                         |                    |
|-----------------------------------------------------------------------------------------|--------------------|
| Project:                                                                                | Location:          |
| General Contractor:                                                                     | Concrete Supplier: |
| Mix Design No:                                                                          | Concrete Grade:    |
| Use (Describe):                                                                         |                    |
| Methods of Placement (chute, pump, chute and buggy, etc.):                              |                    |
| If placing by pumping, verify concrete mix can be pumped distances required in project: |                    |

**A. DESIGN MIX INFORMATION:**

Based on Standard Deviation Analysis:\_\_\_\_\_ or Trial Mix Design Data:\_\_\_\_\_

Design Characteristics - Density:\_\_\_\_\_ pcf; Strength:\_\_\_\_\_ psi (28-day);

Slump:\_\_\_\_\_ in. required BEFORE adding superplasticizer (if used)

Slump:\_\_\_\_\_ in. required AFTER adding superplasticizer (if used)

Entrained Air Content:\_\_\_\_\_ % specified

**Materials:**

Aggregates: (size; type; source; gradation; specification)

Coarse:\_\_\_\_\_

Fine:\_\_\_\_\_

| <u>Other Materials:</u> | <u>Type</u> | <u>Product-Manufacturer (Source)</u> |
|-------------------------|-------------|--------------------------------------|
|-------------------------|-------------|--------------------------------------|

Cement:\_\_\_\_\_

Fly Ash:\_\_\_\_\_

Slag:\_\_\_\_\_

**Admixtures:**

Water Reducer:\_\_\_\_\_

Air-Entraining Agent:\_\_\_\_\_

High-Range, Water-Reducing Admixtures (superplasticizer):\_\_\_\_\_

Non-Corrosive Accelerator:\_\_\_\_\_

Other:\_\_\_\_\_

**B. FINAL MIX DESIGN DATA:**RATIOS

Water \_\_\_\_\_ lb  
 Cementitious \_\_\_\_\_ lb = \_\_\_\_\_  
 Materials

Course Agg. \_\_\_\_\_ lb  
 Fine Agg. \_\_\_\_\_ lb = \_\_\_\_\_

SPECIFIC GRAVITIES

Fine Agg. \_\_\_\_\_

Coarse Agg. \_\_\_\_\_

Other: \_\_\_\_\_

ADMIXTURES

W.R.: \_\_\_\_\_ oz. per 100 # Cement

HRWR: \_\_\_\_\_ oz. per 100 #Cement

Non-Corrosive Accelerator: \_\_\_\_\_ oz.  
 Per 100# Cement

A.E.A.: \_\_\_\_\_ oz. per 100 # Cement

Other: \_\_\_\_\_ oz. per 100# Cement

PLASTIC CONCRETE

Initial Slump = \_\_\_\_\_ in. Air Content = \_\_\_\_\_ %

Final Slump = \_\_\_\_\_ in. Unit Dry Wt. = \_\_\_\_\_ pcf

Unit Wet Wt. = \_\_\_\_\_ pcf

STANDARD DEVIATION ANALYSIS (from experience records):

Number of Test Cylinders Evaluated: \_\_\_\_\_ Standard Deviation: \_\_\_\_\_

$f_{cr} = f_c + 1.34s$  or  $f_{cr} = f_c + 2.33s - 500$

(Refer to ACI for increased deviation factor when fewer than 30 tests are available.)

Mix # \_\_\_\_\_ Job Name \_\_\_\_\_

MIX PROPORTIONS

WEIGHT  
(LBS.)

ABSOLUTE VOL.  
(CU. FT.)

Cement: \_\_\_\_\_

Fly Ash: \_\_\_\_\_

Slag: \_\_\_\_\_

Fine  
Aggregate: \_\_\_\_\_

Coarse  
Aggregate: \_\_\_\_\_

Water: \_\_\_\_\_

Entrained  
Air: \_\_\_\_\_

Other: \_\_\_\_\_

TOTALS: \_\_\_\_\_

**C. LABORATORY TEST DATA (HARDENED CONCRETE):****COMPRESSIVE STRENGTH**

| Age (days) | Mix #1 | Mix #2 | Mix #3 |
|------------|--------|--------|--------|
| 7          | _____  | _____  | _____  |
| 14         | _____  | _____  | _____  |
| 28         | _____  | _____  | _____  |
| Other      | _____  | _____  | _____  |

28-day average compressive strength: \_\_\_\_\_psi

Mix design proportioned to achieve  $f_{cr} = f_c + 1200$  psi (1400 psi for strength higher than 5000 psi at 28 days)**CHLORIDE ION CONTENT:** Total chloride ion content of concrete mixture. Percent by mass of cementitious materials. \_\_\_\_\_

Remarks: \_\_\_\_\_

NOTE: Fill in all blank spaces. Use 0- (Zero) or N.A. (Not Applicable) where appropriate. See "Design and Control of Concrete Mixtures," 13<sup>th</sup> Edition by Portland Cement Association, for assistance in completing this form.**D. REQUIRED ATTACHMENTS:**

- \_\_\_\_\_ Coarse aggregate gradation report and DOT certification
- \_\_\_\_\_ Fine aggregate gradation report and DOT certification
- \_\_\_\_\_ Concrete compressive strength data used for standard deviation calculations
- \_\_\_\_\_ Chloride ion data and related calculations
- \_\_\_\_\_ Admixture compatibility certification letter

Submitted by

Ready-Mix

Supplier: Name \_\_\_\_\_

Address \_\_\_\_\_

Phone Number \_\_\_\_\_ Date \_\_\_\_\_

Main Plant Location \_\_\_\_\_ Miles from Project \_\_\_\_\_

Secondary Plant Location \_\_\_\_\_ Miles from Project \_\_\_\_\_

END OF SECTION 033000



SECTION 042000

CONCRETE UNIT MASONRY

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 unit masonry work as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
  - 1. Concrete block walls and partitions, patching and infill in existing walls.
  - 2. Metal joint reinforcing, anchors, ties, weeps, closures and related accessories for masonry.
  - 3. Chases, recesses, pockets and openings in masonry as required for installation of work by others.
  - 4. Building in of items furnished by others into masonry, including access doors, door frames, anchors, sleeves and inserts, ducts, and other similar items to be embedded in masonry.
  - 5. Protection, pointing and cleaning of masonry.
  - 6. Lintels (steel and block) and reinforcement for openings in masonry walls.

1.3 RELATED SECTIONS

- A. Cutting, Patching, and Repairing - Section 017329.

1.4 SUBMITTALS

- A. Submit Shop Drawings for the following:
  - 1. Anchoring details.
  - 2. Control and expansion joint locations and details.
  - 3. Special brick shapes.
- B. Submit Samples for the following:

1. Each type of block in sufficient number and color to show full range of color, texture and shade. Submit certification that brick meets ASTM standards specified herein.
    - a. Submit samples of all special shapes required showing color range and sizes, including, but not limited to, wall blocks and brick wall base.
  2. Joint reinforcing, each type, width and proposed location (labeled).
  3. Anchors, wedges and ties, each type, width and proposed location (labeled).
  4. Joint filler, each type.
  5. Mortar color, 12" long cured sample.
- C. Submit technical and installation information for the following:
1. Mortar materials, each material and mortar type.
  2. Certification of mortar mix.
  3. Flashing material, descriptive literature.
  4. Concrete block, joint reinforcing, anchors, ties and joint filler; submit manufacturer's technical and descriptive literature.
  5. Block manufacturer shall submit certifications of compliance with ASTM C 90, C 331 and UL 618 prior to any job site delivery. Field sampling of concrete block may be tested by an Independent Testing Laboratory retained by the Owner according to the requirements of ASTM C 140.
- D. Cleaning Procedures: Submit proposed procedures and materials for cleaning masonry work; including certification that cleaner will not adversely affect stone, gaskets, sealants, etc.

## 1.5 QUALITY ASSURANCE

- A. Conform to the following non-cumulative tolerances (any masonry work not meeting these standards shall be re-built as directed by the Architect).
1. Variation from the plumb:
    - a. In lines and surfaces of columns, walls and arrises:
      - 1). In 10 feet 1/8"
      - 2). In any story of 25 feet maximum 1/4"
      - 3). In 40 feet or more 1/4"
    - b. For external corners, expansion joints and other conspicuous lines:
      - 1). In any story of 25 feet maximum 1/4"
      - 2). In 40 feet or more 3/8"
  2. Variation from the level or the grades indicated on the drawings; for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:



- a. In any bay or 20 feet maximum 1/4"
  - b. In 40 feet or more 1/4"
- 3. Variation of the linear building lines from established position in plan related portion of columns and partitions:
  - a. In any bay or 20 feet maximum 1/4"
  - b. In 40 feet or more 1/2"
- 4. Variation in cross-sectional dimensions of columns and in thickness of walls:
  - a. Minus 1/8"
  - b. Plus 1/8"
- 5. Variation in dimensions of masonry openings:
  - a. Horizontal dimension -0" + 1/16"
  - b. Vertical dimension +0" - 1/16"
- B. Work of this Section shall conform to the requirements of the following:
  - 1. 2011 "Building Code Requirements for Masonry Structures," (TMS 402-11/ACI 530-11/ASCE 5-11).
  - 2. 2011 "Specification for Masonry Structures," (TMS 602-11/ACI 530.1-11/ASCE 6-11).
  - 3. Brick Industry Association (BIA) "Technical Notes on Brick Construction."
- C. Pre-Construction Conference: Prior to installation of masonry and associated work, Contractor shall arrange a meeting with Masonry Subcontractor, installers of related work, and other entities concerned with masonry wall performance, including the Architect and Owner. Contractor shall record discussions and agreements and furnish copy to each participant. Provide at least seventy-two (72) hours' advance notice to participants prior to convening conference. Review methods and procedures related to masonry work, including, but not limited to, the following:
  - 1. Review masonry requirements (drawings, specifications and other Contract Documents).
  - 2. Review required submittals, both completed and yet to be completed.
  - 3. Review and finalize construction schedule related to masonry work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
  - 4. Review required inspection, testing, certifying and material usage accounting procedures.
  - 5. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.

6. Coordinate work with air/vapor barrier membrane and related flashing, review details to avoid conflicts.

## 1.6 PRODUCT HANDLING

- A. General: Deliver, store, handle and protect all materials from damage, moisture, dirt and intrusion of foreign matter. Store all masonry units and mortar materials on raised platforms and under ventilated and waterproof cover. Store packaged materials in manufacturer's unopened containers, marked with manufacturer's name and product brand name. Immediately reseal containers after partial use. Remove and replace damaged materials.
- B. Masonry Units: Pack, deliver and store to prevent breakage, cracking, chipping, spalling or other damage. Store, protect and ventilate units at project site.
- C. Aggregate: Store with provisions for good drainage.
- D. Reinforcement and Anchors: Store and protect so that when placed, joint reinforcement and anchors will be free of soil, dirt, ice, loose rust, scale, or other coatings which would destroy or reduce bond with mortar, and will not be disfigured or bent out of shape.
- E. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.
  3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Standard Concrete Block
  1. Portland cement, ASTM C 150, Type 1, low alkali (less than 0.6%), single source for entire project.
  2. Aggregates, ASTM C 331, lightweight expanded shale, clay or slate aggregates, manufactured by the rotary kiln process equal to "Solite," "Norlite," or "Haydite."

- a. Block scheduled to receive painted finish shall contain normal weight aggregate meeting ASTM C 33 in addition to lightweight aggregate in order to receive a smooth, uniform finish.
3. Concrete Masonry Units: Load-bearing, normal weight aggregate concrete masonry units conforming to the requirements of ASTM C 90, Type 1.
  - a. Block for rated walls shall be 75% solid units.
  - b. All other block may be hollow units.
4. The producer of the concrete masonry units shall furnish certification from an independent testing laboratory confirming that all 8" or larger masonry units meet all of the UL 618 requirements for two (2) hours or better (as required), referencing full scale fire test reports (ASTM E 119). All 4" and 6" units shall conform to "National Bureau of Standards" and "National Research Council" full scale fire tests.
5. Sizes and Shapes: Nominal face size 8" x 16" by thickness as indicated on drawings, with stretcher units, jamb units, header units, square corner units (at ends and corners of exposed or painted work), sash units (at control joints within masonry wall), lintel units and other special shapes and sizes required to complete the work.
6. Finish: For exposed or painted block surfaces, in addition to ASTM requirements, block shall have uniformly dense, flat, fine grain texture, with no cracks, chips, spalls, or other defects which would impair appearance. For concealed CMU, surfaces shall be free from deleterious materials that would stain plaster or corrode metal.
7. Curing: All concrete block shall be steam cured, and air dried for not less than thirty (30) days before delivery.
8. Density of concrete block shall not exceed one hundred and five (105) lbs. per cubic foot.
9. Shrinkage: Shrinkage of concrete blocks shall not exceed 0.065% when tested in accordance with ASTM C 426-99.
10. Water Content
  - a. At the time of delivery to the job site, concrete masonry units shall have a value, in weight of contained water, of not more than thirty (30) percent of the fully saturated content for the unit tested.
  - b. Ship all units from the factory, and store at the job site, with all necessary protection to prevent increase of water content from rain and other sources.

B. Joint Reinforcing for Masonry Walls

1. For interior block walls and partitions, provide standard reinforcing fabricated of 9 ga. side and cross rods, truss or ladder design, no ties, spaced every other block course. Provide prefabricated pieces at corners and intersections of walls or

partitions. Reinforcing shall be mill galvanized conforming to ASTM A 641, Class B-1, applied after fabrication.

2. Wire used in assemblies noted above shall be cold drawn steel wire conforming to ASTM A 82.
3. Approved Joint Reinforcing Manufacturers
  - a. Hohmann & Barnard
  - b. Wire-Bond
  - c. Heckmann Building Products
  - d. National Wire Products Industries, Inc.

C. Anchors and Ties

1. Dovetail Anchor Slots: Hot-dip galvanized steel, 16 gauge, equal to No. 100 Dovetail Anchor Slot made by Heckmann Building Products, No. 305 anchor slot made by Hohmann & Barnard, or approved equal by other manufacturers.
2. Flexible Metal Ties for Dovetail Slots: Hot-dip galvanized, 16 gauge by 1" wide by Heckmann Building Products Inc., or approved equal manufacturer noted above in Para. C.5.
  - a. No. 106 Dovetail Corrugated Anchor.
  - b. No. 129 Dovetail Triangle Tie.
3. Wire Mesh: Hot-dip galvanized sixteen (16) gauge steel wire, square mesh, width 3" by length to suit condition; No. 268 by Heckmann Building Products, or approved equal by manufacturer noted above in Para. C.5.
4. For anchoring masonry to structural steel, provide hot-dip galvanized steel, as listed, or approved equal by manufacturer noted above in Para. C.5:
  - a. Made by Heckmann Building Products. Galvanizing shall conform to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft.
    - 1). No. 195 Column Anchors
    - 2). No. 197 Column Anchors
    - 3). No. 315 Weld-On Anchor Rods with No. 316 Triangle Ties
    - 4). No. 315-B Weld-On Anchor Straps with No. 316 Triangle Ties
  - b. Made by Hohmann & Barnard or approved equal. Galvanizing shall conform to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft.
    - 1). No. 355 Column Anchors
    - 2). No. 356 Column Anchors
    - 3). No. 357 Beam Anchors
    - 4). No. 359 F anchor straps with VWT tie.
5. For anchoring CMU interior partitions to underside of steel beams, provide hot dip galvanized steel tube anchors equal to No. 419 and No. 421 made by Heckmann Building Products, No. PTA-420 made by Hohmann & Barnard, or approved equal by manufacturer noted above in Para. C.5.

6. For anchoring CMU interior partitions to underside of structural deck, provide 4" x 4" x 1/4" galvanized steel angles (ASTM A 36), 3'-0" long spaced 3'-0" o.c. alternately on each side of partition. Anchor partition securely to structural deck.
- D. Reinforcing Bars and Rods: ASTM A 615, Grade 60.

## 2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type 1, standard color, one source.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregate for Mortar: Clean, washed, buff colored sand, graded per ASTM C 144.
- D. Aggregate for Grout: ASTM C 404.
- E. Water: Clean, fresh and suitable for drinking.

## 2.3 MORTAR MIX

- A. Interior Masonry Construction: Provide Portland cement/lime mortar conforming to ASTM C 270, Type N. For load-bearing conditions, mortar shall conform to ASTM C 270, Type S.
- B. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of unit masonry. Use grout of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout. Grout shall have a minimum compressive strength of 3000 psi when tested in accordance with ASTM C 1019.
- C. Mixing
  1. General: Add cement just before mixing and mix dry. Use sufficient amount of water as necessary to produce workable mix. Mix in small batches to make plastic mass.
  2. Mixing: Machine mix all mortars in approved type mixer with device to accurately and uniformly control water. Add hydrated lime dry. Mix dry materials not less than two (2) minutes. Add water, then mix not less than three (3) minutes, not to exceed five (5) minutes. Mix only amount of mortar that can be used before initial set. Do not use mortar which has reached its initial set or two (2) hours after initial mixing, whichever comes earlier. Mortar may not be re-tempered. Clean mixer for each batch, whenever mortar type is changed, and at end of each day's work.
  3. Acceleration or other admixtures not permitted.
  4. Mortar shall have a flow after suction of not less than seventy-five (75) percent of that immediately after mixing as determined by ASTM C 91.

D. Admixtures

1. No air-entraining admixtures or cementitious materials containing air-entraining admixtures shall be used in the mortar.
2. No antifreeze compounds or other substances shall be used in the mortar to lower the freezing point.
3. Calcium chloride or admixtures containing calcium chloride shall not be used in mortar.

2.4 MASONRY ACCESSORIES

- A. Neoprene Joint Filler: Provide closed cell neoprene, Type NN-1, conforming to ASTM D 1056, Grade 1, high performance, as manufactured by Williams Products Inc., or equal made by D. S. Brown, Norton, or approved equal.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that masonry may be completed in accordance with all pertinent codes and regulations, the referenced standards, and the original design.
3. Do not start any work until mock-ups are approved by the Architect.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Architect in writing.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
3. Starting of work by the Contractor means acceptance by the Contractor of the substrate.

3.2 COORDINATION

- A. Carefully coordinate with all other trades to ensure proper and adequate interface of the work of other trades with the work of this Section.

3.3 PREPARATION

- A. Concrete Block: Do not wet concrete block units.

### 3.4 INSTALLATION

#### A. General

1. Build walls/infill to the full thickness shown. Build single wythe walls to the actual thickness of the masonry units, using units of nominal thickness shown.
2. Build chases and recesses as shown or required for the work of other trades. Create penetrations as required for the work of other trades in existing block walls.
3. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening. Coordinate with all trades.
4. Pattern Bond: Lay exposed masonry patterns to match existing walls to remain. If inconsistent, provide running bond. Lay concealed concrete block with all units in a wythe bonded by lapping not less than two (2) inches. Bond and interlock each course of each wythe at corners. Do not use units of less than four (4) inches horizontal face dimensions at corners or jambs. Alert Architect if the existing varies from the running bond pattern described here.

#### B. Mortar Bedding and Jointing

1. All joints between bricks shall be completely filled with mortar. Bed joints shall be beveled per BMI recommendations, with the brick then shoved in place. At cavity wall construction, care shall be taken that no excess mortar goes into masonry cavity. Head joints shall be completely filled with mortar and shall be formed by applying a full coat of mortar to the entire end or the entire side, as the case requires, and then shoving the mortar covered end and/or side of the brick tightly against the bricks previously laid; the practice of "slushing" by throwing mortar into the head joints will not be permitted. All brick shall be laid without disturbing the brick previously laid. Brick shall be laid within a minute or so after the mortar is placed. Dry or butt joints will not be permitted. Grouting shall be done only as necessary. Do not slush head joints.
2. Lay concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on exterior walls and in all courses of piers, columns and pilasters, where solid CMU is used and where adjacent to cells or cavities to be reinforced or filled with concrete or grout.
  - a. To ensure alignment of brick and block coursing, adjust block back-up by cutting block to insure alignment of coursing or use adjustable anchorage.
3. Lay masonry walls with 3/8" joints unless otherwise shown on drawings.
4. Tool exposed joints slightly concave after the mortar joint is thumbprint hard. Concealed joints shall be struck flush.
5. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

- C. Stopping and Resuming Work: Rake back 1/2 brick length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.
- D. Built-In Work
  - 1. As the work progresses, build in items specified under this and other Sections of these specifications. Fill in solidly with masonry around built-in items.
  - 2. Mortar in door frames, access doors, louvers and other metal items embedded or built into masonry work solidly with mortar as the masonry units are laid up.
  - 3. Grout under lintels, bearing plates, and steel bearing on masonry with solid bed grout.
  - 4. Sleeves, pipes, ducts and all other items which pass through masonry walls shall be caulked with interior grade sealant meeting requirements of Section 079200, so as to be air tight and prevent air leakage. Refer to Section 078413 for packing of voids in rated masonry walls.
  - 5. Fill vertical cells of masonry units solid with grout which have anchoring, reinforcing rods, supporting or hanging devices embedded in the cell including stone anchors and window or curtain wall anchors.
  - 6. Fill vertical cells of masonry units solid with mortar on each side of door frames to sixteen (16) inches beyond.
  - 7. Unless otherwise noted, fill vertical cells of masonry units solid with grout which are below steel bearing plates, steel beams, and ends of lintels, to eight (8) inches beyond bearing and from floor to bearing.
  - 8. Place wire mesh in horizontal joint below masonry unit cells to be filled with mortar, to prevent mortar from dropping into unfilled cells below.
- E. Cutting and Patching
  - 1. All exposed masonry which requires cutting or fitting shall be cut accurately to size with motorized carborundum or diamond saw, producing cut edges.
  - 2. Holes made in exposed masonry units for attachment of fasteners or conduit penetrations and similar items shall be neatly drilled to proper size.
  - 3. All masonry which requires patching in exposed work, if approved by Architect, shall be patched neatly with mortar to match appearance of masonry as closely as possible and to the Architect's satisfaction. Rake back joints and use pointing mortar to match as required.
- F. Ties and Anchors for Masonry Construction
  - 1. Provide ties and anchors as shown or specified, but not less than one metal tie, spaced not to exceed sixteen (16) inches o.c. horizontally and/or vertically.



Provide additional ties within 1'-0" of all openings and adjacent to expansion joints and spaced not more than 16" apart around perimeter of openings.

2. Anchoring Masonry to Structure: Provide an open space not less than 1/2" in width between masonry and structural member, unless otherwise shown. Keep open space free of mortar or other rigid materials.
3. Attach brick veneer to cold formed metal framing by anchoring brick to studs using specified anchors penetrating through sheathing and through flange of stud. Prior to application of anchors cover sheathing and vapor barrier with tape specified herein. Space anchors 8" o.c. at each stud; provide stainless steel screw anchors for attaching anchor to studs.

#### G. Control and Expansion Joints

1. Provide expansion, control and isolation joints in masonry as shown. Build in related items as the masonry work progresses.
2. CMU Control Joint Spacing: If location of control joints is not shown, place vertical joints spaced not to exceed 40'-0" o.c. In addition, locate joints at points of natural weakness in the masonry work, including the following:
  - a. At structural column or joint between bays.
  - b. Above control joints in the supporting structure.
  - c. Above major openings at end of lintels upward and below at ends of sills downward. Place at one side of jamb for openings not less than 6'-0" wide and at both sides for openings over 6'-0" wide.
  - d. At reduction of wall thickness.
  - e. Where masonry abuts supporting structure.
  - f. If additional joints are required, indicate same on approved shop drawings.

#### H. Lintels

1. Install loose steel lintels, allowing eight (8) inch bearing at ends where indicated on the drawings for opening.
2. Unless otherwise noted, For door openings, duct penetrations, or louvers/dampers in concrete block walls, provide and install specially formed U-shaped concrete block lintel units with reinforcing bars in accordance with the following table, filled with grout.

| Number and Size of Reinforcing Bars<br>Required at Concrete Block Lintels |            |                     |
|---------------------------------------------------------------------------|------------|---------------------|
| Maximum Clearance Span                                                    | Wall Width | Rebar<br>No. - Size |
| 2'-0" to 6'-0"<br>6'-0" to 8'-0"                                          | 6"         | 2 - #3<br>2 - #4    |

|                                  |     |                  |
|----------------------------------|-----|------------------|
| 2'-0" to 6'-0"<br>6'-0" to 8'-0" | 8"  | 2 - #3<br>2 - #4 |
| 2'-0" to 6'-0"<br>6'-0" to 8'-0" | 12" | 3 - #3<br>3 - #4 |

### 3.5 CLEANING, PROTECTION, ADJUSTMENT

#### A. Protection

1. The Contractor shall take adequate precautions for the protection of all surfaces against mortar spatter, and shall immediately remove any such spatter should it inadvertently occur, leaving no stain or discoloration.
2. Excess mortar shall be wiped off the masonry surfaces as the work progresses.
3. Wood coverings shall be placed over all such masonry surfaces as are likely to be damaged during the progress of the entire project.
4. Protective measures shall be performed in a manner satisfactory to the Architect.
5. Damaged masonry units shall be replaced to satisfaction of the Architect.
6. Exterior masonry walls shall be draped with waterproof covering until copings are in place, to prevent water penetration in cavity.

- B. Cleaning of Masonry: Upon completion, all exposed masonry shall be thoroughly cleaned following recommendations of the BIA Technical Note No. 20. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 4' x 4' in a location approved by the Architect. No further cleaning work may proceed until the sample area has been approved by the Architect, after which time the same cleaning materials and method shall be used on the remaining wall area. If stiff brushes and water do not suffice, the surface shall be thoroughly saturated with clear water and then scrubbed with a solution of an approved detergent masonry cleaner, equal to "Vana Trol" made by ProSoCo Inc. or equal made by Diedrich or approved equal, mixed as per manufacturer's directions, followed immediately by a thorough rinsing with clear water. All lintels and other corrodible parts shall be thoroughly protected during cleaning.

1. Unless otherwise required by cleaning agent manufacturer use only low pressure device (30 to 50 psi) for application of cleaning agent and water rinsing.

- C. Pointing: Point any defective joint with mortar identical with that specified for that joint.

Richard McElhiney Architects LLC

Ward Center Renovation  
New York Consortium for Space Technology (NYCST)

March 7, 2025  
Construction Documents

END OF SECTION



## SECTION 055000

### METAL FABRICATIONS

#### 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 SUMMARY

- A. Section Includes:
  - 1. Steel framing and supports for overhead doors and grilles.
  - 2. Steel framing and supports for mechanical and electrical equipment.
  - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  - 4. Steel shapes.
  - 5. Miscellaneous steel trim including steel angle corner guards, steel edgings, and loading-dock edge angles.
  - 6. Abrasive metal nosings, treads, and thresholds.
  - 7. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
  - 1. Loose steel lintels.
  - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
  - 3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Requirements:
  - 1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
  - 2. Section 042000 "Concrete Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
  - 3. Section 055000 "Metal Fabrications."

### 1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
  - 2. Metal nosings and treads.
  - 3. Paint products.
  - 4. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
  - 1. Steel framing and supports for overhead doors and grilles.
  - 2. Steel framing and supports for mechanical and electrical equipment.
  - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  - 4. Steel shapes.
  - 5. Miscellaneous steel trim including steel angle corner guards, steel edgings, and loading-dock edge angles.
  - 6. Abrasive metal nosings, treads, and thresholds.
  - 7. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- C. Samples for Verification: For each type and finish of extruded nosing and tread.
- D. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

## 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

## 1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.
- B. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- C. Structural Performance of Alternating Tread Devices: Alternating tread devices shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
  - 1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
  - 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
  - 3. Uniform and concentrated loads need not be assumed to act concurrently.
  - 4. Alternating Tread Device Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.

- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Stainless-Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 316L.
- D. Stainless-Steel Bars and Shapes: ASTM A276, Type 316L.
- E. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
- F. Rolled-Stainless-Steel Floor Plate: ASTM A793.
- G. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- H. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- I. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
  - 1. Minimum Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm).
  - 2. Material: Galvanized steel, ASTM A653/A653M, commercial steel, Type B, with G90 (Z275) coating; 0.108-inch (2.8-mm) nominal thickness.
  - 3. Material: Cold-rolled steel, ASTM A1008/A1008M, commercial steel, Type B structural steel, Grade 33 (Grade 230); 0.0966-inch (2.5-mm) minimum thickness; hot-dip galvanized after fabrication.
- J. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.
- K. Aluminum Plate and Sheet: ASTM B209 (ASTM B209M), Alloy 6061-T6.
- L. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.



- M. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.
- N. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.
- O. Bronze Extrusions: ASTM B455, Alloy UNS No. C38500 (extruded architectural bronze).
- P. Bronze Castings: ASTM B584, Alloy UNS No. C83600 (lead red brass) or No. C84400 (lead semired brass).
- Q. Nickel Silver Extrusions: ASTM B151/B151M, Alloy UNS No. C74500.
- R. Nickel Silver Castings: ASTM B584, Alloy UNS No. C97600 (20 percent lead nickel bronze).

## 2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless-steel fasteners for fastening aluminum.
  - 2. Provide stainless-steel fasteners for fastening stainless steel.
  - 3. Provide stainless-steel fasteners for fastening nickel silver.
  - 4. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F568M, Property Class 4.6); with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, (ASTM A563M, Class 10S3) heavy-hex carbon-steel nuts; and where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F593 (ASTM F738M); with hex nuts, ASTM F594 (ASTM F836M); and, where indicated, flat washers; Alloy Group 1 (A1).
- E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed

when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.

- G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.
  - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).
- I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

## 2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

- G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- H. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

## 2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

## 2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

## 2.7 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.
- C. Prime plates with zinc-rich primer.

## 2.8 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches (200 mm) unless otherwise indicated.
- C. Galvanize and prime loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

## 2.9 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

## 2.10 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 2.11 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
  - 1. Shop prime with universal shop primer unless zinc-rich primer is indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
  - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## 2.12 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
  - 1. Cast Aluminum: Heavy coat of bituminous paint.
  - 2. Extruded Aluminum: Two coats of clear lacquer.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for overhead doors and overhead grilles securely to, and rigidly brace from, building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
  - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
  - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

### 3.3 INSTALLING METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
  - 1. Do not fill removable bollards with concrete.
- B. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete or in formed or core-drilled holes not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) larger than OD of bollard. Fill annular space around bollard solidly with nonshrink grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.
- C. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- D. Fill bollards solidly with concrete, mounding top surface to shed water.
  - 1. Do not fill removable bollards with concrete.

### 3.4 INSTALLING PIPE GUARDS

- A. Provide pipe guards at exposed vertical pipes in parking garage where not protected by curbs or other barriers. Install by bolting to wall or column with expansion anchors. Provide four 3/4-inch (19-mm) bolts at each pipe guard. Mount pipe guards with top edge 26 inches (660 mm) above driving surface.

### 3.5 INSTALLING NOSINGS, TREADS, AND THRESHOLDS

- A. Center nosings on tread widths unless otherwise indicated.
- B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.
- C. Seal thresholds exposed to exterior with elastomeric sealant complying with Section 079200 "Joint Sealants" to provide a watertight installation.

### 3.6 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.7 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION



## SECTION 055213

### PIPE AND TUBE RAILINGS

#### 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 SUMMARY

- A. Section Includes:
  - 1. Steel pipe and tube railings.
  - 2. Metal infill panels

##### 1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Manufacturer's product lines of mechanically connected railings.
  - 2. Railing brackets.
  - 3. Grout, anchoring cement, and paint products.
- B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- D. Samples: For each type of exposed finish required.
  1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
  2. Fittings and brackets.
  3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
    - a. Show method of connecting and finishing members at intersections.
- E. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- F. Evaluation Reports: For post-installed anchors, from ICC-ES.

#### 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## 1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Steel Pipe and Tube Railings:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers fabricating products with minimum 10 year's experience.
- B. Source Limitations: Obtain each type of railing from single source from single manufacturer. Obtain metal infill panel components and system from a single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Handrails and Top Rails of Guards:
    - a. Uniform load of 50 lbf/ ft. applied in any direction.
    - b. Concentrated load of 200 lbf applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  - 2. Infill of Guards:
    - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
    - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F.

## 2.3 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
  - 1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

## 2.4 STEEL AND IRON

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
  - 1. Provide galvanized finish for exterior installations and where indicated.
- D. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

## 2.5 FASTENERS

- A. General: Provide the following:
  - 1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
  - 2. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
  2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
  3. Provide Phillips flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
  2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

## 2.6 METAL INFILL PANELS

- A. Manufacturer: Provide metal infill panel system for new or existing tube railings by McNichols Co. All components to be from single manufacturer.
- B. Infill panel comprised of the following:
1. Infill material: Wire Mesh, rectangular, carbon steel, cold rolled, welded. Trimmed, 4"x2" mesh (3.75"x1.75" opening). .25" thick wire diameter, 93% open area. Item: 36422501141
  2. Edge accessories: U-Edging, carbon steel, 14 gauge. 1" wide with opening width to accommodate the specified infill material.
  3. Attachments: provide mounting tabs as detailed to new or existing tube railings.
  4. Accessories: provide all assembly, welding, fasteners, and accessories for a complete installation infill panel system.
- C. Substitutions: Equal products are subject to approval by the Architect. Alternate manufacturers include:
1. Banker Wire
  2. HDI Railing Systems
  3. Viva Railings
  4. Newark Wire Works, Inc.

## 2.7 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Shop Primers: Provide primers that comply with Section 099000 Painting and Finishing.
- E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- F. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- G. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- H. Intermediate Coats and Topcoats: Provide products that comply with Section 099000 Painting and Finishing.
- I. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.
- J. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.
- K. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- L. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- M. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
  - 1. Water-Resistant Product: At exterior locations 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.

## 2.8 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove flux immediately.
  - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
  - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- J. Form Changes in Direction as Follows:
  - 1. As detailed.
  - 2. By bending or by inserting prefabricated elbow fittings.
  - 3. By flush bends or by inserting prefabricated flush-elbow fittings.
  - 4. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
- K. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.

- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
  - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- P. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- Q. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
  - 1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

## 2.9 STEEL AND IRON FINISHES

- A. Galvanized Railings:
  - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
  - 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
  - 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
  - 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
  - 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.



- D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 1. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Railings Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 4. Other Railings: SSPC-SP 3, "Power Tool Cleaning."
- F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
  - 1. Shop prime uncoated railings with universal shop primer unless primers specified in Section 099000 Painting and Finishing are indicated.
  - 2. Do not apply primer to galvanized surfaces.
- G. Shop-Painted Finish: Comply with Section 099000 Painting and Finishing.
  - 1. Color: As selected by Architect from manufacturer's full range.
- H. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
  - 1. Color: As selected by Architect from manufacturer's full range.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

#### 3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.

- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
  - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
  - 1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

### 3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

### 3.4 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.
- D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
  - 1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
  - 2. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
  - 3. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
- E. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

### 3.5 ATTACHING RAILINGS

- A. Where ever possible attach railing posts by welding bottom flanges to tops of stringers or mechanically fastening to concrete deck. Allow for additional post length at roof system penetrations and provide a flashing boot compatible with roofing system components and supplied by roofing system manufacturer. Coordinate rail post installation with roofing system installation so as not to void roofing system warranty. Avoid wall penetrations through roofing membrane system.
- B. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends or connected to railing ends using nonwelded connections.
- C. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.
- D. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. See part A above and avoid penetrations through roofing system membrane.
- E. Secure wall brackets and railing end flanges to building construction as follows:
  - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  - 2. For hollow masonry anchorage, use toggle bolts.
  - 3. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

4. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

### 3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
  1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

### 3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 06 20 00

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.
  - 2. Plywood backing panels for telephone, electrical closets, and select wall partitions.
  - 3. Rough hardware.
  - 4. Installation only of finish hardware.
  - 5. Installation only of doors and hollow metal frames.

1.3 RELATED SECTIONS

- A. Hollow Metal Doors and Frames - Section 081113.

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. S-Dry: Maximum nineteen (19) percent moisture content as per ASTM D 2016.

- 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. Pressure Treatment: Include certification by treating plant stating chemicals and process used, net amount of salts retained and conformance with applicable standards.
- B. 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. Plywood and rough carpentry for telephone and electrical 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 AWP 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 AWP 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. For exterior blocking, roofing and sheet metal, pressure treat wood with copper azole, Type B (CA-B); ammoniacal copper quat (ACQ) or similar preservative product that contains no arsenic or chromium. Preservative shall comply with AWP Standard U1, (.25 lbs./cubic foot of chemical in wood).
  - a. After treatment, kiln dry to a maximum moisture content of fifteen (15) percent. Treatment shall be equal to "Wolmanized Natural Select" made by Arch Wood Protection Inc. or approved equal.
3. Treated wood which is cut or otherwise damaged shall be further treated in accordance with the AWP 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 for Treated Woods and Exterior Use: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.
- 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.

## 2.3 PLASTIC LAMINATE SILLS

- A. Face Sheets: NEMA Publication LD3, Grade GP50, Type I, 0.05" thick, as manufactured by Formica, Nevamar, 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. Material Thickness: See drawings for general material thickness. Provide treated plywood or particleboard sheets required to match existing thickness. Minimum thickness of material sheets shall be  $\frac{3}{4}$ ".
- D. Edges: Finish with plastic laminate to match face and applied before face sheets are applied, unless otherwise shown or specified.
- E. Submit samples to the Architect for approval. Finish to match existing adjacent to remain.



## 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 250.11-20001, 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.
  5. 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.
  6. Installation Tolerances: Adjust steel door frames for squareness, alignment, twist, and plumb to the tolerance given in HMMA 841 of ANSI/NAAMM, current edition.
  7. 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.
- C. 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. Rough Lumber for Roofing and Sheet Metal

1. Furnish and install all wood nailing strips and wood blocking required in connection with respective types of roofing, fans, flashings, and sheet metal work, using preservative treated wood as herein before specified.
2. Wood blocking shall be of sizes and shapes as indicated on the drawings and/or designed for the reception of curb flashings for roof ventilators and similar items.
3. All nailing strips and blocking shall be carried out in accordance with the printed installation instructions, and/or recommendations of the accepted manufacturer of the roofing materials, and in coordination and cooperation with the sheet metal work trades.
4. All blocking and nailing strips shall be firmly secured in place using counter bored bolt and nut fastenings, or secured by any other proposed flush surfaced fastenings.
5. Wood nailing strips or blocking required to be embedded in concrete work shall be furnished in time due for placing, prior to start of concrete operations. Locations and spacings of nailing strips or blocking shall be performed in coordination with the concrete trades, as required for respective installations.

3.5 TELEPHONE AND ELECTRICAL EQUIPMENT MOUNTING BOARDS

- A. Furnish and install 3/4" thick plywood panels to the walls of the telephone and electrical 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.
- C. See partition types for 5/8" plywood block at select wall partitions.

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 07 84 13

PENETRATION FIRESTOPPING

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 SUMMARY

- A. Section includes:
  - 1. Penetrations in fire-resistance-rated walls.
  - 2. Penetrations in horizontal assemblies.

1.3 SUBMITTALS

- A. Product data: for each type of product indicated.
- B. Product schedule: for each penetration firestopping system. include location and design designation of qualified testing and inspecting agency.
- C. Qualification data: for qualified installer.
- D. Installer certificates: from installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
- E. Product test reports: based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.4 QUALITY ASSURANCE

- A. Installer qualifications: a firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this project, whose work has resulted in construction with a record of successful performance. qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. manufacturer's willingness to sell its penetration firestopping products to contractor or to installer engaged by contractor does not in itself confer qualification on buyer.

- B. Fire-test-response characteristics: penetration firestopping shall comply with the following requirements:
  - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
    - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
    - b. Classification markings on penetration firestopping correspond to designations listed by the following:
      - 1) UL in its "Fire Resistance Directory."
- C. Preinstallation conference: conduct conference at project site.

Project conditions

- D. Environmental limitations: do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet.
- E. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.5 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.
- C. notify testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:



1. A/D Fire Protection Systems Inc.
2. Grace Construction Products.
3. Hilti, Inc.
4. Johns Manville.
5. Nelson Firestop Products.
6. NUCO Inc.
7. Passive Fire Protection Partners.
8. RectorSeal Corporation.
9. Specified Technologies Inc.
10. 3M Fire Protection Products.
11. Tremco, Inc.; Tremco Fire Protection Systems Group.
12. USG Corporation.

## 2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in fire-resistance-rated walls: provide penetration firestopping with ratings determined per astm e 814 or ul 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 pa).
  1. Fire-resistance-rated walls include fire walls, fire-barrier walls, and fire partitions.
  2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in horizontal assemblies: provide penetration firestopping with ratings determined per astm e 814 or ul 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 pa).
  1. Horizontal assemblies include floors and floor/ceiling assemblies.
  2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
  3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. W-rating: provide penetration firestopping showing no evidence of water leakage when tested according to ul 1479.
- E. Exposed penetration firestopping: provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per astm e 84.
- F. Voc content: provide penetration firestopping that complies with the following limits for voc content when calculated according to 40 cfr 59, subpart d (epa method 24):

1. Architectural Sealants: 250 g/L.
  2. Sealant Primers for Nonporous Substrates: 250 g/L.
  3. Sealant Primers for Porous Substrates: 775 g/L.
- G. Accessories: provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
1. Permanent forming/damming/backing materials, including the following:
    - a. Slag-wool-fiber or rock-wool-fiber insulation.
    - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    - c. Fire-rated form board.
    - d. Fillers for sealants.
  2. Temporary forming materials.
  3. Substrate primers.
  4. Collars.
  5. Steel sleeves.

## 2.3 FILL MATERIALS

- A. Latex sealants: single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- B. Firestop devices: factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- C. Intumescent putties: nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- D. Intumescent wrap strips: single-component intumescent elastomeric sheets with aluminum foil on one side.
- E. Mortars: prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at project site to form a nonshrinking, homogeneous mortar.
- F. Pillows/bags: reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- G. Silicone foams: multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

- H. Silicone sealants: single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

## 2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce 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 configurations, penetrating items, substrates, and other conditions affecting performance of the work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface cleaning: clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Priming: prime substrates where recommended in writing by 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 penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the work and that would

otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

### 3.3 INSTALLATION

- A. General: install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
  - 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 the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
  - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
  - 2. Contractor's name, address, and phone number.
  - 3. Designation of applicable testing and inspecting agency.
  - 4. Date of installation.
  - 5. Manufacturer's name.
  - 6. Installer's name.

### 3.5 FIELD QUALITY CONTROL

- A. Engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

### 3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of substantial completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

### 3.7 PENETRATION FIRESTOPPING SCHEDULE

- A. Where ul-classified systems are indicated, they refer to system numbers in ul's "fire resistance directory".
- B. Firestopping with no penetrating items:
  - 1. UL-Classified Systems.
- C. Firestopping for metallic pipes, conduit, or tubing:
  - 1. UL-Classified Systems
- D. Firestopping for nonmetallic pipe, conduit, or tubing:
  - 1. UL-Classified Systems
- E. Firestopping for electrical cables:
  - 1. UL-Classified Systems
- F. Firestopping for insulated pipes:
  - 1. UL-Classified Systems
- G. Firestopping For Miscellaneous Electrical Penetrants
  - 1. UL-Classified Systems
- H. Firestopping for miscellaneous mechanical penetrants:

1. UL-Classified Systems
- I. Firestopping for groupings of penetrants:
  1. UL-Classified Systems

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

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 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. Firestop sealants - Section 078413.
- B. Sealant within drywall construction - Section 092900.

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 ten (10) 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 No. 790 or 795 made by Dow Corning, "Silpruf SCS 2000" or "LM SCS 2700" made by G.E., "Spectrem 1" or "Spectrem 3" made by Tremco, "Sonolastic 150" made by Sonneborn, or "Sikasil WS-295" or "Sikasil WS-290" made by Sika 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 or equal made by Tremco, Sherwin Williams or approved equal.
- C. 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 4A 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.

END OF SECTION

SECTION 08 06 71

DOOR HARDWARE SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section references specification sections relating to commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Commercial door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical and access control door hardware.
3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
4. Automatic operators.
5. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section "Door Hardware".
2. Division 28 Section "Access Control Hardware Devices".

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

### 1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

- a. Type, style, function, size, label, hand, and finish of each door hardware item.
- b. Manufacturer of each item.
- c. Fastenings and other pertinent information.
- d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
- e. Explanation of abbreviations, symbols, and codes contained in schedule.
- f. Mounting locations for door hardware.
- g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

#### 1.5 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties 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.

#### 1.6 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## PART 2 - PRODUCTS

### 2.1 SCHEDULED DOOR HARDWARE

- A. Refer to "PART 3 – EXECUTION" for required specification sections.

## PART 3 - EXECUTION

### 3.1 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
  2. The supplier is responsible for handing and sizing all products.
  3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
  4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.

1. Section 08 71 00 – Door Hardware.

C. Manufacturer's Abbreviations:

1. MK - McKinney
2. MR - Markar
3. SA – SARGENT
4. OT – Other
5. RO – Rockwood
6. PE – Pemko
7. ST – Stanley
8. SE - Securitron



**Set: 1**

Single door with access control, rated:

|                               |                                              |       |    |        |
|-------------------------------|----------------------------------------------|-------|----|--------|
| 4 Hinge (heavy weight)        | T4A3786                                      | US26D | MK | 087100 |
| 1 Access Control Mortise      | 70 SN200 x 12 82271 x LNL                    | US32D | SA | 087100 |
| 1 Cylinder                    | 70-SFIC                                      |       | OT |        |
| 1 Surface Closer              | 351 O                                        | 26D   | SA | 087100 |
| 1 Wall Stop                   | 403 (or) 441CU (As<br>Required)              | US26D | RO | 087100 |
| 1 Threshold                   | to architect detail                          |       | PE | 087100 |
| 1 Gasketing                   | S773BL                                       |       | PE | 087100 |
| 1 ElectroLynx Harness - Frame | QC-C006P                                     |       | MK | 087100 |
| 1 ElectroLynx Harness - Door  | QC-CXXX (Size as required)                   |       | MK | 087100 |
| 1 Electric Power Transfer     | EL-CEPT                                      |       | SU | 087100 |
| 1 Power Distribution Board    | AQL4-R8E1                                    |       | SU | 087100 |
| 1 Wiring Diagram              | Elevation and Point to Point<br>as Specified |       |    |        |
| 1 Access Control Test Unit    | Weigand WT2                                  |       |    |        |

*University to confirm power supply*

Notes: Operation:

- Door normally closed and secured.
- Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
- Built in request to exit switch to allow authorized egress, integrated door position switch to be tied into security system to monitor status of door.
- Upon loss of power door to remain locked.
- Always free egress.

Notes: Door wiring shall be installed in factory, not in field.

**Set: 2**Overhead Coiling Door:  
Hardware by Mfr.

|                        |       |    |    |        |
|------------------------|-------|----|----|--------|
| 1 Door Position Switch | DPS-M | BL | SE | 087100 |
|------------------------|-------|----|----|--------|

**Set: 3**

Single door, restroom with indicator

|                              |                         |       |    |        |
|------------------------------|-------------------------|-------|----|--------|
| 3 Hinge, Full Mortise        | TA2714 NRP              | US26D | MK | 087100 |
| 1 Institutional Privacy Lock | DG2 LB V21 8267 LNL V21 | US26D | SA | 087100 |
| 1 Surface Closer             | 351 CPS                 | EN    | SA | 087100 |
| 1 Kick Plate                 | K1050 = 10" CSK BEV     | US32D | RO | 087100 |
| 3 Silencer                   | 608/609 (As Needed)     |       | RO | 087100 |
| 1 Coat Hook                  | RM823                   | US32D | RO | 087100 |

**Set: 4**

Unequal Pair, mechanical room

|                           |                                          |       |    |        |
|---------------------------|------------------------------------------|-------|----|--------|
| 6 Hinge                   | TA2714 NRP                               | US26D | MK | 087100 |
| 2 Flush Bolt              | 555/557 As Required                      | US26D | RO | 087100 |
| 1 Dust Proof Strike       | 570                                      | US26D | RO | 087100 |
| 1 Access Control Rim Exit | 70 SN200 x 43 55 56 70 M1 8204 24v x LNL | US26  | SA | 871000 |
| 1 Storeroom/Closet Lock   | 70 8204 LNL                              | US26D | SA | 087100 |
| 1 Cylinder                | 70-SFIC                                  |       | OT |        |
| 1 Surface Closer          | 351 UO                                   | 26D   | SA | 087100 |
| 1 Door Seal               | 5050CL x 18'                             | CL    | NG | 087100 |
| 1 Astragal                | S771BL                                   | CL    | PE | 087100 |
| 2 Wall Stop               | 403                                      | US26D | RO | 087100 |
| 1 Metal Astragal          | By Door Mfr                              |       |    |        |

**Set: 5**

Single door, non-rated

|                         |              |       |    |        |
|-------------------------|--------------|-------|----|--------|
| 3 Hinge                 | TA2714 NRP   | US26D | MK | 087100 |
| 1 Storeroom/Closet Lock | 70 8205 LNL  | US26D | SA | 087100 |
| 1 Cylinder              | 70-SFIC      |       | OT |        |
| 1 Surface Closer        | 351 O        | 26D   | SA | 087100 |
| 1 Door Seal             | 5050CL x 18' | CL    | NG | 087100 |
| 1 Wall Stop             | 403          | US26D | RO | 087100 |
| 3 Silencer              | 608-RKW      |       | RO | 087100 |

**Set: 6**

Single exterior door

|                        |              |       |    |        |
|------------------------|--------------|-------|----|--------|
| 3 Hinge                | TA2714 NRP   | US26D | MK | 087100 |
| 1 Exit Device          | 8804 LNL     | US26D | SA | 087100 |
| 1 Cylinder             | 70-SFIC      |       | OT |        |
| 1 Surface Closer       | 351 O        | 26D   | SA | 087100 |
| 1 Door Position Switch | DPS-M        | BL    | SE | 087100 |
| 1 Door Seal            | 5050CL x 18' | CL    | NG | 087100 |
| 1 Threshold            | 177_V        | A     | PE | 087100 |
| 1 Wall Stop            | 403          | US26D | RO | 087100 |
| 3 Silencer             | 608-RKW      |       | RO | 087100 |

**Set: 7**

Unequal pair with access control, rated:

|                               |                                           |       |    |        |
|-------------------------------|-------------------------------------------|-------|----|--------|
| 6 Hinge (heavy weight)        | T4A3786                                   | US26D | MK | 087100 |
| 2 Flush Bolt                  | 555/557 As Required                       | US26D | RO | 087100 |
| 1 Dust Proof Strike           | 570                                       | US26D | RO | 087100 |
| 1 Access Control Mortise      | 70 SN200 x 12 82271 x LNL                 | US32D | SA | 087100 |
| 1 Cylinder                    | 70-SFIC                                   |       | OT |        |
| 1 Surface Closer              | 351 O                                     | 26D   | SA | 087100 |
| 1 Wall Stop                   | 403 (or) 441CU (As Required)              | US26D | RO | 087100 |
| 1 Threshold                   | to architect detail                       |       | PE | 087100 |
| 1 Gasketing                   | S773BL                                    |       | PE | 087100 |
| 1 ElectroLynx Harness - Frame | QC-C006P                                  |       | MK | 087100 |
| 1 ElectroLynx Harness - Door  | QC-CXXX (Size as required)                |       | MK | 087100 |
| 1 Electric Power Transfer     | EL-CEPT                                   |       | SU | 087100 |
| 1 Power Distribution Board    | AQL4-R8E1                                 |       | SU | 087100 |
| 1 Wiring Diagram              | Elevation and Point to Point as Specified |       |    |        |
| 1 Access Control Test Unit    | Weigand WT2                               |       |    |        |

*University to confirm power supply*

Notes: Operation:

- Door normally closed and secured.
- Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
- Built in request to exit switch to allow authorized egress, integrated door position switch to be tied into security system to monitor status of door.
- Upon loss of power door to remain locked.
- Always free egress.

Notes: Door wiring shall be installed in factory, not in field.

END OF SECTION

## SECTION 08 11 13

### HOLLOW METAL DOORS AND FRAMES

#### 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 SUMMARY

- A. Section Includes:

- 1. Standard and custom hollow metal doors and frames.
  - 2. Steel sidelight, borrowed lite and transom frames.
  - 3. Louvers installed in hollow metal doors.
  - 4. Light frames and glazing installed in hollow metal doors.

- B. Related Sections:

- 1. Division 01 Section "General Conditions".
  - 2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
  - 3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
  - 4. Division 08 Section "Door Hardware".
  - 5. Division 08 Section "Access Control Hardware".
  - 6. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

- C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

- 1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
  - 2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
  - 3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
  - 4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
  - 5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.

6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Include the following:
  1. Elevations of each door design.
  2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
  3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  4. Locations of reinforcement and preparations for hardware.
  5. Details of anchorages, joints, field splices, and connections.
  6. Details of accessories.
  7. Details of moldings, removable stops, and glazing.
  8. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
  1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.
  - 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
  - 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
  - 3. Smoke Control Door Assemblies: Comply with NFPA 105.
    - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. 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. Provide labeled glazing material.
- E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

## 1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

## 1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
  1. CECO Door Products (C).
  2. Curries Company (CU).

## 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.



- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

## 2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.
- B. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
  - 1. Design: Flush panel.
    - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
  - 2. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
  - 3. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
  - 4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
  - 5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
  - 6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. Manufacturers Basis of Design:
  - 1. CECO Door Products (C) Honeycomb Core - Regent Series.

## 2.4 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Interior Frames: Fully welded frames. Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
  - 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
  - 2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
  - 3. Manufacturers Basis of Design:

- a. CECO Door Products (C) - BU Series.
  - b. CECO Door Products (C) - SU Series.
- C. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

## 2.5 FRAME ANCHORS

- A. Jamb Anchors:
- 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
  - 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
  - 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

## 2.6 LOUVERS

- A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.
- 1. Blade Type: Vision proof inverted V or inverted Y.
  - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.
- B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.
- 1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
  - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

## 2.7 LIGHT OPENINGS AND GLAZING

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

## 2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors, unless noted otherwise.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

## 2.9 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
  - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
  - 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
  - 3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
  - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:
  - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
    - 1) Two anchors per jamb up to 60 inches high.
    - 2) Three anchors per jamb from 60 to 90 inches high.
    - 3) Four anchors per jamb from 90 to 120 inches high.
    - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
  - b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

- 1) Three anchors per jamb up to 60 inches high.
    - 2) Four anchors per jamb from 60 to 90 inches high.
    - 3) Five anchors per jamb from 90 to 96 inches high.
    - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
    - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
  10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
  11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
  2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
  3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
  4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

## 2.10 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

#### 3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
  - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
  - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
  - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
  - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

- a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
- b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
- c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
- d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION





SECTION 08 14 16

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.

1.3 RELATED SECTIONS

- A. Carpentry - Section 062000, for installation of wood doors.
- B. Steel Doors and Frames - Section 081113, for hollow metal frames.
- C. Painting and Finishing - Section 099000, for field painting of wood doors.

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, requirements for finishing and other pertinent data.
  - 1. Include requirements for veneer matching.
- C. Submit samples of 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. Finish to match adjacent doors to remain. Contractor to verify and submit samples accordingly.

#### 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.

#### 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 2.2 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 for the life of the installation starting from date of Substantial Completion.

## 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: Marshfield Door Systems, Inc., Algoma Hardwoods Inc., or Eggers Industries.
  - 1. 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.
  - 2. 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 criterion, 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. Transparent Finish: Finish in the shop with clear satin catalyzed polyurethane finish conforming to AWI System "Catalyzed Polyurethane Transparent."
  - 1. Doors with transparent finish to have center balanced, slip matched, quarter sliced, Wood Species Veneer: Maple. Veneer to conform to AWI, "AA" grade veneer with 3" wide leaf. Minimum veneer thickness shall be not less than 1/50" after sanding.
  - 2. Veneers shall be continuous or end matched at transoms.
  - 3. Provide range of manufactur finish/stain options for selection by Architect to match existing adjacent doors to remain.
- E. Opaque Finish: For doors to be field painted, shop prime on all surfaces with one coat of alkyd wood primer applied to a dry film thickness of 1.5 mils.
  - 1. Doors to be field painted shall have MDO or hardboard face.

- F. 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.
- G. Doors shall have hinge-loading capacity of 500 lbs. per WDMA TM-8.
- H. 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.

## 2.2 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.
- 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.
- G. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kinds of doors required.

## 2.3 SOURCE QUALITY CONTROL

- A. Once doors are 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.

Richard McElhiney Architects LLC

Ward Center Renovation  
New York Consortium for Space Technology (NYCST)

March 7, 2025  
Construction Documents

PART 3 EXECUTION

3.1 INSTALLATION

- A. Refer to Section 062000 for installation of wood doors.

END OF SECTION



## SECTION 08 31 13

### 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. Framed flush panel access doors at tile walls.
  - 3. 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 23 and 26.
    - 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. Pipe spaces, if required.
    - g. Inlets of fans.
    - h. Fusible link and splitter damper at filter bank.
    - i. Automatic damper and motor.
    - j. Equipment not otherwise accessible.

##### 1.3 RELATED SECTIONS

- A. Gypsum Drywall - Section 092900.
- B. Valves and connections - Division 23.

##### 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.

- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units which may vary slightly from sizes shown or scheduled.

## 1.5 SUBMITTALS

- A. Before any materials of this Section are delivered to the job site, submit complete manufacturer's literature to the Architect. Submit plans and schedules showing size and location of each and every access door for Architect's acceptance prior to installation.

## 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 AND FABRICATION

- A. 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.
- B. 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.
- C. Frames for masonry walls (Flush Panel Units): Fabricate frame from sixteen (16) gauge steel. Provide frame with exposed flange not less than one (1) inch wide around perimeter of frame. Finish with manufacturer's factory applied baked enamel prime coat applied over phosphate protective coating on steel.
- D. Frameless Units for Drywall Surfaces (Recessed Panel Units): Provide access doors without exposed frames for drywall adhered to recessed panel.
- E. 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.

- F. Locking Devices: For non-rated access doors, provide flush, screwdriver operated cam locks of number required to hold door in flush, smooth plane when closed. For fire rated doors, provide locks as described in paragraph 1.4, B. herein.

### 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 insure 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 083323

OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulated service doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
2. Show locations of controls, locking devices detectors or replaceable fusible links, and other accessories.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
- B. Accessibility Standard: Comply with applicable provisions in the ABA standards of the Federal agency having jurisdiction.

## 1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:
  - 1. Design Wind Load: As indicated on Drawings.
  - 2. Testing: According to ASTM E 330/E 330M.
- B. Windborne-Debris Impact Resistance: Provide overhead coiling doors that pass missile-impact and cyclic-pressure tests according to E 1996 for Wind Zone 3.
  - 1. Large-Missile Test: For overhead coiling doors located within 30 feet (9.14 m) of grade.
- C. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

### 2.2 DOOR ASSEMBLY

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
  - 1. Acceptable manufacturers:
    - a. ACME Rolling-Doors.
    - b. ASTA Door Corp.
    - c. Overhead Door Company.
    - d. Raynor.

- B. Operation Cycles: Door components and operators capable of operating for not less than 50,000.
- C. Curtain R-Value: 5.0 deg. F x h x sq. ft./Btu.
- D. Door Curtain Material: Galvanized steel.
- E. Door Curtain Slats: Flat profile slats of 2-5/8-inch (67-mm) center-to-center height.
  - 1. Insulated-Slat Interior Facing: Metal.
- F. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from hot-dip galvanized steel stainless steel and finished to match door.
- G. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.
- H. Hood: Match curtain material and finish.
  - 1. Mounting: Face of wall.
- I. Locking Devices: Equip door with locking device assembly and chain lock keeper.
  - 1. Locking Device Assembly: Single-jamb side locking bars, operable from inside and outside with cylinders.
- J. Manual Door Operator: Chain-hoist operator.
- K. Electric Door Operator:
  - 1. Usage Classification: Heavy duty, 25 or more cycles per hour and more than 90 cycles per day.
  - 2. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use.
  - 3. Motor Exposure: Interior.
  - 4. Motor Electrical Characteristics:
    - a. Horsepower: 1/2, 1, 2, 3 hp.
    - b. Voltage: 115-V ac, 208-V ac, 230-V ac, single phase, 60 Hz.
    - c. Voltage: 208-V ac, 230-V ac, 460-V ac, three phase, 60 Hz.
  - 5. Emergency Manual Operation: Chain type.
  - 6. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar; self-monitoring type.
  - 7. Control Station(s): Interior mounted.
  - 8. Other Equipment: Audible and visual signals.
- L. Curtain Accessories: Equip door with smoke seals and automatic-closing device.

M. Door Finish:

1. Baked-Enamel or Powder-Coated Finish: Tan
2. Factory Prime Finish: Tan
3. Interior Curtain-Slat Facing: Tan

2.3 MATERIALS, GENERAL

- 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.

2.4 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84 or UL 723. Enclose insulation completely within slat faces.
  2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch (0.25 mm).
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.5 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

2.6 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
  - 1. Lock Cylinders: As standard with manufacturer and keyed to building keying system.
  - 2. Keys: Three for each cylinder.
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

## 2.7 CURTAIN ACCESSORIES

- A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

## 2.8 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

## 2.9 MANUAL DOOR OPERATORS

- A. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf (111-N) 30-lbf (133-N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

## 2.10 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
  - 1. Comply with NFPA 70.

2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Motors: Reversible-type motor with controller disconnect switch for motor exposure indicated for each door assembly.
  1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
  2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
- D. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
  1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
    - a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
- E. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
  1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
  2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- F. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).
- G. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.



- H. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- I. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

#### 3.2 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION



SECTION 08 43 13

ALUMINUM-FRAMED STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Storefront framing and doors

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For aluminum-framed storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- C. Samples: For each type of exposed finish required.
- D. Delegated-Design Submittal: For aluminum-framed storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.
- B. Product test reports.
- C. Source quality-control reports.
- D. Field quality-control reports.
- E. Sample warranties.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
  - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

## 1.7 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable manufacturers:
  - a. Kawneer
  - b. EFCO Corp.
  - c. Trulite Glass & Aluminum Solution, Inc

d. Approved Equal

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Aluminum-framed storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - 2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- C. Structural Loads:
  - 1. Wind Loads: As indicated on Drawings.
  - 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
  - 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
  - 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller
  - 3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
    - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans less than 11 feet 8-1/4 inches (3.6 m).
- E. Structural: Test according to ASTM E 330/E 330M as follows:
  - 1. When tested at positive and negative wind-load design pressures, storefront assemblies do not evidence deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
  3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
    - a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
- H. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K) as determined according to NFRC 100.
  2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas as a system shall have a SHGC of no greater than 0.26 as determined according to NFRC 200.
  3. Condensation Resistance: Fixed glazing and framing areas as a system shall have an NFRC-certified condensation resistance rating of no less than 35 as determined according to NFRC 500.
- I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.3 STOREFRONT SYSTEMS

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Interior Framing Construction: Nonthermal.
  2. Exterior Framing Construction: Thermal
  3. Glazing System: Retained mechanically with gaskets on four sides

4. Glazing Plane: Center
  5. Finish: Clear anodic finish.
  6. Fabrication Method: Field-fabricated stick system.
  7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  8. Steel Reinforcement: As required by manufacturer.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

## 2.4 DOORS

- A. Doors: Provide heavy-traffic wide-stile doors by storefront system manufacturer.
1. Top Rail: 5"
  2. Vertical Stile: 5"
  3. Bottom Rail: 10"
  4. Infill: Provide glazing infill. See 088000 Glass & Glazing.
  5. Hardware: See 087100 Door Hardware. All integral hardware components to be installed in factory by door supplier.

## 2.5 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.

## 2.6 MATERIALS

- A. Sheet and Plate: ASTM B 209 (ASTM B 209M).
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
- C. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
- D. Structural Profiles: ASTM B 308/B 308M.
- E. Steel Reinforcement:
1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.

2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
4. Primer: Manufacturer's standard zinc-rich, 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.

## 2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
  1. Profiles that are sharp, straight, and free of defects or deformations.
  2. Accurately fitted joints with ends coped or mitered.
  3. Physical and thermal isolation of glazing from framing members.
  4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  5. Provisions for field replacement of glazing from interior.
  6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General:
  1. Comply with manufacturer's written instructions.
  2. Do not install damaged components.



3. Fit joints to produce hairline joints free of burrs and distortion.
  4. Rigidly secure nonmovement joints.
  5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
  6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:
1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
  2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section 088000 "Glazing."

### 3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed storefronts.
1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
    - a. Perform a minimum of three tests in areas as directed by Architect.
  2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
    - a. Perform a minimum of three tests in areas as directed by Architect.
  3. Water Penetration: ASTM E 1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa), and shall not evidence water penetration.

- C. Aluminum-framed storefronts will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
  - 1. Swinging doors.
  - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Electromechanical door hardware.
  - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Division 08 Section "Hollow Metal Doors and Frames".
  - 2. Division 08 Section "Steel-Framed Entrances and Storefronts".
  - 3. Division 10 Section "Glass Markerboards"
  - 4. Division 28 Section "Access Control Hardware Devices".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 - Installation of Smoke Door Assemblies.
  - 7. State Building Codes, Local Amendments.

- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
1. ANSI/BHMA Certified Product Standards - A156 Series.
  2. UL10C – Positive Pressure Fire Tests of Door Assemblies.
  3. ANSI/UL 294 – Access Control System Units.
  4. ULC-S319 - Electronic Access Control Systems.
  5. ULC-60839-11-1, Alarm and Electronic Security Systems - Part 11-1: Electronic Access Control Systems - System and Components Requirements.
  6. UL 305 – Panic Hardware.
  7. ULC-S132, Emergency Exit and Emergency Fire Exit Hardware.
  8. ULC-S533 – Egress Door Securing and Releasing Devices.
  9. ANSI/UL 437- Key Locks.
  10. ULC-S328, - Burglary Resistant Key Locks.

### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
    - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    - b. Complete (risers, point-to-point) access control system block wiring diagrams.
    - c. Wiring instructions for each electronic component scheduled herein.
  2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
- 1.4 QUALITY ASSURANCE
- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
  - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
  - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
  - 1. Function of building, purpose of each area and degree of security required.
  - 2. Plans for existing and future key system expansion.
  - 3. Requirements for key control storage and software.
  - 4. Installation of permanent keys, cylinder cores and software.
  - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
  - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for

aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.

2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  3. Review sequence of operation narratives for each unique access controlled opening.
  4. Review and finalize construction schedule and verify availability of materials.
  5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

#### 1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

## 1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties 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. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of the hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
  - 1. Ten years for mortise locks and latches.
  - 2. Five years for exit hardware.
  - 3. Twenty five years for manual overhead door closer bodies.
  - 4. Two years for electromechanical door hardware.

## 1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## PART 2 - PRODUCTS

### 2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:



1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

## 2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
  1. Quantity: Provide the following hinge quantity:
    - a. Two Hinges: For doors with heights up to 60 inches.
    - b. Three Hinges: For doors with heights 61 to 90 inches.
    - c. Four Hinges: For doors with heights 91 to 120 inches.
    - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
  2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
    - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
    - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
  3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
    - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
  4. Hinge Options: Comply with the following:
    - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
  5. Manufacturers:
    - a. Bommer Industries (BO).

- b. Hager Companies (HA).
  - c. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
- B. Pin and Barrel Continuous Hinges: ANSI/BHMA A156.26 Grade 1-600 certified pin and barrel continuous hinges with minimum 14 gauge Type 304 stainless steel hinge leaves, concealed teflon coated stainless pin, and twin self-lubricated nylon bearings at each knuckle separation. Factory trim hinges to suit door height and prepare for electrical cut-outs.
  - 1. Manufacturers:
    - a. Hager Companies (HA).
    - b. Markar Products; ASSA ABLOY Architectural Door Accessories (MR).
    - c. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

## 2.3 POWER TRANSFER DEVICES

- A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
  - 1. Manufacturers:
    - a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE) – EL-CEPT Series.
    - b. Securitron (SU) - EL-CEPT Series.
    - c. Von Duprin (VD) - EPT-10 Series.
- B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
  - 1. Provide one each of the following tools as part of the base bid contract:
    - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.

- b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.
- 2. Manufacturers:
  - a. Hager Companies (HA) - Quick Connect.
  - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) – QC-C Series.

## 2.4 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinders: Original manufacturer cylinders complying with the following:
  - 1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
  - 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  - 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
  - 4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
  - 5. Keyway: Match Facility Standard.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
  - 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
  - 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
  - 3. Existing System: Field verify and key cylinders to match Owner's existing system.
- E. Key Quantity: Provide the following minimum number of keys:
  - 1. Change Keys per Cylinder: Three (3).
  - 2. Master Keys (per Master Key Level/Group): Five (5).
  - 3. Construction Keys (where required): Ten (10).
- F. Construction Keying: Provide temporary keyed construction cores.
- G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

H. Manufacturer:

1. Best - To match existing building keying

## 2.5 KEY CONTROL

- A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

- a. Lund Equipment (LU).
- b. MMF Industries (MM).
- c. Telkee (TK).

- P. Electronic Key Management System: Provide an electronic key control system with Stand-alone Plug and Play features including advanced RFID technology. Touchscreen interface with PIN access for keys individually locked in place. Minimum 1,000 system users and 21 iFobs for locking receptors. System shall have a minimum 250,000 audit events screen displayed or ability to be exported via USB port.

1. Manufacturers:

- a. Medeco (MC).
- b. Traka (TA).

## 2.6 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Where specified, provide status indicators with highly reflective color and wording for "locked/unlocked" or "vacant/occupied" with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1" x 0.6" with a curved design allowing a 180 degree viewing angle with protective covering to prevent tampering.

2. Manufacturers:

- a. Sargent Manufacturing (SA) – 8200 Series.

## 2.7 ELECTROMECHANICAL LOCKING DEVICES

- A. Electromechanical Multi-Point Locks: Vertical rod locking devices designed for openings requiring multiple latching points within one locking mechanism. Rods are retracted by dual mounted outside lever trim controls available in a variety of ANSI/BHMA operational functions. Option for single top latching only eliminates the need for bottom strikes. Electromechanical options include solenoid activated trim, electric latch retraction, and inside and outside lever monitoring.
  1. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
  2. Manufacturers:
    - a. Sargent Manufacturing (SA) – 7000 Series.

## 2.8 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
  1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
  2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
  3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
  4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
  1. Strikes for Mortise Locks and Latches: BHMA A156.13.
  2. Strikes for Bored Locks and Latches: BHMA A156.2.
  3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
  4. Dustproof Strikes: BHMA A156.16.

## 2.9 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
5. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
6. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
  - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
  - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
11. Rail Sizing: Provide exit device rails factory sized for proper door width application.

12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
  1. Manufacturers:
    - a. Sargent Manufacturing (SA) - 80 Series.
    - b. dormakaba Precision (PR) - Apex 2000 Series.
    - c. Von Duprin (VD) - 35A/98 XP Series.

## 2.10 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
  1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
  2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
  3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
  4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
  5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
  6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable

backcheck and separate non-critical valves for closing sweep and latch speed control.  
Provide non-handed units standard.

1. Manufacturers:
  - a. LCN Closers (LC) – 4040SE Series.
  - b. Sargent Manufacturing (SA) – 351 Series.

## 2.11 ARCHITECTURAL TRIM

### A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
  - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
  - a. Hager Companies (HA).
  - b. Hiawatha, Inc. (HI).
  - c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

## 2.12 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as



indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:
  - a. Hager Companies (HA).
  - b. Hiawatha, Inc. (HI).
  - c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

## 2.13 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
  1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: 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, based on testing according to UL-10C.
  1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
  1. National Guard Products (NG).
  2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
  3. Reese Enterprises, Inc. (RE).

## 2.14 ELECTRONIC ACCESSORIES

- A. Switching Power Supplies: Provide power supplies with either single or dual voltage configurations at 12 or 24VDC. Power supplies shall have battery backup function with an integrated battery charging circuit and shall provide capability for power distribution, direct lock control and Fire Alarm Interface (FAI) through add on modules. Power supplies shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs.

1. Manufacturers:

- a. Securitron (SU) - AQD Series.

- B. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.

1. Manufacturers:

- a. Securitron (SU) - AQL Series.

## 2.15 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

## 2.16 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## 2.17 SLIDING TRACK HARDWARE

- A. Provide Pemko G60 Stainless Steel Sliding Track Hardware System, Glass Door Model and all required mounting accessories. Coordinate with glass markerboard manufacturer for mounting and penetrations. Alternate Bid 2 only.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

### 3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

### 3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
  - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
  - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
  - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

### 3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures" and "Cash Allowances". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
  - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
  - 2. Submit documentation of incomplete items in the following formats:
    - a. PDF electronic file.
    - b. Electronic formatted file integrated with the Openings Studio™ door opening management software platform.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

### 3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

### 3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
  - 1. Quantities listed are for each pair of doors, or for each single door.
  - 2. The supplier is responsible for handing and sizing all products.
  - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
  - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Refer to Section 080671, Door Hardware Sets, for hardware sets.

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. Glass for doors, frames, borrowed lites
  - 2. Interior mirrors, frameless.

1.3 RELATED SECTIONS

- A. Hollow metal doors and frames - Section 081113.
- B. Aluminum-Framed Storefronts – Section 084312.

1.4 REFERENCES

- A. Comply with the recommendations of the following references unless more stringent requirements are indicated herein.
  - 1. LSGA Publications: LSGA Design Guide.
  - 2. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201.
  - 3. 16 CFR 1201, Safety Standards for Architectural Glazing, Sealed Insulating Glass Manufacturing Association.
  - 4. ASTM C 920, Elastomeric Joint Sealant.
  - 5. SAFETY ANSI Z97.1.

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 land 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 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. 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."
- 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. Manufacturer shall be ISO 9001-2000 Certified.

I. 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 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.

## 1.9 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 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 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. 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".

## 2.3 GLAZING UNITS

- A. Type GL-1: Laminated Insulated Glazing assembly for frames and doors. One layer shall be 1/8" clear (low iron) glass plus 0.030" PVB interlayer plus 1/8" clear (low iron) glass and the

other ¼" clear tempered glass (low iron), with ½" air gap. Thickness shall be coordinated with approved framing and glazing system.

1. Accessories:
  - a. Include Glazing Film where indicated on the drawings. See this Section for Glazing Film

## 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. Backer Rod: Closed cell non-gassing polyethylene rod with rod diameter 25% wider than joint width.
- D. 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.
- E. 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.
- F. 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.
- G. 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.

- H. Edge Blocks: Provide neoprene or silicone as required for compatibility with glazing sealants. Provide blocks with Shore A hardness of  $55 \pm 5$ .
- I. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place.
- J. Miscellaneous Glazing Materials: Provide sealant backer rods, primers, cleaners, and sealers of type recommended by glass and sealant manufacturers.
- K. 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.

## 2.6 GLAZING FILMS

- A. Patterned glass privacy film, surface applied. Manufactured by 3M, Decorative Films, or approved equal. Field installed per all manufacturer recommendations. Locations indicated on the drawings (elevations). Provide product data and samples for approval.
  - 1. Pattern and type: Solyx SXJ-0691 Dual Feather Gradient 72" high.

# 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 09 29 00

GYPSUM DRYWALL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with 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, interior and exterior.
  - 3. Acoustical insulation for gypsum drywall work.
  - 4. Sealant for gypsum drywall work.
  - 5. Taping and finishing of drywall joints.
  - 6. Installing rings and frames in drywall surfaces for grilles, registers and lighting fixtures.
  - 7. Bracing and connections.

1.3 RELATED SECTIONS

- A. Steel doors and frames - Section 081113.
- B. Painting and Finishing- Section 099000.
- C. 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.
  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.

#### 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.

#### 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.

#### 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.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers for Gypsum Drywall Panels and Accessories: U.S. Gypsum Co., Georgia Pacific, CertainTeed Corporation, Lafarge North America, 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 Building Systems, Super Stud Building Products, Marino/Ware, or approved equal.
- 2.2 METAL SUPPORTS
- A. Metal Floor and Ceiling Runners
    1. Channel Type: Formed from 20 U.S. Std. gauge (unless otherwise noted) galvanized steel, width to suit channel type metal studs. Use 20 ga. top runners with 1-1/4" minimum flanges.
    2. Ceiling runners and 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 20 ga. galvanized steel for clips, 25 ga. galvanized steel for ceiling runners. Providing a friction free – anti-seizure movement capacity.
      - a. 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. "J" Type: Formed from 20 U.S. Std. gauge galvanized steel, 1" x 2-1/2" or 4" wide (to suit detail).
    4. Deflection track as detailed at shaft wall locations.
  - B. Metal Studs, Framing and Furring
    1. For each type of metal framing required, interior and exterior, provide manufacturer's stand steel runner, tracks, blocking, lintels, clip angles, shoes, reinforcements, fasteners and accessories, as recommended by the manufacturer for applications indicated, as needed to provide a complete metal framing system.
    2. Channel Type Studs: Channel type with holes for passage of conduit formed from minimum 20 U.S. Std. gauge (unless heavier gauge is required to meet deflection limits) galvanized steel, width as shown on drawings.
    3. Furring Channels: Hat shaped, formed from galvanized steel, 25 U.S. Std. gauge.
    4. Continuous 16 gauge x 8" wide steel wall plate screwed to studs as required for support of railings 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. All galvanized steel members shall have coating conforming to ASTM A 653, G60.

### 2.3 GYPSUM WALLBOARD TYPES

- A. Gypsum Wall Board: 5/8" thick "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.
- B. Fire Rated Gypsum Wall Board: 5/8" thick "Sheetrock Firecode C" by USG, "Firecheck Type C" by Lafarge/Continental, or "Gold Bond Fireshield" by National Gypsum, 48" wide, in maximum lengths available to minimize end-to-end butt joints.
- C. Moisture/Mold Resistant Gypsum Wall Board at locations listed below, unless otherwise shown on drawings: 5/8" thick "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. Walls and ceilings of spaces containing condensers, wet equipment such as ice makers, water tanks, water pumps and pressure reduction valves.
  3. Portions of walls within 2 feet of sinks to a height of 4 feet above the floor.
  4. All perimeter walls and wet shafts.
- D. Impact Resistant Wallboard: 5/8" thick as indicated on drawings, "Fiberock Brand VHI Abuse Resistant Panel" 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.

## 2.4 ACCESSORIES

- A. Acoustical Insulation: Paper-less, non-combustible, semi-rigid mineral fiber mat, 2" thick, in walls (unless otherwise indicated), 3 lb./cu. ft. maximum density; Thermafiber LLC "Thermafiber," or approved equal.
- B. Fasteners for Wall Board: 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 wall board. 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 - "Dur-A-Bead" No. 103, 27 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. 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.
- G. Control Joints: No. 0.093, USG.
- H. Acoustical Sealant: USG "Acoustical Sealant" or "Tremco Acoustical Caulking" of Tremco Mfg. Co., or approved equal.
- I. Neoprene Gaskets: Conform to ASTM D 1056.
- J. Trims and reveals: Where indicated on drawings Reveals, Trims, & Moldings, as manufactured by Fry Reglet Corporation, shall be installed. Aluminum shall be extruded alloy 6063 T5. Finish to be selected for mfr. powder coat options or clear anodized.
  - 1. Products by Trim-Tex Drywall Solutions and Gordon Inc, meeting the profiles illustrated and construction above are approved.



## 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 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.

#### 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. Wall Board Application

1. Do not install wallboard panels until steel door frames are in place; coordinate work with Section 081113, "Hollow Metal Doors and Frames."
2. See drawings for all board types. Use fire-rated wallboard for fire-rated assemblies. Use sag-resistant board for ceilings. 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" safing 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, 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 screw driver, 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. Cementitious Backer Board

1. General: Furnish cementitious backer board in maximum available lengths. Install horizontally, with end joints over framing members.
2. Fastening: Secure cementitious backer board to each framing member with screws spaced not more than 12 inches on center and not closer than 1/2" from the edge. Install screws with a conventional screw gun so that the screw heads are flush with the surface of the board.
3. Joint Treatment: Fill space between edge of backer and receptor with dry-set Portland cement or latex-Portland cement mortar. Fill all horizontal and vertical joints and corners with dry-set Portland cement or latex-Portland cement mortar. Apply fiberglass tape over joints and corners and embed with same mortar.

- G. 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.
- H. 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.
- I. 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 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.
- 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.

### 3.4 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.

### 3.5 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.

- 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.

### 3.6 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.

### 3.7 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 093013

CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Porcelain tile.
  - 2. Glazed wall tile.
  - 3. Stone thresholds.
  - 4. Tile backing panels.
  - 5. Waterproof membrane for thinset applications.
  - 6. Crack isolation membrane.
  - 7. Metal edge strips.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples:
  - 1. Each type and composition of tile and for each color and finish required
  - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required.
  - 3. Stone thresholds.
- C. Sustainable Design Submittals:
  - 1. Refer to Division 01.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 2 percent of amount installed for each type, composition, color, pattern, and size indicated.

## 1.5 QUALITY ASSURANCE

### A. Installer Qualifications:

1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
3. Installer employs Ceramic Tile Education Foundation Certified Installers or [installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

#### A. Sustainable Design Requirements:

1. Provide products that comply with: Green Squared American National Standard Specifications for Sustainable Ceramic Tiles, Glass Tiles and Tile Installation Materials.
2. Comply with LEED IEQ4.1: Low Emitting Adhesives and Sealants
3. Submit products complying with CDPH Low VOCs Guidelines.

### 2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

### 2.3 TILE PRODUCTS

#### A. Ceramic Tile Type CT-1: Field tile.

1. Basis of Design:
  - a. Alaska porcelain tile by Crossville
  - b. Approved Equal subject to approval
2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 24" x 24" Field Tile
4. Dynamic Coefficient of Friction: Not less than 0.42.
5. Tile Color, Glaze, and Pattern: Glacier
6. Grout Color: As selected by Architect from manufacturer's full range.

7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
  - a. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch (12.7 to 6.4 mm) across nominal 4-inch (100-mm) dimension.
- B. Ceramic Tile Type CT-2: Base tile.
  1. Basis of Design:
    - a. Alaska porcelain tile by Crossville
    - b. Approved Equal subject to approval
  2. Certification: Tile certified by the Porcelain Tile Certification Agency.
  3. Face Size: 6" x 12" cove base trim
  4. Tile Color, Glaze, and Pattern: Glacier
  5. Grout Color: As selected by Architect from manufacturer's full range.
  6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile
- C. Ceramic Tile Type CT-3: Glazed wall tile.
  1. Basis of Design:
    - a. Swatches ceramic wall tile by Crossville
    - b. Approved Equal
  2. Certification: Tile certified by the Porcelain Tile Certification Agency.
  3. Module Size: 3 inch by 12 inch
  4. Thickness: 3/8 inch
  5. Tile Color and Pattern: Necessary Objects Stone
  6. Grout Color: As selected by Architect from manufacturer's full range.
  7. Mounting: Factory, back mounted.
  8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
    - a. Wainscot Cap: Bullnose cap, module size 3 inches by 12 inches
    - b. External Corners: Bullnose, same size as adjoining flat tile.
    - c. Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.
  - 9.
- D. Accessories: Provide vitreous china accessories of type and size indicated, suitable for installing by same method as used for adjoining wall tile.
  1. One soap holder for each shower and tub indicated.
  2. Color and Finish: Match adjoining glazed wall tile

## 2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503/C 503M, with a minimum abrasion resistance of 12 according to ASTM C 1353 or ASTM C 241/C 241M and with honed finish.
  1. Description: Uniform, fine- to medium-grained white stone with gray veining.

## 2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A.
  1. Thickness: 5/8 inch (15.9 mm)

## 2.6 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch (0.76-mm) nominal thickness.

## 2.7 SETTING MATERIALS

- A. Standard Dry-Set Mortar (Thinset): ANSI A118.1.
  1. For wall applications, provide nonsagging mortar.

## 2.8 GROUT MATERIALS

- A. High-Performance Tile Grout: ANSI A118.7.
  1. Polymer Type: Dry, redispersible form, prepackaged with other dry ingredients.
  2. Polymer Type: Liquid-latex form for addition to prepackaged dry-grout mix.

## 2.9 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.
- 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.

### 3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
  - 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
    - a. Tile floors in wet areas.
    - b. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
    - c. Tile floors consisting of rib-backed tiles.

- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. 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, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
  - 1. Glazed Wall Tile: 1/16 inch.
  - 2. Porcelain Tile: 3/16 inch.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
- K. Floor Sealer: Apply floor sealer to grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- L. Install tile backing panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

- M. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

END OF SECTION





SECTION 09 51 13

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.
  - 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. Drywall ceilings - Section 092900.
- B. Diffusers, grilles and related frames - Division 23.
- C. Lighting fixtures - Division 26.

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.

## 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.
  8. Especially showing the layout of the suspended cloud ceiling with edge trims located in the Maker Space.
- 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 UNITS

- A. Provide mineral fiber panels with square tegular edges, manufactured by Armstrong World Industries USG Interiors, Inc., Roxul Rockfon, or approved equal. Panels shall meet ASTM E 1264, Class A, with minimum flame spread of 25 and smoke developed of 50 per ASTM E 84.
  - 1. ACP-1: Provide Ultima Mineral Fiber Panels by Armstrong. Or equal by USG Interiors, Inc., Roxul Rockfon, or approved equal.
  - 2. ACP-2: Provide USG Glacier Basic Acoustical Panels, Flat White to match existing building construction. Alternates subject to approval and match to existing conditions.

## 2.2 SUSPENSION SYSTEM

- A. Provide Prelude XL (15/16") steel suspension system with low sheen white baked enamel finish as manufactured by Armstrong World Industries, USG Interiors, Inc., Chicago Metallic Corp., or approved equal.
- B. 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.
- C. Provide min. 12 ga. galvanized wire hangers, soft annealed steel conforming to ASTM A 641, prestretched, Class 1 zinc coating, soft temper, size so that stress at 3 times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire.
- D. 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.
- E. Suspension systems shall conform to ASTM C 635, intermediate duty.
- F. Provide manufacturer's permitted angle moulding, in profile to be approved by architect 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 wire hangers supported only from building structural members. Locate hangers not more than 6" from each end and spaced 4'-0" along direct-hung runner, leveling to tolerance of 1/8" in 12'-0".
- C. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.
- D. 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.
- E. 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".
- F. 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.
- G. Install hold-down clips in toilet areas, and in areas where required by governing regulations; space 2'-0" o.c. on all cross tees.
- H. 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.
- I. 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 09 65 13

RESILIENT BASE AND ACCESSORIES

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 accessories, as shown on the drawings and/or specified herein, including, but not limited to, the following:
  - 1. Rubber base
  - 2. Accessories.

1.3 RELATED SECTIONS

- A. Gypsum Drywall - Section 092900.
- B. Resilient Tile Flooring – Section 096519
- C. Carpet Tile – Section 096813

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 base.
- B. Submit color sample chips of standard colors requested by Architect for initial selection.
- C. Samples: Submit four (4) samples of each color of base, each sample to be six (6) inches long.

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 JOB CONDITIONS

- A. Continuously heat spaces to receive base to a temperature of seventy (70) degrees F. for at least forty-eight (48) hours prior to installation, whenever project conditions are such that heating is required. Maintain seventy (70) degrees F. temperature continuously during and after installation as recommended by the manufacturer, but for not less than forty-eight (48) hours. Maintain a temperature of not less than fifty-five (55) degrees F. in areas where work is completed.

### PART 2 PRODUCTS

#### 2.1 BASE

- A. Provide "Traditional Wall Base" as manufactured by Johnsonite, or equal by Armstrong, Roppe, or approved equal, 4" high by 1/8" thick, continuous vulcanized SBR rubber, toeless, with pre-formed internal and external corner pieces, color as scheduled. Base shall conform to ASTM F 1861, Type TS, Group 1 (solid).
- B. Flexibility: Does not crack, break, or show any signs of fatigue when bent around a 1/4" (6.4 mm) diameter cylinder when tested according to ASTM F 137 Standard Test Method for Flexibility of Resilient Flooring Materials protocols.

#### 2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based formulation manufactured and warranted by a reputable manufacturer, as recommended by the manufacturer.
- B. Adhesives: Waterproof, stabilized type, as recommended by the manufacturer for site conditions and the type of service indicated.

#### 2.3 ACCESSORIES

- A. Rubber Transition Strips: "Adapters", "Slim Line Transitions" or wheeled traffic transitions as indicated on drawings, or if not indicated, as is most appropriate for the condition, as manufactured by Johnsonite, or approved equal. Colors shall be approved by Architect.

### PART 3 EXECUTION

#### 3.1 INSPECTION

- A. Examine the areas and conditions where resilient base is to be installed and correct any conditions detrimental to the proper and timely completion of the work.
- B. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.



- C. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- D. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient wall base.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Vacuum clean substrates to be covered by resilient products immediately before installation.

### 3.3 INSTALLATION

- A. In all spaces where base is indicated, install bases tight to walls, partitions, columns, built-in cabinets, etc. Install resilient base in lengths as long as practicable with tops of adjacent pieces aligned, without gaps at top or bulges at bottom, with tight joints and flush edges, with preformed corner pieces at internal and external corners. Install preformed corners before straight pieces. Do not stretch resilient base during installation. 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 and floor until adhesive sets.

### 3.4 CLEANING AND PROTECTION

- A. Remove any excess adhesive or other surface blemishes from base using neutral type cleaners as recommended by the manufacturer. Damp-mop surfaces to remove marks and soil.
- B. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION



## SECTION 096519

### RESILIENT TILE FLOORING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Solid vinyl floor tile.

##### 1.2 ACTION SUBMITTALS

###### A. Product Data: For each type of product.

###### B. Sustainable Design Submittals:

1. Provide products that comply with: Cradle to Cradle Certified Product Standard; NSF/ ANSI 332
2. Provide products that comply with: Sustainability Assessment for Resilient Floor Coverings or ANSI A138.1
3. Refer to 018113.13 - Sustainable Design Reqs for additional sustainability requirements.

###### C. Samples: For each exposed product and for each color and pattern specified.

##### 1.3 CLOSEOUT SUBMITTALS

###### A. Maintenance data.

##### 1.4 QUALITY ASSURANCE

###### A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation.

#### PART 2 - PRODUCTS

##### 2.1 PERFORMANCE REQUIREMENTS

###### A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Sustainable Design Requirements:
  1. Provide products that comply with: Cradle to Cradle Certified Product Standard; NSF/ ANSI 332
  2. Provide products that comply with: Sustainability Assessment for Resilient Floor Coverings or ANSI A138.1
  3. Refer to 018113.13 - Sustainable Design Reqs for additional sustainability requirements.

## 2.2 SOLID VINYL FLOOR TILE

- A. Acceptable manufactures:
  1. Armstrong
  2. Jonhsonite
  3. Congeleum Corp
  4. Approved Equal
- B. Tile Standard: ASTM F 1700.
  1. Class: Class III, Printed Film Vinyl Tile.
  2. Type B, Embossed Surface.
- C. Thickness: 1/8 inch (3.2 mm).
- D. Size: see finish schedule.
- E. Colors and Patterns: see finish schedule.
- F. Schedule: RES-1. Refer finish schedule and legend.

## 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
  1. Comply with LEED IEQ4.1: Low Emitting Adhesives and Sealants
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

## PART 3 - EXECUTION

### 3.1 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 10 PH.
  - 4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m) 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    - b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install floor tiles until materials are the same temperature as 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.
- F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

### 3.2 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.

- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  - 1. Lay tiles with grain running in one direction.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
  - 1. Apply three coats.

END OF SECTION

SECTION 09 90 00

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 gypsum drywall exposed to view.
  - 6. 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.
  - 7. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
  - 8. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers, lighting fixtures, and the like, which are exposed to view through these items.
  - 9. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
  - 10. 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. Non-ferrous metals, except for items specified and/or indicated to be painted.
- C. Finished hardware, excepting hardware that is factory primed.
- D. 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 journeyman 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. Closeout Submittal - 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 approximately ten (10) percent 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, Akzo Nobel Paint (Glidden Professional), and Sherwin Williams (S-W). 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

First Coat: "27 Typoxy" or "N69 Epoxoline II" by Tnemec; "Intergard 345" by International Protective Coatings; "Carboguard 893 SG" or "Carboguard 888" by Carboline; "Devran 203 WB Epoxy Primer" by Akzo; Epoxy Mastic Coating V 160 Series by Cortech/Moore or "Recoatable Epoxy Primer 867-45" by Sherwin Williams.

Second Coat: "V73 Endura Shield" or "1074/1075" by Tnemec; "Interthane 870UHS" or "990 UHS" by International Protective Coatings; "Carbothane 133 LH" by Carboline; "Devthane 379UH Aliphatic Vizethne" by Akzo; Acrylic Aliphatic Urethane V 500 (Gloss) or V 510 (Semi-Gloss) by Corotech/Moore or "Hi-Solids Urethane B65-300/350" by Sherwin Williams.

B. High Performance Coating On Exterior Non-Galvanized Ferrous Metals

Prime Coat: "Tneme-Zinc 90/97" by Tnemec; "Interzinc 52" or "315" by International Protective Coatings; "Carbozinc 859, Class B" by Carboline; "Cathacoat 302V Reinforced Inorganic Zinc Primer" by Akzo; Organic Zinc Rich Primer V 170 by Corotech/Moore or "Zinc Clad II Plus Inorganic Zinc Rich Coating B69V212" by Sherwin Williams.

Second Coat: "27 Typoxy" or "N69 Epoxoline II" by Tnemec; "Intergard 345" by International Protective Coatings; "Carboguard 893 SG" or "Carboguard 888" by Carboline; "Bar-Rust 231V Multi Purpose Epoxy Mastic" by Akzo; Epoxy Mastic Coating V 160 Series by Corotech/Moore or "Macropoxy 646 I.C. Epoxy B58-600" by Sherwin Williams.

Third Coat: "V73 Endura Shield" or "1074/1075" by Tnemec; "Interthane 870UHS" or "990 UHS" by International Protective Coatings; "Carbothane 133 LH" by Carboline; "Devthane 379 UH Aliphatic Urethane" by Akzo; Acrylic Aliphatic Urethane V 500 (Gloss) or V 510 (Semi-Gloss) by Corotech/Moore or "Hi-Solids Polyurethane B65-300/350" by Sherwin Williams.

C. Interior Ferrous Metal

Satin Finish/Latex

Primer: 1 coat Ben Moore Alkyd Metal Primer (Z06)  
1 coat Akzo Devflex 4020 PF DTM Prime/Flat Finish or touch-up shop primer  
1 coat Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer B66-310

First Coat: 1 coat Ben Moore Ultra Spec-HP DTM Acrylic Low Luster P25  
1 coat Akzo: Glidden Professional Diamond 350 Acrylic Eggshell GP1403  
1 coat S-W Pro-Classic Waterborne Acrylic Satin, B20

Second Coat: 1 coat Ben Moore Ultra Spec-HP DTM Acrylic Low Luster P25  
1 coat Akzo: Glidden Professional Diamond 350 Acrylic Eggshell GP1403  
1 coat S-W Pro-Classic Waterborne Acrylic Satin, B20  
a. Total DFT not less than: 3.9 mils

Semi-Gloss Finish/Latex

Primer: 1 coat Ben Moore Super Spec-HP Acrylic Metal Primer (P04)  
1 coat Akzo Devflex 4020 PF DTM Primer/Flat Finish or touch-up shop primer.

- 1 coat Sherwin-Williams, Pro Industrial Pro-Cryl Universal Primer B66-310
- First Coat: 1 coat Moore Ultra Spec HP DTM Acrylic Semi-Gloss (P29)
- 1 coat Akzo: Glidden Professional Diamond 350 Acrylic S/G 6P1407
- 1 coat S-W Pro-Classic Waterborne Acrylic Semi-Gloss, B31
- Second Coat: 1 coat Moore Ultra Spec HP DTM Acrylic Semi-Gloss (P29)
- 1 coat Akzo: Glidden Professional Diamond 350 Acrylic S/G 6P1407
- 1 coat S-W Pro-Classic Waterborne Acrylic Semi-Gloss, B31
- a. Total DFT not less than: 4.0 mils

D. Interior Drywall

Flat Finish/Vinyl Acrylic Latex

- Primer: 1 coat Ben Moore Ultra Spec 500 Interior Latex Primer (N534)
- 1 coat Akzo Glidden Professional Gripper GP 3210
- 1 coat S-W Promar 200 Interior Latex Primer
- First Coat: 1 coat Ben Moore Ultra Spec 500 Latex Flat (N536)
- 1 coat Akzo Glidden Professional Diamond 350 Flat GP 1201
- 1 coat S-W Promar 200 Zero VOC Interior Latex Flat, B30-2600
- Second Coat: 1 coat Ben Moore Ultra Spec 500 Latex Flat (N536)
- 1 coat Akzo Glidden Professional Diamond 350 Flat GP 1201
- 1 coat S-W Promar 200 Zero VOC Interior Latex Flat, B30-2600
- a. Total DFT not less than: 3.6 mils

Eggshell Finish/Vinyl Acrylic Latex

- Primer: 1 coat Ben Moore Ultra Spec 500 Interior Latex Primer (N534)
- 1 coat Akzo Glidden Professional Gripper GP 3210
- 1 coat S-W Promar 200 Interior Latex Primer,
- First Coat: 1 coat Ben Moore Ultra Spec 500 Interior Latex Eggshell (N538)
- 1 coat Akzo Glidden Professional Diamond 350 Acrylic Eggshell GP 1403
- 1 coat S-W Promar 200 Zero VOC Interior Latex Egg-Shell, B20-2600
- Second Coat: 1 coat Ben Moore Ultra Spec 500 Interior Latex Eggshell (N538)
- 1 coat Akzo Glidden Professional Diamond 350 Acrylic Eggshell GP 1403
- 1 coat S-W Promar 200 Zero VOC Interior Latex Egg-Shell B20-2600
- a. Total DFT not less than: 3.8 mils

E. Drywall Surfaces to Receive High-Performance Polyamide Epoxy Coating: Where epoxy paint is indicated for application to gypsum drywall surfaces, provide the following over primer recommended by manufacturer of paint:

1. Provide 2 coats of high-performance polyamide epoxy, total dry film thickness not less than 4 mils.

F. Interior Painted Wood

Satin Finish/Latex

- Primer: 1 coat Ben Moore Advance Waterborne Int. Alkyd Primer (790)
- 1 coat Akzo Glidden Professional Gripper GP 3210

- First Coat: 1 coat S-W Premium Wall and Wood Primer B28W111  
1 coat Moore Advance Waterborne Int. Alkyd Satin (792)  
1 coat Akzo Glidden Professional Diamond 350 Acrylic Eggshell GP 1403
- Second Coat: 1 coat S-W Pro Classic Interior WB, Acrylic/Alkyd Classic B20.  
1 coat Ben Moore Advance Waterborne Int. Alkyd Satin (792)  
1 coat Akzo Glidden Professional Diamond 350 Acrylic Eggshell GP 1403  
1 coat S-W Pro Classic Interior WB, Acrylic/Alkyd Classic B20.  
a. Total DFT not less than: 4.0 mils
- Semi-Gloss Finish/Latex
- Primer: 1 coat Ben Moore Advance Waterborne Int. Alkyd Primer (790)  
1 coat Akzo Glidden Professional Gripper GP 3210  
1 coat S-W Premium Wall and Wood Primer B28W111
- First Coat: 1 coat Ben Moore Advance Waterborne Int. Alkyd (793)  
1 coat Akzo Glidden Professional Diamond 350 Acrylic S/G GP 1407  
1 coat S-W Pro Classic Interior WB, Acrylic/Alkyd Classic Semi-Gloss B31
- Second Coat: 1 coat Ben Moore Advance Waterborne Int. Alkyd (793)  
1 coat Akzo Glidden Professional Diamond 350 Acrylic S/G GP 1407  
1 coat S-W Pro Classic Interior WB, Acrylic/Alkyd Classic Semi-Gloss B31  
a. Total DFT not less than: 3.8 mils

## 2.5 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. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

### 3.3 PREPARATION OF SURFACES

#### A. 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.

#### B. 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 insure 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.

- C. 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."



- D. 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.
- E. 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. 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 insure 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.
- B. 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.
- C. Prime Coats: Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- D. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.
- E. Touching-Up of Factory Finishes: Unless otherwise specified or shown, materials with a factory finish shall not be painted at the project site. To touchup, 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 101423

### SIGNAGE

#### 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 SUMMARY

- A. Section includes room-identification signs that are directly attached to building elements, including but not necessarily limited to walls, partitions, Glazed Partitions, and doors.

##### 1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standards listed herein and elsewhere in the Construction Documents.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For interior signs, including but not necessarily limited to room identification signs and signage required by Authorities having Jurisdiction.
  - 1. Include fabrication and installation details and attachments to other work.
  - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
  - 3. Show message list, typestyles, and graphic elements, including raised characters and Braille, and layout for each sign at full size.
  - 4. Show layout and graphics of each sign indicated on the drawings, including the wall decals.
- C. Approved full-size Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), and as follows:
  1. Room-Identification Signs: Full-size Sample.
  2. Letter Signage: Full-Size Sample.
  3. Exposed Accessories: Full-size Sample of each accessory type.
  4. Full-size Samples, if approved, will be returned to Contractor for use in Project
- E. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Sample Warranty: For special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

#### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Tools: One set of specialty tools for assembling signs and replacing variable sign components.

#### 1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Deterioration of finishes beyond normal weathering.
    - b. Deterioration of embedded graphic image.
    - c. Separation or delamination of sheet materials and components.
  2. Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design and ICC A117.1.

## 2.2 ROOM-IDENTIFICATION SIGNS

- A. Room Signs: Sign system to accommodate changeable insets, with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
1. Provide signs by ASI Sign Systems, Inc., or Signs & Decal, Corp., Mohawk Sign Systems, Signarama, or approved equal products by an approved manufacturer.
  2. See drawings for sign material, layout, and details, in addition to material and standards noted below.
  3. Composite Sheet Sign at glass:
    - a. Photopolymer face sheet with raised graphics laminated to vinyl backing sheet to produce composite sheet.
    - b. Composite-Sheet Thickness: As indicated on Drawings.
  4. Solid Sheet Sign At drywall or other opaque surface:
    - a. Photopolymer face sheet with raised graphics.
    - b. Thickness: As indicated on Drawings.
    - c. Slide-in changeable insert.
    - d. Color(s): To match campus standard signage colors.
  5. Sign-Panel Perimeter: Finish edges smooth.
    - a. Edge Condition: Square cut.
    - b. Corner Condition in Elevation: As indicated on Drawings.
  6. Mounting:
    - a. At opaque wall surfaces: Surface mounted to walls with VHB tape.
    - b. At glass: Vinyl backer mounted to glass with clear VHB tape; photopolymer sign mounted to vinyl with VHB tape.
  7. Text and Typeface: Accessible raised characters and Braille typeface as indicated on drawings and variable content as scheduled. Finish raised characters to contrast with background color, and finish Braille to match background color, as indicated.

## 2.3 VINYL GRAPHIC DECAL SIGNAGE

- A. Graphic Decal Signs: Provide wall graphics where indicated on the Drawings. Final layout and design to be approved by Architect and Owner upon submission of Shop Drawings.
1. Material: Vinyl, or approved material appropriate for direct attachment to wall

- surfaces, including but not limited to glazing, plaster, and gypsum board.
- 2. Mounting: Adhesive
- 3. Size: as indicated on the Drawings
- 4. Text/Font: as indicated on the Drawings

## 2.4 SIGN MATERIALS

- A. See Drawings for sign layout and materials.
- B. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- C. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as indicated on Drawings and suitable for exterior applications.
- D. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.
- E. Cast Metal: Aluminum

## 2.5 ACCESSORIES.

- A. Adhesive: As recommended by sign manufacturer.
- B. Two-Face Tape: 3M brand VHB Heavy Duty Mounting Tape, 0.045-inch-thick, with adhesive on both sides, or approved equal.
- C. Two-Face VHB clear acrylic tape: 3M brand 3905, .020 inches thick, or approved equal.
- D. All fasteners and standoffs required for letter pin mounting.

## 2.6 FABRICATION

- A. General: Provide sign assemblies according to requirements indicated.
  - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
  - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
  - 3. Conceal connections if possible; otherwise, locate connections where they are



- inconspicuous.
  - 4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
- 1. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Subsequent changeable inserts are by Owner

## 2.7 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.8 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
  - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
  - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Accessibility: Install signs in locations on walls as indicated on Drawings and according to the accessibility standard.
- C. Mounting Methods:
  - 1. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

## 2.9 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 10 44 16

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. The 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 21.

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 Type 304 stainless steel with No. 4 finish, recessed, with plexiglass panel, sized to fit within the partition or wall depth. Provide fire rated cabinets within fire rated partitions. By Larsen's Mfg. Co. or approved equal.

## 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. 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 123619

### WOOD COUNTERTOPS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Wood countertops.
2. Shop finishing of wood countertops.

##### 1.2 ACTION SUBMITTALS

###### A. Product Data: For each type of product.

###### B. Shop Drawings: For wood countertops.

1. Apply AWI Quality Certification Program label to Shop Drawings.

###### C. Samples: For each shop-applied transparent finish and for each color and wood species specified.

##### 1.3 INFORMATIONAL SUBMITTALS

###### A. Product Certificates: For the following:

1. Composite wood products.
2. Adhesives.

###### B. Quality Standard Compliance Certificates: AWI Quality Certification Program

##### 1.4 QUALITY ASSURANCE

###### A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Shop Certification: AWI's Quality Certification Program accredited participant

###### B. Installer Qualifications: AWI's Quality Certification Program accredited participant

## PART 2 - PRODUCTS

### 2.1 FABRICATORS

- A. Fabricators: Subject to compliance with requirements.

### 2.2 WOOD COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of wood countertops indicated for construction, finishes, installation, and other requirements.
  - 1. Provide inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that countertops comply with requirements of grades specified.
- B. Grade: Custom.
- C. Butcher-Block Countertops: For transparent finish. Fabricated from narrow strips of lumber glued together and arranged for random mix of color and grain.
  - 1. Wood Species: Hard maple
  - 2. Strip Thickness: 1-1/2 inches

### 2.3 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of wood countertop and quality grade specified unless otherwise indicated.
  - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches (75 mm) wide.
  - 2. Wood Moisture Content: not to exceed 8 to 13percent.
- B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.
  - 1. MDF: Medium-density fiberboard, ANSI A208.2, Grade 130.
  - 2. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
  - 3. Softwood Plywood: DOC PS 1.

### 2.4 ACCESSORIES

- A. Wire-Management Grommets: Circular, molded-plastic grommets and matching plastic caps with slot for wire passage.



1. Outside Diameter: 2 inches (51-mm)
2. Color: Black]

## 2.5 MISCELLANEOUS MATERIALS

### A. Installation Adhesive:

1. Low VOC adhesive approved for use with wood.

## 2.6 FABRICATION

### A. Fabricate wood countertops to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Solid-Wood (Lumber) Members: 1/16 inch (1.5 mm) unless otherwise indicated.
2. Edges of Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).

### B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

### C. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

## 2.7 SHOP FINISHING

### A. General: Finish wood countertops at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

### B. Finish Materials: Use finish materials that comply with the testing and product 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."

### C. Shop Priming: Shop apply the prime coat including backpriming, if any, for items specified to be field finished. Refer to Section 099300 "Staining and Transparent Finishing" for material and application requirements.

### D. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing wood countertops, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of wood countertops. Apply two coats to end-grain surfaces.
- E. Transparent Finish:
1. Grade: Custom
  2. Finish: System 12, water-based polyurethane
  3. Washcoat for Closed-Grain Woods: Apply washcoat sealer to woodwork made from closed-grain wood before staining and finishing.
  4. Staining: None required
  5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
  6. Filled Finish for Open-Grain Woods: paste wood filler and wipe off excess. Tint filler to match stained wood.
  7. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Grade: Install wood countertops to comply with same grade as item to be installed.
- B. Assemble wood countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
  1. Secure field joints in countertops with concealed clamping devices located within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Scribe and cut wood countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
  1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inches (3-mm-in-2400-mm) variation from a straight, level plane.
  2. Secure backsplashes to walls with adhesive.
  3. Seal joints between countertop and backsplash, and joints where countertop and backsplash abut walls with sealant specified in Section 079200 "Joint Sealants."

- F. Shop Finishes: Touch up finishing after installation of wood countertops.
  - 1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.
- G. Field Finishing: See Section 099000 Painting and Finishing
- H. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches (1220 mm) o.c. Remove protection at Substantial Completion.

END OF SECTION



## SECTION 22 05 00

### 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 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, glycol, chilled, drain, vent, 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 laboratory equipment and special equipment. Verify connection requirements before bidding.

#### 1.8 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 special equipment. Verify connection requirements before bidding.

#### 1.9 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 special equipment. Verify connection requirements before bidding.

END OF SECTION

## SECTION 22 05 23

### 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. 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).

### 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 filled double seal Reinforced Teflon (RTFE), 15% glass
  - 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 77LF-140, 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. Valves for Gauges and Instruments:

1. Use Ball Valve.

E. 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.

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. Inspect valves for proper operation before installation. 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 22 05 53**

**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.

### 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<br>RECIRCULATING |
| Sanitary Waste          | SANITARY WASTE                      |
| Indirect Waste          | INDIRECT WASTE                      |
| Storm                   | STORM                               |
| Vent                    | VENT                                |
| Compressed Air          | COMPRESSED AIR                      |

## 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 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 22 05 80**

**EXCAVATION AND BACKFILL**

**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 the Contract Documents.

**1.2 SUBMITTALS**

- A. Not required.

**1.3 CODES**

- A. Comply with local, state, and federal codes, regulations, and laws affecting work of this section.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Cushion Sand: Clean, coarse, and free of organic matter, conforming to New York State DOT Item No. 703.06.
- B. Crushed Stone: Crushed stone, graded, free of organic materials, No. 1 to No. 4 size. Conforming to New York State DOT Item No. 703-0201.
- C. Gravel Fill: Well-graded natural inorganic sand and gravel conforming to New York State DOT Item No. 703-0202.
- D. Ordinary Fill: Well-graded, natural soil, meeting the following requirements:
  - 1. Free of organic and other compressible materials, debris and frozen materials, and of stones larger than 4 in. maximum dimension.
  - 2. Be of such nature and character that it can be compacted to the specified densities.
  - 3. Free of highly plastic clays, of materials subject to decay, decomposition, or dissolution, and of cinders, ash and other corrosive materials.
  - 4. Maximum dry density of not less than 115 lbs. per cu. ft.
  - 5. Material from excavation on the site may be used as ordinary fill if it meets the above requirements.

### PART 3 - EXECUTION

#### 3.1 PREPARATORY WORK, SCHEDULING SHUTDOWNS, AND TEMPORARY WORK

- A. Build lines to grade and elevations shown. Provide stakes, grade boards, cleats, nails, and instruments. Locate and stake each new run for its entire length. Verify elevations given. Start excavation at low point. Notify Engineer of elevation discrepancies. Protect marks and stations. Before starting excavation work, coordinate with and furnish schedule of work to Owner's Representative and other trades. Provide and maintain temporary walks and bridges over excavations where underground utility lines, sewers, water lines, etc., cross access roads, walks, and streets. Make necessary arrangement with authorities having jurisdiction.

#### 3.2 PROTECTION

- A. Provide bracing, shoring, sheathing and other work for protection of personnel, the contract work, excavations, trees, shrubs, existing structures, and surrounding properties. Provide and maintain barricades, warning signs, flags, and lights for the protection of work, workmen, public, and property. Plank walks, pavements, and curbs to be crossed by equipment. Protect adjacent property, fences, trees, shrubs, roads, curbs, sidewalks, manholes, hydrants, and other items.
  - 1. Restore, repair or replace any items damaged or destroyed to a condition equal to that existing before such damage occurred.
  - 2. Establish conditions, before starting work, by taking photographs to determine state to which existing conditions must be restored. Submit such photographs notarized, identified and dated for record.
- B. The use of equipment with metal tracks over paved areas is not permitted unless the pavement is protected with methods as approved by the Owner's Representative.

#### 3.3 INVESTIGATION AND PROTECTION OF EXISTING UTILITIES

- A. Every attempt has been made to indicate existing utilities as accurately as possible from existing drawings, surveys, and data. Immediately report other utility lines encountered, but not shown on the drawings. Notify Underground Facilities Protection Organization (UFPO) before starting work. Phone (800)-962-7962 for information and location of nearest organization address and telephone number. Verify exact location of existing utility lines where work crosses existing utilities and where connections are to be made by test hole before starting work. Notify utility companies, municipalities, and other involved jurisdictions when excavating occurs within vicinity of existing underground service such as sewers, water, electric, gas, telephone, including such services owned by Owner. If existing service lines, utilities and utility structures which are to remain in service are uncovered or encountered during this excavation, they shall be protected from damage, and securely supported as directed and approved by the involved jurisdiction. Comply with all local, state and federal regulations when working in vicinity of combustible gas piping.

Immediately report damage to utility lines to Owner's Representative and involved jurisdiction. Repair or replace utility lines damaged or destroyed as directed and approved by the involved jurisdiction. Excavate by hand in proximity to existing underground utility lines; take extreme care when excavating around ductbanks carrying energized cable. Remove, plug or cap inactive or abandoned utilities encountered during construction operations. The location of such utilities shall be noted on the record drawings. Verify inactivity of services with involved jurisdiction before start of work.

- B. Saw cut floor slabs perpendicular to surface and parallel with/perpendicular to walls. Replace slabs and adjacent surfaces damaged by excavation operations with materials equal to adjacent existing materials.

### 3.4 CUTTING AND PATCHING

- A. Prior to starting work, obtain necessary permits and pay all costs and fees. Cut paved areas, perpendicular to surface and in straight saw-cut lines. Replace pavements, roadways, streets, blacktop areas and walks damaged by excavating operations with materials equal to adjacent pavements.

### 3.5 EXCAVATION

- A. Provide for buried work in contract both inside and outside of building. Excavate to proper depth and width for installation work and comply with rules set forth by New York State Department of Labor. Remove materials including masonry work, rubble, earth, brickwork, concrete, sand, debris, abandoned pipe lines, drains, sewers, rocks, boulders, and concrete, all of which is considered "earth excavation". Provide for legal disposition of excess excavated materials. Make allowance for gravel fill, sand bases, form work, floor slabs, manholes, anchor and thrust blocks, sheet piling, drainage pumps, and work space. Start excavation at rough grade and provide form work and sheet piling where required.
- B. Trench Excavation:
  - 1. By open cut, to proper depth and grade no wider than required for placement of work and not more than 100 ft. in advance of utility being installed.
  - 2. Should trench bottom be wet, unstable or otherwise incapable of supporting the contract work, immediately report the condition to the Owner's Representative. Should it be deemed unsuitable, excavate to depth as directed and backfill with gravel to trench depth, or provide concrete cradling.
  - 3. Should rock be encountered, excavate 6 in. deeper and fill space between trench bottom and pipe with coarse sand, well compacted to form a firm pipe bed.

C. Shoring, Bracing, Sheathing:

1. In addition to governing codes, protect sides of excavations with shoring, bracing and sheathing to prevent sliding or caving of banks and to protect adjacent structures. Remove as backfill is placed.
2. Provide at locations adjacent to existing manholes, hydrants, and similar items.

D. General Excavation:

1. As required for all buried work. This shall include, but not be limited to, piping, tanks, ductbanks, conduits, footings, manholes, anchors, concrete pads, thrust blocks, fixture bases, and other work in contract.

3.6 BACKFILL

A. Bedding:

1. Around piping with cushion sand from 6 in. below to 8 in. above. Apply by hand and compact under and at sides by mechanical means.
2. Piping, jackets and sand bed must be inspected and tested prior to backfill of any nature. Provide necessary anchors, thrust blocks, for testing.

B. Remainder of Trench:

1. Backfill remainder of trench in 12 in. layers, with ordinary fill materials, except as otherwise specified. Do not use frozen material. Remove boulders, stones, broken rock, wood, bricks, blocks, and debris from fill materials before backfill operation.
2. Compaction to not less than 95% density compared to maximum laboratory tests by weight, per modified ASTM D1557-64T, latest editions, Method "A" under slab on grade, roadways, drives, and other paved areas and 85% for general grading. Submit certified test results by an approved soil testing laboratory.

3.7 REMOVAL OF WATER

- A. Provide pumps, hoses, pipe, labor and fuel, necessary to keep excavations free of water accumulation. Maintain and operate equipment. Discharge water in manner not to interfere with any trade's work, undermine or disturb adjacent structures or properties. Grade to prevent surface water from flowing into all excavations and trenches. Do not discharge dirt, backfill or debris into sanitary or storm drainage systems.

3.8 ROUGH GRADING

- A. Trim and grade areas to receive fill material or topsoil specified.

- B. Set grade stakes where spot elevations are shown, at breaks in grade, along drainage "swales" and as otherwise required to correctly grade the area to existing conditions.
- C. On completion of rough grading, obtain Owner's Representative's approval before spreading topsoil or preparing pavement subgrade.
- D. Compact fill as specified.

### 3.9 FINAL GRADING

- A. Spread topsoil conforming to New York State DOT Item No. 713-01 over entire area disturbed by work of this project unless otherwise noted.
- B. Spread, compact and manipulate topsoil to a minimum of six (6) inches thickness after compaction to smooth draining grades true to original elevations. Remove all excess topsoil remaining after all needs of this contract are met.
- C. Repair to proper grade any settlement of slab, pavement, utility, structure, or lawn adversely affected by settlement within one year after final acceptance at no expense to the Owner.
- D. Protect all disturbed areas during and after earthwork operation to prevent gullyng, erosion, and subsequent deposition on or off site. Repair/remove all erosion and deposition that occurs at no expense to the Owner.

### 3.10 FLOOR SLABS

- A. Upon completion of backfilling, drill and grout steel dowels into existing slab, place steel rebar and pour concrete slab the same thickness as the existing slab. All work shall be performed by workmen skilled in the appropriate trade in accordance with the requirements of the Architect.
- B. New slab shall be finished smooth and flush with existing slab.

### 3.11 RESTORATION

- A. On completion of the work, clean the entire site, remove surplus earth, large stones and debris and legally dispose to an off-site location. Remove tools and equipment and leave the entire area in a neat condition.

END OF SECTION





## **SECTION 22 07 00**

### **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 jackets, 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. 2020 Energy Conservation Code of New York State
  - 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; 25 or less flame spread rating/50 or less smoke developed rating, 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. 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.

## 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. 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.
- I. Provide insulation on exposed hot and cold plumbing piping to within 18 in. of fixture or equipment connection.
- J. Insulate exposed domestic water and waste piping for plumbing fixtures designated for use by the handicapped.

### 3.3 EXISTING INSULATION

- A. Jacketing for piping in existing areas shall match existing jacketing.

**EXHIBIT "I" - PIPE INSULATION MATERIALS**  
**(Notes at end of Exhibit "I")**

| <b><u>SERVICE</u></b>                                                                  | <b><u>INSULATION MATERIAL</u></b> | <b><u>THICKNESS</u></b>                                         | <b><u>REMARKS</u></b> |
|----------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------|-----------------------|
| Domestic cold water                                                                    | Glass fiber                       | 1-1/2 in. and larger: 1 in.<br>1-1/4 in. and smaller: 1/2 in.   |                       |
| Domestic hot, tempered and circulation water<br>(105°F - 140°F)                        | Glass fiber                       | 1-1/2 in. and larger: 1-1/2 in.<br>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 in.                                                |                       |

END OF SECTION

## **SECTION 22 10 10**

### **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 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.

## 2.3 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.

## 2.4 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.



## 2.5 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.

## 2.6 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.
- E. Dielectric Unions are not acceptable.

## 2.7 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<br>Horizontal<br>Joint 5 ft.<br>Maximum<br>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.

- F. 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.
- G. 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.
- H. 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.
- I. 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.

J. 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.

K. Provide V-Groove channel for continuous support for unpigmented and pigmented polypropylene piping.

L. Piping systems with material not listed above shall be supported and protected in accordance with manufacturer's recommendations.

2.8 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.

2.9 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.

2.10 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.

2.11 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.

2.12 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.

2.13 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. Threaded Connections: Clean out tapering threads, made up with pipe dope; screwed until tight connection. Pipe dope must be specifically selected 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 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 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")**

| <b><u>SERVICE</u></b>                                               | <b><u>PIPE MATERIALS</u></b>                            | <b><u>FITTINGS</u></b> | <b><u>CONNECTIONS</u></b>                                 |
|---------------------------------------------------------------------|---------------------------------------------------------|------------------------|-----------------------------------------------------------|
| Domestic water interior/hot, cold and circulating 3 in. and smaller | Type L copper                                           | Wrought copper         | No-lead solder                                            |
| Sanitary, sanitary vent, grease waste and storm (buried)            | SEE "UNDERGROUND PIPING AND ACCESSORIES" SECTION 221020 |                        |                                                           |
| Sanitary, sanitary vent                                             | 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                                            |
| 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                                            |
| Compressed air-house (doors, lab equipment, etc.)                   | Type L copper                                           | Wrought copper         | Brazed                                                    |

**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.                                                                             |
| Compressed air and Vacuum (house) | Test with clean air or nitrogen at a pressure of 175 PSI for 24 hours.                                                       |

END OF SECTION



## **SECTION 22 10 20**

### **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".
- 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")**

| <b><u>SERVICE</u></b> | <b><u>PIPE MATERIALS</u></b>          | <b><u>FITTINGS</u></b>       | <b><u>CONNECTIONS</u></b>           |
|-----------------------|---------------------------------------|------------------------------|-------------------------------------|
| Sanitary and Vent     | Service weight cast iron<br>soil pipe | Cast iron, hub and<br>spigot | Neoprene gasket<br>compression type |

**EXHIBIT "B" - TESTING**

| <b><u>SERVICE</u></b>             | <b><u>TEST REQUIREMENTS</u></b>                  |
|-----------------------------------|--------------------------------------------------|
| Sanitary, sanitary vent,<br>storm | Maintain 10 ft. head of water for two (2) hours. |

END OF SECTION





## **SECTION 22 30 10**

### **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 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.

##### **2.2 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.

##### **2.3 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.

### PART 3 - EXECUTION

#### 3.1 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.

#### 3.2 HOSE BIBBS

- A. Install at low points of piping system.

#### 3.3 SHOCK ABSORBERS

- A. Install in vertical position.

END OF SECTION

**SECTION 22 40 00**

**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. Flushometers: Sloan "Regal XL" or Zurn.
  - 4. Closet Seats: Bemis, Beneke, Church or Olsonite.
  - 5. Fixture Carriers: Jay R. Smith, Watts, Wade, Josam or Zurn.
  - 6. Sinks: Elkay, Just or Kohler.
  - 7. 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 WATER CLOSETS

#### A. WC-A (HDCP):

- 1. American Standard #3461.001 Madera, floor mount, vitreous china, siphon jet, elongated bowl, 1.28 GPF, fully glazed 2 in. ball pass trapway, with 1-1/2 in. top spud, fitted with following:
  - a. Sloan #ECOS111-1.28-LT, 1.28 GPF, sensor operated, hard wired powered, closet flushometer, for left or right hand supplies, exposed diaphragm type, 1 in. screwdriver angle stop with vandal resistant metal cap and replaceable sensor window, bumper on stop, vacuum breaker, adjustable tailpiece, sweat solder adaptor kit and cast wall flange with set screw, override button, with adjustable sensor on centerline of fixture, WaterSense Listed.
    - 1) Solenoid extension nipple option to protect low voltage wiring from wall plate to solenoid.
    - 2) Sloan #EL-485-A flushometer electrical box positioning and support kit.
    - 3) Sloan #EL-154, 120 volt transformer. Refer to plans for locations and quantity required.
    - 4) Plumbing Contractor shall furnish transformer(s) and provide low voltage wiring. Electrical Contractor shall install transformer(s) and provide power to transformer.
  - b. Church #9500SCC, extra heavy weight, white elongated solid plastic, open front closet seat with self-sustaining check hinge, less cover.
  - c. Mount at ADA required height and location or as shown on Architectural drawings.

## 2.2 LAVATORIES

### A. LAV-A (HDCP):

1. American Standard #0954004EC, 20-7/8 in. x 22-1/16 in. wall hung, vitreous china lavatory with 4 in. centers, overflow, self-draining deck and faucet ledge, fitted with the following:
  - a. Sloan EAF-100-HLT-ISM-CP-0.35-MLM-IR-IQ-FCT, lead-free sensor faucet, deck mounted, 4 in. centers, swing plain end gooseneck spout with 0.35 GPM flow control device in spout base, ADA compliant. Hard wired, trim plate for 4" centers, integrated side mixer, water sense listed.
  - b. McGuire #155WC offset chrome plated P.O. plug with open grid strainer and 1-1/4 in., 17 gauge offset tailpiece.
  - c. McGuire #8902 chrome plated, 17 gauge, 1-1/4 in. x 1-1/2 in. "P" trap with cleanout plug and cast brass escutcheon with set screw.
  - d. McGuire # LF165LKF, lead-free, 3/8 in. chrome plated wall supplies with loose key angle stops, 12 in. long flexible risers, cast brass escutcheon with set screws.
  - e. Jay R. Smith Series 700 concealed arm floor mounted carrier with rectangular uprights.
  - f. Cover exposed waste, stops and supply piping with ADA conforming pipe covers, Truebro, Inc. "Lav-Guard".
  - g. Mount at ADA required height and location or as shown on Architectural drawings.

## 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. Quantity of anchors:
  - 1. Water Closets - Four (4).
  - 2. Lavatories - Eight (8).
- 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. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.
- H. 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.
- I. Fasten counter-mounting-type plumbing fixtures to casework.
- J. 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 23 05 00

### 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 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, glycol, chilled, drain, vent, 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 laboratory equipment and special equipment. Verify connection requirements before bidding.

## 1.8 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 special equipment. Verify connection requirements before bidding.

## 1.9 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 special equipment. Verify connection requirements before bidding.

END OF SECTION

## **SECTION 23 05 04**

### **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, lower voltage wiring and data network system 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".
- C. Coordinate all work with Division 27, "Communications".

##### **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".
- B. Wiring shall be installed in compliance with all requirements of Division 27, "Communications".

##### **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 & 27, "Electrical" & "Communications", shall be clearly indicated.

## PART 2 - PRODUCTS

### 2.1 PRODUCTS

#### A. Control Wiring:

1. Refer to Division 26 specifications for required wiring materials.
2. Unless specifically required otherwise by the BACS equipment manufacturer, all I/O wiring shall be twisted shielded cable.

#### B. Conduit:

1. Refer to Division 26 specifications for type of conduit to be used in specific applications.
2. All conduit containing control wiring shall be green.

## 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 below, supported on 5ft. centers.
1. Provide 18 in. length flexible conduit at motors and devices subject to vibration.
  2. Do not attach directly to hot surfaces, piping, or ductwork.
  3. Control wiring shall be in separate conduit and raceway from all other wiring.
  4. Control wiring shall be un-spliced from the controller to the sensor or device and shall be labeled at all points of termination.
  5. For sensors with twisted shielded pair cable, the shield shall be ground at the panel and taped back at the sensor.
  6. All control wiring shall be run in conduit within the following locations:
    - a. Mechanical rooms or other spaces in which it is readily accessible.



- b. Interstitial spaces
    - 1) Control wiring can be run in either conduit, cable tray or raceway.
  - c. Vertical chases.
  - d. Above non-accessible ceilings.
  - e. Accessible ceilings within laboratories.
  - f. Air Handling Units.
7. 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:
- a. Have the proper insulation and meet the requirements of NEC Article 300-22 when installed above accessible ceiling spaces.
  - b. Be adequately supported using bridle rings spaced a maximum of 3 ft. on centers or other approved method when installed horizontally above accessible ceilings or run exposed in unfinished areas.
  - c. Be run in wall cavity or surface metal raceway where no access is available to wall cavity, in finished areas.
  - d. Be installed in conduit in all cases not specifically covered by the above cases, or where subject to physical damage.
- B. Provide pushbutton stations, pilot lights, selector switches, auxiliary starter contacts, and other devices required to provide specified functions.
- 1. 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. Size ground wire as required by NEC.
- 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 23 05 13**

### **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.

6. 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        |

7. 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                                   |

8. 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 23 05 53**

### **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 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. Fans

### 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 equipment tags for all equipment listed above.

END OF SECTION



**SECTION 23 05 93**

**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. Constant flow systems.
    - b. 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's 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. 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 23 07 10**

### **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 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. Polyisocyanurate: Johns Manville Trymer 25-50 PIR (Indoors), 2000XP (Outdoors), HiTherm, or approved equal.
- D. Jacketing: Johns Manville (PVC) or approved equal.
- E. Adhesives, Coatings, Mastics, Sealants: Childers, Foster, or approved equal.

## 2.2 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/ft<sup>2</sup> 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.

### 2.3 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. Aboveground Exterior Wall: Install insulation continuously through penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above through surface and seal with joint sealant.
- B. Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Interior Floor, Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. 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 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.

Richard McElhiney Architects LLC  
*M/E Engineering, P.C.*

Ward Center Renovation  
New York Consortium for Space Technology (NYCST)

March 7, 2025  
Construction Documents

**EXHIBIT "II" - DUCT INSULATION MATERIALS**

| <b><u>SERVICE</u></b> | <b><u>INSULATION<br/>MATERIAL</u></b> | <b><u>THICKNESS</u></b> | <b><u>REMARKS</u></b>          |
|-----------------------|---------------------------------------|-------------------------|--------------------------------|
| Supply                | Flexible Fiberglass                   | 2 in.                   | Min. installed<br>R value of 6 |

END OF SECTION

## SECTION 23 09 01

### BUILDING AUTOMATION CONTROL SYSTEM COMMUNICATIONS

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Provide labor, materials, equipment and services as required for the complete installation of the Building Automation Control System (BACS) designed in Contract Drawings and described in Section 230923. The Building Automation Control System (BACS) to perform the communication and interoperability requirements as described in this Section.
- B. Building automation and direct digital control systems throughout Cornell require integration to the campus Energy Management and Control System (EMCS). To ensure compatibility, all installations of digital building automation and control equipment shall support communications via the BACnet standard, ANSI/ASHRAE Standard 135-2012, BACnet® - A Data Communication Protocol for Building Automation and Control Networks and the related international standard, ISO 16484- 5.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 230923 – Building Automation Control System.

##### 1.3 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.

## 1.4 DEFINITIONS

- A. In addition to the definitions contained in the applicable standards, the following should be noted:
1. ARCNET: Attached Resource Computer Network. See BACnet, Clause 8 and ATA/ANSI 878.1.
  2. BACnet/IP: BACnet Annex J Devices. Annex J of BACnet describes how BACnet devices can make use of IP directly for communicating across IP-based internets.
  3. BACnet PICS; A Protocol Implementation Conformance Statement that describes the BACnet capabilities of a specific device. See BACnet, Annex A.
  4. BACS: Building Automation and Control System.
  5. BACSI: The Building Automation and Control Systems Integration group within the Cornell Facilities and Campus Services organization. BACSI is responsible for the EMCS and the coordination of BACS device addressing and network numbering.
  6. BBMD: BACnet Broadcast Management Device. See BACnet, Annex J.
  7. BI: BACnet International. The trade association responsible for the worldwide promotion of BACnet.
  8. BIBB: BACnet Interoperability Building Block. A collection of one or more BACnet services defined for the purpose of describing communication functionality in an unambiguous way. See BACnet, Annex K.
  9. BTL: The BACnet Testing Laboratories of BI. The organization responsible for testing products to assure that they conform to the BACnet standard. Listings of tested products are available at [www.bacnetassociation.org](http://www.bacnetassociation.org).
  10. Campus Backbone: A fiber optic data communication infrastructure on the Cornell campus managed by CIT. Users connect to the backbone by means of CIT-supplied Ethernet switches in each building and appropriate 10/100/1000BASE-T unshielded, twisted pair wiring. The backbone uses IP for routing messages to and from computers both on and off the Cornell campus.
  11. CIT: Cornell Information Technologies. The organization that manages the Cornell campus networking infrastructure, including the provision of network connections in Cornell buildings.

12. Device Profile: A collection of BIBBs that describes the minimum BACnet capabilities of a particular device in order to achieve reliable communication in one of five specified "interoperability areas." Devices include BACnet Building Controllers (B-BC), BACnet Advanced Application Controllers (B-AAC) and BACnet Application Specific Controllers (B-ASC). See BACnet, Annex L.
13. EMCS: A computer complex that provides Energy Management and Control System functions for the University. The EMCS is connected to the campus backbone and uses IP for the routing of messages to and from individual buildings, and allows 24/7 monitoring of BACS alarms. The EMCS also provides other infrastructure monitoring and control functions for campus utilities and CIT's network operations.
14. Ethernet: A carrier sensing multiple access with collision detection network technology defined by ISO/IEC 8802-3.
15. Gateway: A device that translates BACnet messages into those of a non- BACnet protocol and vice-versa.
16. Internetwork: A set of two or more BACnet networks interconnected by routers.
17. Interoperability Area: A communications domain in which functional cooperation is desired. These areas are currently: 1) data sharing; 2) alarm and event management; 3) trending; 4) scheduling; and 5) device and network management. See BACnet, Clause 22.
18. IP: The Internet Protocol. A networking protocol originally developed by the federal Defense Advanced Research Projects Agency. BACnet messages can traverse the campus backbone by being encapsulated in routable IP packets.
19. Local: Pertaining to the requirements of a specific job or building project.
20. LAN: Local Area Network. One of the approved BACnet network technologies: Ethernet, ARCNET or MS/TP.
21. MS/TP: Master-Slave/Token-Passing Network. One of the approved BACnet LANs. See BACnet, Clause 9.
22. Network: One of the communication technologies for data communications specified in BACnet. Approved network technologies at Cornell are Ethernet, ARCNET, and MS/TP.
23. PICS: Protocol Implementation Conformance Statement. A document that describes in detail a device's BACnet capabilities. See BACnet, Annex A.
24. PM: Project Manager. The Owner's representative who oversees a BACS project.

25. Synchronization: In order to ensure that alarms are properly interpreted, the names of all BACnet objects within a device are stored in an EMCS database. This process of coordinating the names of the objects in the field devices and the EMCS is initiated manually whenever a device is installed or its objects have been updated. The EMCS reads the Object\_List property of the device's Device object (a BACnetARRAY of Object Identifiers) and then reads each object's Object\_Name property (a CharacterString). This Object\_Name is used along with the EMCS device name to identify the alarms related to this object so it must be unique and descriptive.
26. UDP: The User Datagram Protocol. One of the IP family of protocols. UDP is used to convey BACnet/IP messages and is characterized by a "port number" for each protocol. BACnet/IP typically uses UDP port X'BAC0' or decimal 47808.
27. VLAN: Virtual Local Area Network. A network configuration that allows devices to communicate across multiple physical local area networks (LANs) using their hardware or "medium access control" (MAC) addresses as if they shared a common networking medium. As with a physical LAN, "local" broadcast messages are also propagated to each of the participating LANs. VLAN capability depends on the configuration of the interconnecting data communication equipment. VLAN configuration is performed by CIT.
28. Zone: The facilities on the Ithaca campus are divided into groups called "zones" for the purpose of maintenance management. Each has a "Zone Facility Manager" and controls technicians responsible for the BACS equipment in their zone.

## 1.5 SUBMITTALS

- A. In addition to any requirements specified elsewhere, the Contractor shall provide both proposed and as-built versions of the following:
  1. Schematic drawings that represent the system architecture and configuration, in both hardcopy and editable electronic format.
  2. A points list that includes, for each physical or logical point, the name, description, display units, alarm limits and definitions, along with the BACnet object description, object ID, and associated device ID. The list shall also indicate whether Trend Log or Schedule objects have been established for the point.
  3. Documentation for any non-standard BACnet objects, properties, or enumerations utilized detailing their structure, data types, and any associated lists of enumerated values.



4. PICS files indicating the BACnet functionality and configuration of each device. In addition to the requirements of BACnet, Annex A, the Contractor shall provide information on any limitations on the numbers of supported objects in a given device including, specifically, Trend Log and Schedule objects.
5. Documentation on submitted products that have been tested and listed by the BACnet Testing Laboratory (BTL). If, for any reason, BTL testing and listing has not been completed, a written commitment shall be provided to upgrade installed controls to a version that meets BTL testing and listing requirements should deficiencies be found during BTL testing.

#### 1.6 WORK INCIDENTAL TO TEMPERATURE CONTROL CONTRACTOR

- A. The Contractor shall be responsible for all coordination of subcontractors' work relative to the BACS. Specific questions relating to communication and interoperability shall be submitted to BACSI.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. Each networked device supplied pursuant to this section shall be installed and configured to correctly execute all sequences of operation for its intended application, as defined in other sections of this guideline. In addition, each networked device shall provide, at a minimum, the BACnet communication capabilities prescribed in the device profiles for devices of its type.

#### 2.2 CONTROLLER

- A. Controller devices supplied to meet the functional and operational requirements of this guideline shall conform, at a minimum, to one of the BACnet device profiles contained in BACnet, Annex L: BACnet Building Controller (B-BC), BACnet Advanced Application Controller (B-AAC) or BACnet Application Specific Controller (B-ASC). The interoperability requirements of such devices are contained in BACnet, Annex L. B-BC controller devices shall communicate using BACnet/IP. Other devices may use BACnet over ARCNET or BACnet over MS/TP.

#### 2.3 ROUTER

- A. In the event that devices are provided that do not use BACnet/IP over Ethernet as their communication technology, BACnet routers shall be provided that route between BACnet/IP over Ethernet and the other BACnet LAN type(s), whether ARCNET or MS/TP. These routers shall conform to the specifications of BACnet, Clause 6.

## 2.4 GATEWAY

- A. BACS devices that use BACnet as their native protocol are preferred. The use of gateways, in circumstances where no native BACnet devices are available, requires the specific approval of the Owner in each instance.

## 2.5 SWITCH & HUB

- A. If the network topology of the job requires the use of network switches, they shall be selected from the list of approved hardware, which can be found at [https://pminfo.emcs.cornell.edu/switch\\_hardware](https://pminfo.emcs.cornell.edu/switch_hardware). In the event the job requires additional switches, the proposed design of the network topology including all CIT jacks, switches, and network connected BACS devices shall be submitted in advance to BACSI for approval. Schematic examples of typical extended network topologies can be referenced at the pminfo web site referenced above.

## 2.6 NON-BACNET DEVICE

- A. For devices that are used for utility metering and other non- BACS applications, the Cornell EMCS provides several protocol handlers including Modbus and EtherNet/IP. Contractors supplying devices using these protocols need not provide a gateway.

## 2.7 WORKSTATION

- A. The EMCS operator interface is the responsibility of BACSI. If, however, a specific job requires a local workstation, the Contractor shall provide a personal computer of current design and approved by the Owner equipped with a web browser that can display information from a Contractor-supplied web server that interfaces with the local BACnet network and the campus backbone.

## 2.8 WEB SERVER REQUIREMENTS

- A. If a local workstation is required, the Contractor shall provide a web server computer with the web page presentation, data acquisition and storage functionality described in this section, including the specific functions listed below. The web server shall be configured in such a way that there is no software-imposed limit to the number of simultaneous users.
  - 1. Data Sharing
    - a. Presentation of data (i.e., user definable reports and graphics)
    - b. The ability to monitor and display the values of all BACnet object types, including all required and optional properties
    - c. The ability to modify setpoints and parameters

2. Alarm and Event Management
  - a. Operator notification and presentation of event information
  - b. Alarm acknowledgment by operators
  - c. Alarm summarization
  - d. Adjustment of alarm limits
  - e. Adjustment of alarm routing
3. Scheduling
  - a. Modification of schedules
  - b. Display of the start and stop times (schedule) of scheduled devices
4. Trending
  - a. Modification of the parameters of a trend log
  - b. Display and archive of trend log data
5. Device and Network Management
  - a. Display of information about the status of any device on the BACnet internetwork
  - b. Display of information about any object on the BACnet internetwork
  - c. Ability to silence a device on the network that is transmitting erroneous data
  - d. Ability to cause a remote device to reinitialize itself
  - e. Ability to backup and restore the configuration of devices on the local BACnet network
  - f. Ability to query and change the configuration of local BACnet routers

## 2.9 DUAL HOME EQUIPMENT

- A. To protect network security, dual-homed devices, i.e., devices with two (or more) Network Interface Cards that have an identity on a BACSI-administered LAN and another non-BACSI-administered LAN, e.g., a locally administered laboratory LAN is strictly prohibited without prior written authorization by BACSI.

## 2.10 LAN

- A. All control devices meeting the B-BC device profile shall be connected to an ISO 8802-3 (Ethernet) LAN provided by the Contractor. This LAN, in turn, shall be connected to the campus backbone network. Unless otherwise specified, the connection shall be via a 10/100/1000BASE-T port provided by the Owner. The location of the jack will be determined in consultation with BACSI, which will arrange for the jack's installation. The Contractor shall also provide any additional data communication hardware, such as switches, hubs, and repeaters that may be needed to interconnect the supplied BACS equipment and to connect to the Owner's backbone network. Although cascaded switches and hubs are not prohibited, they must meet the requirements.
- B. To facilitate maintenance technician access to the LAN, the Contractor shall also provide at least one additional 10/100/1000BASE-T access point in each mechanical room that contains BACS equipment. This requirement may be met by supplying either a hub with a spare port or a dedicated jack.
- C. Control devices that meet the B-ASC profile, but do not support Ethernet, must use another approved BACnet LAN technology. These technologies are ARCNET and MS/TP. If Ethernet is not supported on any part of the internetwork, a standalone BACnet router, or a BACnet Building Controller with built-in routing capability, must be provided for routing between the Ethernet and ARCNET or MS/TP LANs.

## PART 3 - EXECUTION

### 3.1 DATA SHARING

- A. Data Sharing requirements apply to the exchange of information between BACnet devices for archival storage, generating graphics and reports, the sharing of common sensor or calculated values, carrying out interlocked control strategies, and the modification of setpoints or other operational parameters.
- B. All such data to be exchanged shall be represented as BACnet objects and conveyed using BACnet messages. Only standard BACnet objects and messages may be used to implement data sharing requirements unless the non-standard extensions are explicitly approved by the Owner. Any extensions to BACnet shall be fully documented in the manner used within the BACnet standard. Submission of such documentation is a prerequisite for obtaining approval of an extension.
- C. Points List: The Contractor shall provide devices installed and configured with all points indicated in the BACS points list. The Contractor shall provide any additional points needed to fully implement the sequence of operations and other functionality described in this guideline.

- D. Data Presentation: The following characteristics shall apply to graphic displays:
1. The graphic displays shall include schematic diagrams of the systems being displayed.
  2. When a graphic display is being viewed, all values displayed shall be updated when a change of value (COV) notification is received or, if COV is not implemented, within five seconds.
  3. Any data value from any networked device shall be available for plotting in real time. The operator shall be able to select binary and analog data concurrently and to plot multiple instances of each datatype on the same screen. The operator shall be able to select sampling intervals from 1 second to 60 seconds. For devices that implement COV reporting, the operator shall be able to select this as the means to update the plot. It shall be possible to save such real-time plots for subsequent recall.
- E. Monitoring of Any Property: The operator shall be able to display any value of any property of any object from any networked device including all properties required by BACnet, all supported optional properties, and any proprietary extensions.
- F. Global Object Definitions: The control system shall be configured with system- wide unique BACnet objects as needed to convey all globally significant information necessary to implement the control strategy.
- G. Setpoint and Parameter Modifications: Operators with appropriate authority shall be able to modify all control loop setpoints and tuning parameters via BACnet messages initiated through operator interaction with graphics displays.
- H. Peer-to-Peer Data Dependencies: All BACnet devices shall be installed and configured to exchange data values directly, without the need for operator intervention, to implement the sequence of operations specified in the mechanical system drawings and to share global data values. BACnet network points set up to acquire data from a peer device shall use dynamic binding. If static binding configurations are necessary, prior permission from BACSI must be obtained.

### 3.2 ALARM AND EVENT MANAGEMENT

- A. Alarm and Event management is the exchange of data between BACnet devices related to the occurrence of predefined conditions that meet specific criteria. Such conditions are called "events" and may be the basis for the initiation of a particular control action in response or the simple logging of the event's occurrence. The event may also be deemed to represent a condition that constitutes an "alarm" requiring human acknowledgment and intervention.

- B. All alarms and events shall be implemented using standard BACnet event detection and notification mechanisms. Either intrinsic reporting or algorithmic change reporting may be used but the intrinsic reporting method is preferred. See BACnet, Clause 13.
- C. Alarm Lists
  - 1. The Contractor shall provide devices installed and configured to detect alarms and events for the points indicated in the system drawings. Software logic shall be provided to avoid nuisance alarms, e.g., no temperature or status alarms shall be generated when fan systems are not running or during start-up and shutdown transitions. It shall be possible to configure a delay between the occurrence of an alarm condition and its enunciation.
  - 2. Alarms shall be annunciated on the network within five seconds of their occurrence. The graphics shall display an alarm message window that appears on top of any other open windows. The alarm message window shall have a distinctive color and appearance to attract the operator's attention. Operators with sufficient privilege shall be able to configure the controls to emit an audible signal (or not) when an alarm message is received.
  - 3. Alarms that require operator acknowledgement shall cause the alarm window to remain active until such an acknowledgement is received. If multiple alarms are received, unacknowledged alarms shall be displayed on a first come first served basis grouped by priority, with the highest priority alarms displayed first.
  - 4. Alarms shall be distributed using the BACnet notification class mechanism. Assignment of classes and destinations shall be configured according to details provided by the Owner.
  - 5. BACnet provides a mechanism for prioritizing alarm and event notification messages using a numerical range of 0-255 with 0 being the highest priority and 255 being the lowest priority. The priorities are consistent with the safety requirements of UL 864 (applies to fire systems) and UL 1076 (applies to security systems).
  - 6. Alarm and event notification priorities shall be configured in the Priority Range and shall be conveyed using the indicated Network Priority. See BACnet, Clause 6.
  - 7. See Exhibit "A", "Cornell Alarm and Event Priorities" at end of this Section for configuration and priorities of all alarms and event notifications.
- D. Alarm Acknowledgment: Alarms shall be acknowledged through the EMCS alarm acknowledgement process.
- E. Alarm Summarization: Alarm summarization shall be handled through the EMCS alarm summarization process.

- F. Alarm Parameter Adjustment: Operators with sufficient privilege shall be able to change alarm parameters for all standard BACnet event types.
- G. Alarm Routing Adjustment
  - 1. Operators with sufficient privilege shall be able to change alarm routing (BACnet notification classes) for each alarm including the destination for each type of alarm and alarm priority, the day of week, time of day, and the type of transition involved (TO-OFFNORMAL, TO-NORMAL, etc.).
  - 2. Initially, notification classes shall be configured in a manner that distinguishes between the EMCS and any local alarm.

### 3.3 SCHEDULING

- A. Scheduling is the exchange of data between BACnet devices related to the establishment and maintenance of dates and time at which specified output actions are to be taken. All schedules shall be implemented using BACnet objects and messages.
- B. Schedule Lists
  - 1. The Contractor shall provide devices installed and configured with start/stop, mode change, and night setback schedules as defined in the sequence of operations. As part of the installation process, the Contractor shall configure vacation, holiday, and any special event schedules as provided by the Owner.
  - 2. The system shall have the ability to program alterations to programmed operating schedules based on the priority of events.
  - 3. Based on operator privileges, the operator shall have the ability to temporarily override the programmed schedule of equipment. Operational override of a programmed schedule shall be for a specific duration following which the schedule shall revert back to the preprogrammed schedule.
- C. Display of Start and Stop Times and Actions: An operator shall be able to inspect the content of any schedule and determine the specific control actions that will occur at any time, on any date. For any particular device or system parameter that is the subject of a schedule, an operator shall be able to determine the schedule of actions related to that particular device or parameter.
- D. Modification of Schedules: All calendar entries and schedules shall be modifiable from the EMCS or locally by an operator with sufficient privilege.

### 3.4 TRENDING

- A. Trending is the accumulation of (time, value) data pairs at specified rates for a specified duration. Trends are distinguished from real-time plotting of data by the fact that the data are destined for long-term storage.
- B. Archival Storage of Data: Archival storage of data will be handled by the EMCS. However, the Owner may specify local trend archiving and display through the use of BACnet Trend Log objects.
- C. Modification of Trend Log Parameters: An operator with sufficient privilege shall be able to change the data points to be logged, the sampling rate, and the duration of a trend log.

### 3.5 DEVICE AND NETWORK MANAGEMENT

- A. Device and network management is the exchange of data between BACnet devices concerning the operation and status of specific devices. The following functions shall be available:
  - 1. Display of Device Status Information: Operators shall be able to display at any time the operational status of any device on the BACnet internetwork.
  - 2. Display of BACnet Object Information: Operators shall be able to display at any time any property of any BACnet object. Operators shall be able to display property values of objects grouped by object type, object location, and building system.
  - 3. Silencing Devices that are Transmitting Erroneous Data: Operators shall be able to direct a field device to stop transmitting event, alarm, or COV notifications until a subsequent command to resume transmissions is received.
  - 4. Time Synchronization: Operators shall be able to set the time and date in any device on the network that supports time-of-day functionality. The operator shall be able to select to set the time and date for an individual device or all devices on a single local network.
  - 5. Remote Device Re-initialization: Operators shall have the ability to issue re-initialization commands to any device that supports remote re-initialization.
  - 6. Backup and Restore: Operators shall have the ability to backup and restore all BACnet devices on the network that support this capability.
  - 7. Configuration Management of Half-Routers, Routers and BBMDs: Operators shall have the ability to display and modify the routing table entries in all supplied BACnet half-routers and routers and the broadcast distribution and foreign device registration tables in all BBMDs.



Cornell BACS networks typically employ non-vendor-supplied BBMDs. Therefore, BACS devices should never be configured as a BBMD without prior authorization from BACSI.

### 3.6 USE OF BACNET OBJECTS

- A. Naming Conventions: The following sections list the requirements for the assignment of names and identifiers for BACnet objects.
1. Device Names:
    - a. The EMCS uses a system for naming its control devices based on facility name, location within a facility, the system or systems that the device monitors and/or controls, or the area served.
    - b. Names can be up to 254 characters in length, without embedded spaces. Only the characters A-Z, 0-9, ".", and "-" may be used.
    - c. The goal is the shortest descriptive, but unambiguous, name. For example, if there were only one chilled water pump "P1", a valid name would be "DUFFIELD.CW.P1.CONTROL". If there are two pumps designated "P1", one in the basement mechanical room and one in the penthouse mechanical room, the names could be "CHP.BSMT.CW.P1.CONTROL" or "CHP.PENT.CW.P1.CONTROL". In the case of unitary controllers, for example a VAV box controller, a name might be "COURT.122.TV- LOUNGE". These names should be used for the value of the "Object\_Name" property of the BACnet Device objects of the controllers involved so that the BACnet name and the EMCS name are the same.
  2. Device Instance Numbers
    - a. BACnet allows 4194304 device instances per BACnet internetwork, each of which must be unique. Cornell's unique device instances are formed as follows: Device Instance = "FFFFNDD" where:
      - 1) FFFF = Facility Code
      - 2) N = 0-9 This allows up to 10 networks per facility or building
      - 3) DD = 00-99 This allows up to 100 devices per network
    - b. Facility Code assignments are unique four digit numbers assigned by the Facilities Inventory Office. Some facilities have a facility code with an alphabetic suffix to denote wings, related structures, etc. The suffix will be ignored.

- c. Network numbers for facility codes above 4193 and for facilities that require more than 10 BACnet networks will be assigned in the range 0000-0999.
    - d. The Contractor shall contact BACSI for assignment, or confirmation, of the BACnet network and device instance numbers to be used prior to beginning device configuration. In the event of renovation or addition, the existing device instances are available and should be planned around as part of the project.
  - 3. Non-Device Object Names: Objects other than Device objects shall be named in a manner analogous to Device objects. The names shall consist of a facility. [sub-facility] system. [sub-system] point designation. All BACnet object names within a particular device must be unique within that device. For those objects that will be used to generate alarms, the point name should be descriptive of the alarm. Point names are synchronized with the EMCS database at the completion of each installation or update and the object name will appear in the EMCS alarm notification.
  - 4. Non-Device Object Instance Numbers: The instance numbers for objects other than Device objects may be assigned at the Contractor's discretion subject only to the constraint that they be unique for a given object type within a given device.
- B. Commissioning / Diagnostic Mode: In order to support commissioning and troubleshooting functions, the Out\_Of\_Service property of all Analog, Binary, Multi-state, Loop, and Program objects shall be writable using BACnet services.
- C. Using Object Descriptions
  - 1. Each Device object and every object in BACnet Building Controllers (B-BC) shall be configured with a Description property. The descriptions used shall be submitted to the Owner for approval.
  - 2. For all object types in all devices that support Description properties, the available string length and whether or not the Description is writable using BACnet services shall be specified in the device's PICS.
- D. Issues Relating to Specific BACnet Object Types: This section provides requirements that pertain to the use of specific BACnet object types. For those object types that support Change of Value (COV) reporting, the COV\_Increment must be set to a value appropriate for the parameter being measured, typically 10% of the normally expected steady state value.
  - 1. Analog Input, Output, and Value: All Analog\_Input, Analog\_Output, and Analog\_Value objects shall have the capability of using the COV reporting mechanism and the COV\_Increment property shall be writable using BACnet services.

2. Binary Input: The Inactive\_Text and Active\_Text properties of Binary Input objects shall be configured with text string values as indicated on the points list. Binary Input objects shall support COV reporting.
  3. Binary Output: The Inactive\_Text and Active\_Text properties of Binary Output objects shall be configured with text string values as indicated on the points list. All Binary Output objects associated with motor on/off status shall track changes of state and runtime. Binary Output objects shall support COV reporting.
  4. Binary Value: The Inactive\_Text and Active\_Text properties of Binary Value objects shall be configured with text string values as indicated on the points list. Binary Value objects shall support COV reporting.
  5. Calendar: Devices providing scheduling capability shall also provide at least one Calendar object with a capacity of at least ten entries. Operators shall be able to view the calendar object and make modifications. If the Calendar's Date\_List property is writable using BACnet services, all calendar entry datatypes shall be supported.
  6. Loop: All control loops using any combination of proportional, integral, and/or derivative control shall be represented by BACnet Loop objects. Operators with sufficient authority shall be able to adjust at least the Update\_Interval, Setpoint, Proportional\_Constant, Integral\_Constant, and Derivative\_Constant using BACnet services. Loop objects shall support COV reporting.
  7. Multi-state Input, Output, and Value: The text to be used for the Multi-state object types shall be determined from the points list. Feedback\_Value shall be determined by sensing the actual condition or mode of the device. All Multi-state objects shall support COV reporting.
  8. Schedule: All building systems with date and time scheduling requirements shall have schedules represented by BACnet Schedule objects. All operators shall be able to view the entries for a schedule. Operators with sufficient privilege shall be able to modify schedule entries. Required schedules are shown on the drawings as part of the occupied and unoccupied modes.
- E. Dynamic Object Creation: BACnet Building Controllers shall be configured to allow the dynamic creation of Trend Log, Calendar, and Schedule objects by means of the BACnet CreateObject service.

### 3.7 USE OF BACNET SERVICES

- A. Interoperable Commands: All dampers, valves, fans, or other mechanical equipment that may need to be controlled by more than one application shall be represented as commandable BACnet objects.

The application programs interacting with this equipment shall be configured to use the command priorities listed in Table 2. If implementing the sequence of operations or other required functionality requires using a command priority not listed in Table 2, the priority assignment must be approved by the Owner.

- B. See Exhibit "B", " Cornell Command Priorities " at end of this Section for configuration of all command priorities.
- C. Alarming: This section provides requirements that are specific to the use of BACnet for alarm processing.
  - 1. Notification Classes:
    - a. The EMCS shall be designated as a recipient for all alarm notifications.
    - b. The Priority, Ack\_Required, and Recipient\_List properties of Notification Class objects shall be writable over the network using BACnet services.
  - 2. Event Notification Message Texts: Alarm and event processing shall be configured to convey descriptive text messages along with the notification.
- D. Operator Authority Levels: There shall be at least three levels of authority:
  - 1. Administrator - All privileges
  - 2. Controls Technician - All programming and configuration
  - 3. Building Coordinator - Read only
  - 4. Commissioning Agent – Read only
  - 5. A/E, Consultant, Facilities - Read only
- E. Change of Value Processing
  - 1. Property values shall be displayed based on the receipt of confirmed and unconfirmed Change of Value notifications. Operators shall have the ability to subscribe to COV notifications for all objects that support COV subscriptions.
  - 2. After initialization, all graphic display screens shall update the displayed values using COV notifications if COV notification capabilities are available from the data source.
  - 3. The COV increment shall be adjustable by an operator using BACnet services.

### 3.8 LOCAL AREA NETWORKS

- A. This section provides requirements that are specific to the integration of multiple BACnet networks, possibly on different LAN types, into a single BACnet internetwork.
- B. Network Numbering:
  - 1. Cornell BACnet network numbers are based on a "facility code, network" concept. The "facility code" is the Cornell-assigned numeric value assigned to a specific facility or building. The "network" typically corresponds to a "floor" or other logical configuration within the building. BACnet allows 65535 network numbers per BACnet internetwork.
  - 2. Cornell's network numbers are thus formed as follows: Network Number = "FFFFN" where:
    - a. FFFF = Facility Code
    - b. N = 0-9 This allows up to 10 networks per facility or building
  - 3. N = 0 (zero) will generally be assigned to a facility's BACnet Ethernet LAN. Normally, this network is connected to the campus backbone. The additional N-numbers will be assigned to any ARCNET or MS/TP networks as required.
  - 4. The Contractor shall contact BACSI for assignment, or confirmation, of the Network Number(s) to be used prior to beginning device configuration.
- C. IP Address Assignments:
  - 1. Cornell maintains specially configured VLANs for the purpose of securely transporting BACS communication traffic. Address assignments are coordinated by BACSI.
  - 2. The Contractor shall contact BACSI for assignment of IP addresses (and possibly non-standard UDP ports) prior to beginning device configuration.

### 3.9 BACNET ROUTERS

- A. The Contractor shall configure each BACnet router to transmit network layer (routing) error messages to the EMCS.

### 3.10 PROCEDURES

- A. For demolition or removal of existing control equipment, or the addition of new control equipment on the campus backbone network, the contractor shall inform the Energy Management and Control System (EMCS) Operations at 607-255-5777 prior to any potential connection to, or interruption of, the data communication network. Additional current information can be found at [pminfo.emcs.cornell.edu](http://pminfo.emcs.cornell.edu).
- B. Installation, Modification, Retrofit, and Removal of BACS Hardware and Software:
  - 1. Prior to commencing work:
    - a. The Contractor shall notify EMCS of the scope of work, date work is to start, tentative schedule of remaining work, and the contact information for the responsible application engineer, technicians and contractor personnel.
    - b. On larger Projects (300 or more devices), the Contractor shall conferred with EMCS/BACSI regarding measures to be employed during construction to protect the BACS network infrastructure of the University before and during the project, e.g., firewalls, sequestered construction servers, Virtual Private Network connections, etc. Transfer of programs, point names, and other configuration from the construction server to the production server should be done by the vendor as part of commissioning.
    - c. The Contractor shall review with, and provide documentation to, EMCS/BACSI regarding the network topology and device instance numbering scheme for the new controls being installed. Upon job completion, accurate as-built drawings are required that clearly show the network topologies including all switches, repeaters, and devices, both for IP and child MS/TP and ARCNET networks.
    - d. The Contractor confers with the Zone Facility Manager prior to any demolition activities. Demolition activities should be planned to proceed in an orderly way to minimize impact and disruption to Campus BACS networks.
  - 2. On Projects involving retrofit/replacement of existing BACS devices in a facility:
    - a. Upon request, EMCS will provide an MS-Excel spreadsheet that indicates which existing points appear in EMCS graphics, trends and reports; which points have previously come into alarm; and the remaining points in the controller.

- b. The Contractor shall then provide to EMCS a mapping of all controller points that have been renamed or removed showing the old and new designation or status.
    - c. The Contractor shall inform EMCS of all changes to communication, including any addresses that have been retired, replaced, etc., so that the Owner's network database can be kept current.
    - d. As new BACS devices are added to Campus networks, the Controls Contractor shall complete and submitting the appropriate checklists for EMCS/BACSI and EMCS General Foreperson review. Visit <http://pminfo.emcs.cornell.edu> for downloadable copies of the checklists. Devices added to in-service non-sequestered building automation networks must be configured and submitted to EMCS for definition and synchronization within one business week of activation.
  - 3. When the Controls Installation is complete and the project desires alarm reporting to EMCS:
    - a. EMCS/BACSI shall review with the Contractor previous submitted documentation, status of job, and network safety measures in place.
    - b. EMCS/BACSI will work with the PM and the Contractor to complete final integration of new controls into the Campus BACS infrastructure, including defining and synchronizing field panels with the EMCS database for alarm reporting.
- C. Check out of BACnet/IP Installations
  - 1. Prior to connection to the Campus backbone network, it must be demonstrated to the EMCS General Foreperson that these criteria have been met:
    - a. The IP 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.
    - b. The device's Device Name must be shown to conform to Cornell standards.
    - c. The names of BACnet objects within a device must be shown to conform to Cornell's naming conventions.
    - d. The device's Device Instance Number (DIN) must be shown to conform to Cornell's naming conventions.

2. 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.
3. 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 or Alerton) and the EMCS alarm server.
4. For each device containing network variables, a list of network variables must be provided showing that each network variable references a valid network-accessible point.
5. For each device containing points that are to issue UnconfirmedCOVNotifications, 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.
6. 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.
7. Ethernet devices must be connected to CIT provided Ethernet network jacks, or a CIT managed switch. In the event a switch needs to be installed in a mechanical room, closet, enclosure, or other non-CIT node room location, the switch can be procured from CIT network engineering. The equipment used must be selected from the list of approved equipment.



**EXHIBIT "A" – CORNELL ALARM AND EVENT PRIORITIES**

| <b><u>MESSAGE GROUP</u></b>                    | <b><u>PRIORITY RANGE</u></b> | <b><u>NETWORK PRIORITY</u></b> | <b><u>BRIEF DESCRIPTION</u></b>                                                                                                               |
|------------------------------------------------|------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Life Safety                                    | 0 - 31                       | Life Safety Message            | Notifications related to an immediate threat to life, safety, or health such as fire detection or armed robbery                               |
| Property Safety                                | 32 - 63                      | Life Safety Message            | Notifications related as an immediate threat to property such as forced entry                                                                 |
| Supervisory                                    | 64 - 95                      | Critical Equipment Message     | Notifications related to improper operation, monitoring failure (particularly of Life Safety or Property Safety monitoring), or monetary loss |
| Trouble                                        | 96 - 127                     | Critical Equipment Message     | Notifications related to communication failure (particularly of Life Safety or Property Safety equipment)                                     |
| Miscellaneous Higher Priority Alarm and Events | 128 - 191                    | Urgent Message                 | Higher-level notifications related to occupant discomfort, normal operation, normal monitoring, or return to normal                           |
| Miscellaneous Lower Priority Alarm and Events  | 192 - 255                    | Normal Message                 | Lower-level notification related to occupant discomfort, normal operation, normal monitoring, or return to normal                             |

**EXHIBIT “B” – CORNELL COMMAND PRIORITIES**

| <b><u>PRIORITY<br/>LEVEL</u></b> | <b><u>APPLICATION</u></b>  | <b><u>PRIORITY<br/>LEVEL</u></b> | <b><u>APPLICATION</u></b> |
|----------------------------------|----------------------------|----------------------------------|---------------------------|
| 1                                | Manual-Life Safety         | 9                                | Available                 |
| 2                                | Automatic-Life Safety      | 10                               | Available                 |
| 3                                | Available                  | 11                               | Load Shedding             |
| 4                                | Available                  | 12                               | Available                 |
| 5                                | Critical Equipment Control | 13                               | Available                 |
| 6                                | Minimum On/Off             | 14                               | Available                 |
| 7                                | Available                  | 15                               | Available                 |
| 8                                | Manual Operator            | 16                               | Available                 |

END OF SECTION

## **SECTION 23 09 23**

### **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.
- A. The BACS shall have the following capabilities as described in these specifications:
  - 1. The network controllers shall be connected directly to the Owner's Ethernet Network. The network controller shall also contain SNMP for integration to the Owner's Network Controllers System.
  - 2. The system shall be capable of sending both emails and text messages, and calling phone numbers for alarms. Coordinate with the Owner for email addresses, phone numbers and alarms.
  - 3. Network controllers shall all be flash upgradeable and not require changing chips for upgrades.
  - 4. Short term logging of historical data shall be provided for every BACS input and output in the system. Each point shall be capable of being logged for a minimum of two (2) weeks.

- B. The BACS shall consist microcomputer controllers of modular design providing distributed processing capability, and allowing future expansion of both input/output points and processing/control functions.
- C. The system shall consist of the following components:
  - 1. Provide Ethernet-based network controllers as described in this specification. Controllers shall connect directly to the Operator Workstation over Ethernet, provide communication to the Standalone Digital Control Units and/or other Input/Output Modules and serve as a gateway to equipment furnished by others.
  - 2. Provide the necessary quantity and types of standalone controllers to meet the requirements of the project for mechanical equipment control including air handlers, central plant control, and terminal unit control. Each standalone controller shall operate completely standalone, containing all of the I/O and programs to control its associated equipment.
  - 3. A high speed Ethernet connection to the site shall be used for offsite access to the site. Coordinate with the Owner's IT professionals for high speed system access and shall comply with Owner's requirements to maintain the level of security required by the Owner. Coordinate with Owner and provide VPN (Virtual Private Network) as required, to comply with the Owner's IT professionals requirements.

## 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 230504 – Electric Wiring
- B. Section 230901 – Building Automation Control System Communications.

## 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.
  - g. Complete bill of materials listing all devices and manufacturer numbers.
- 4. List of all points, including alarms and trends: A listing of all input/output (I/O) points shall include all physical and virtual points, organized by system/sub-system; names, descriptors, and point types; as well as the following:
  - a. Hardware & Software point type and addresses.
  - b. Specific input points that must be able to be put in test mode to facilitate commissioning.
  - c. Listing of any associated alarms, as well as annunciation location (BACS, EMCS, etc). Control loops shall include an adjustable deviation from setpoint alarm based upon error and time. The alarm parameters shall be the state the point is in to cause a particular alarm, including whether the source system is also enabled. Examples of points in this list are as follows:
- 5. Detailed written sequences of operation.
- 6. Submit a valve and damper scheduled showing size, pressure drop configuration, capacity, and locations. Provide apparatus Bulletins and data sheets for all control system components.
- 7. Product Data: The BACS vendor shall submit manufacturer's technical product data for each control device, panel, controller, and accessory furnished indicating dimensions, capacities, performance and electrical characteristics, and material finishes. Also include installation, start-up, calibration, and maintenance instructions as well as all cable and tubing requirements.
- 8. Wiring Diagrams: The BACS vendor shall include detailed wiring. Indicate all required electrical wiring. Wiring diagrams shall include both ladder logic type diagrams for motor starter, control, and safety circuits and detailed digital interface panel point termination diagrams with all wire numbers and terminal block numbers identified. Provide panel termination drawings on separate drawings. Ladder diagrams shall appear on the system schematic. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed. All wiring of related components that make up a system shall be grouped together in one diagram (e.g., all wiring diagrams for the components and devices on a particular AHU shall be shown on one drawing. The supply fan components and devices shall not be shown separate from return fan components and devices, etc.).

- B. Record Documents: Record documents shall be prepared reflecting the final installed condition of the BACS. These as-built documents shall be kept up to date throughout the construction and warranty period. Provide the following information for approval prior to project closeout:
1. Maintenance instructions and spare parts list for each type of control device, control unit, and accessory.
  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 Mechanical and Electrical Commissioning Specification Section 230800 and 260800.

#### 1.7 WORK INCIDENTAL TO BACS 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. The BACS Contractor/Subcontractor is responsible for providing 120 volt dedicated power to all BACS panels and for providing 120 volt dedicated power emergency power with surge protection to all BACS panels, where noted.
- D. Electrical trade to provide occupancy sensors unless noted otherwise. Refer to responsibility matrices in Part 3.
- E. The BACS to provide 120 volt dedicated power and control transformers at all microprocessor based VAV terminal unit controllers. As an option, provide control transformers sized to serve multiple VAV terminal unit controllers and laboratory air valve controllers. 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.



- F. BACS Contractor/Subcontractor is responsible for providing Ethernet data drops at main building controller and IP controllers.

## 1.8 SYSTEM ADJUSTMENT AND CALIBRATION

- A. When the Work has been completed, completely adjust and calibrate the control system. Review the operation of each system input and output, control loops and/or software routings, timing functions, operator entered constants and facilities management functions and observe that they perform their intended functions. Provide a complete values and points log, printed every hour, for one week to demonstrate control functions and programming. Provide one point log for summer operation and one winter. Points to be trended shall be selected by the engineer. When above procedure has been completed and the control system is operating satisfactorily, submit a letter with one copy of completed values and points log to the Owner's Representative advising them that the control system is 100% complete and operates in accordance with the Contract Documents.
- B. After review and approval of points log by the Engineer, the BACS Contractor shall schedule a technician on site for field review of system components, operation and graphics as part of final system appearance.

## 1.9 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.
  - 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. 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.
- D. Software and Hardware Updates - At the end of the first six months, and during the subsequent six months, the BACS Contractor shall update the equipment and any controllers, servers, workstations, 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.

## PART 2 - PRODUCTS

### 2.1 SENSORS

#### A. Temperature Sensors / Transmitters:

1. Temperature sensors / Transmitters shall comply with the following as a minimum:
  - a. 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) over a range of -30 to 230°F.
  - b. Accuracy: +/- 0.4°F accuracy at calibration point. When used in combination with a humidity and/or CO<sub>2</sub> sensor, +/- 0.5°F is acceptable.
  - c. Element: Thermistor.
    - 1) Outside air (OA) temperature and liquid immersion sensors: Thermistor or Integrated circuit.
2. Room Temperature Sensor:
  - a. These shall be an element contained within a ventilated cover, suitable for wall mounting on a standard electrical box. Provide an insulated base. Provide in white, unless noted otherwise.
  - b. Setpoint Adjustment: Provide set point adjustment where indicated. The setpoint adjustment shall be a warmer/cooler indication that shall be scalable via the BACS. Programmable scale shall have the capability to be limited via the BACS. Public spaces shall not have setpoint adjustment.

- c. Occupancy Override: Where spaces do not have occupancy/vacancy sensors, provide a button on the room sensor enclosure where indicated. This shall be a momentary contact closure. Public spaces shall not have occupancy overrides.
    - d. Display: Alphanumeric.
  - 3. Single Point Duct Temperature Sensor:
    - a. These shall consist of a sensing element, junction box for wiring connections, and a gasket to prevent air leakage or vibration noise. The sensor probe shall be stainless steel.
  - 4. Averaging Duct Temperature Sensor:
    - a. 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. The averaging sensor tube shall contain at least four thermistor sensors.
- B. Humidity Sensors:
  - 1. Sensors shall comply with the following as a minimum:
    - 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.
    - d. Accuracy:
      - 1) General Duty, monitoring: +/- 3% RH between 20-90% RH at 77 °F, including hysteresis, linearity, and repeatability.
      - 2) 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.
  - 2. Device shall be suitable for duct, wall, or outdoor mounting. Device shall be combined into one device with temperature and CO2 sensors, where applicable. 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. Duct sensors and outdoor air humidity sensors shall be suitable for ambient temperature conditions of -40 to 212°F.

C. Air Flow Sensors/Transmitters:

1. Air flow sensors shall be Pitot-tube averaging grid or Vortex Shedding type.
  - a. Fan inlet grids shall be used where possible to measure fan flow. Fan inlet grids shall be provided by the fan vendor, where possible. BMS contractor shall provide fan inlet grid when it is not provided by fan vendor and it shall not block or affect fan efficiency.
  - b. The use of "golf ball" type airflow probes is not acceptable.
  - c. The use of combination control damper/flow measurement devices is not acceptable.
2. Duct Mounted Air Flow Sensor:
  - a. Rectangular: 16 gauge galvanized casing, 8 in. deep, with formed 1-1/2 in. integral 90° connecting flanges.
  - b. Oval: 18 gauge galvanized casing, 8 in. long between beads with 1 in. connecting sleeve on each end (10 in. overall length). Actual O.D. dimensions are 1/4 in. less than specified duct I.D. dimensions.
  - c. Accuracy: Within 2% throughout the velocity range of 600 FPM and over, when installed in accordance with published recommendations.
  - d. Temperature: 350°F continuous operation, 400°F intermittent operation.
  - e. Humidity: 0-100% continuous operation.
  - f. Corrosion Resistance: Good salt air, excellent solvent and aromatic hydrocarbon resistance.
  - g. Element Material: 6063-T5 anodized aluminum.
  - h. Connection Fittings: 1/4 in. compression, suitable for use with thermoplastic or copper tube.
  - i. Acceptable Manufacturers: Accutrol Vortek, Air Monitor, Paragon
3. Fan Inlet Air Flow Stations:
  - a. Material: 6063-T5 anodized aluminum, galvanized mounting brackets.
  - b. Accuracy: Within 2% throughout the velocity range of 600 FPM and over, when installed in accordance with published recommendations.
  - c. Temperature: 350°F continuous operation; 400°F intermittent operation.

- d. Humidity: 0-100% continuous operation.
  - e. Connection Fittings: 1/4 in. compression, suitable for use with thermoplastic or copper tube.
  - f. Corrosion Resistance: Good salt air and mild acid resistance, excellent solvent and aromatic hydrocarbon resistance.
  - g. Design Equipment: Paragon Controls FE-1050.
  - h. Acceptable Manufacturers: Accutrol Vortek, Air Monitor, Paragon
- D. Current Switches (CS):
- a. For constant speed motors, switch shall indicate loss of status when current falls below an adjustable trip point.
  - b. CS shall include LED indication of status.
  - c. Acceptable Manufacturer: Veris Industries.
- E. Occupancy/Vacancy Sensors:
- 1. For spaces with standalone lighting controls, the sensors are to be provided by the electrical trade to control both HVAC and lighting; The BACS contractor shall provide a single gang box with face plate at the sensor. Refer to the Standalone Lighting Controls Responsibility Matrix in Part 3.
- A. Safety/Status Devices:
- 1. Low Limit Detector: Electric type, with 20 ft. long serpentine element, with manual reset and auxiliary contacts to the BACS, set for 37°F for "freeze" protection and 55°F for fan discharge application. Provide a 20 ft. long element for every 25 sq. ft. of coil face area.
  - 2. High Limit Detector: High limit thermostats shall be located as directed, and shall be manual reset type set at 120°F in the return and 180°F in the discharge. Thermostats shall be double pole so as to provide input capability for alarm at the temperature control system.
  - 3. Pump status shall be provided through adjustable range current sensing element on pump motor.
  - 4. Fan status shall be provided through adjustable range current sensing element on the fan motor.

B. Miscellaneous Devices:

1. Provide necessary, relays, transformers, required for a complete and operable system.

2.2 CONTROL DAMPERS

A. General:

1. Dampers shall be applicable for the rated pressure and velocity service. Damper structural rating shall exceed extreme anticipated conditions like fan deadhead.
2. Where damper sizes are not specifically indicated, they shall be sized by the BACS Contractor. Maximum velocity shall be 1500 fpm and maximum pressure drop 0.1 in. w.g.
3. Modulating dampers shall be carefully selected to control in a smooth and stable fashion across the range of anticipated conditions.
4. Except where size dictates a single blade, dampers shall always be opposed blade.
5. 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.
6. 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.
7. Output to modulating control dampers shall be analog.

B. Electrical Operators:

1. Provide 24 VAC control operators which are 0-10 VDC input proportional or two position with spring return as needed by control sequence and designed to operate the control dampers. Operator shall be synchronous motor driven with sufficient reserve torque to provide smooth modulating action or two position action and adequate close off rating.
2. Actuators shall be electric, one motor only. Stacking of actuators is unacceptable. Design for a minimum of 60,000 full cycles at full torque and listed to UL 873. 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.

3. Acceptable Manufacturer: Belimo

C. General Duty, Control Dampers:

1. Provide control dampers as shown on the drawings and diagrams, to meet the following minimum construction standards.
2. Leakage: Class 1, 4 CFM/sq. ft. at 1 in. W.C., tested per AMCA Standard 500-D-98 and AMCA Standard 511 and bearing AMCA's Certified Ratings for both air performance and air leakage.
3. Frame: 16 gauge galvanized steel structural hot channel with tabbed corners for reinforcement to meet 13 gauge criteria.
4. Blades: 14 gauge (equivalent thickness galvanized steel) roll forward air foil type for low pressure drop and low noise generation. Blades shall be parallel for two-position dampers and opposed, for modulating dampers.
5. Blade Seals: Ruskiprene, suitable for -72°F to +275°F mechanically locked into the blade edge.
6. Jamb Seals: Flexible metal, compression type.
7. Blade Axles: 1/2 in. plated steel hexagonal positively locked into the damper blade. Linkage conceded out of the air stream.
8. Bearings: Corrosion resistant, permanently lubricated stainless steel sleeve.
9. Dampers subject to corrosive fumes or humidity shall be constructed of stainless steel.
10. Dampers over 48 in. length and height shall be made in multiple sections.
11. Where shown or required for proof of closure or open position, provide factory installed damper positioning switch package.
12. Design Make: Ruskin CD60.
13. Acceptable Manufacturers: Greenheck, Ruskin and Tamco.

D. High Performance Thermally Broken and Insulated Control (Motorized) Dampers:

1. Provide high performance thermally broken and insulated control dampers at outdoor air intake and exhaust louvers to meet the following minimum construction standards.

2. Leakage: Shall not exceed 4 CFM/sq. ft. at 1 in. W.C. (Leakage Class 1), tested per AMCA Standard 500-D-98 and AMCA Standard 511 and bearing AMCA's Certified Ratings for both air performance and air leakage. Holding torque shall not exceed 5 in. lbs./sq. ft. on opposed blade dampers, and 7 in. lbs./sq. ft. on parallel blades with a minimum torque of 40 in. lbs.
3. Frame: 0.125 in. extruded aluminum structural hat channel with tabbed corners for reinforcement.
4. Blade Seals: Ruskiprene II, suitable for -40°F and with locked into the blade edge extruded silicone, down to -70°F.
5. Jamb Seals: Flexible polycarbonate type.
6. Blade Axles: 1/2 in. plated steel hexagonal positively locked into the damper blade. Linkage conceded out of the air stream.
7. Bearings: Corrosion resistant, permanently lubricated molded synthetic.
8. Dampers over 48 in. length and height shall be made in multiple sections.
9. Where shown or required for proof of closure or open position, provide factory installed damper positioning switch package.
10. Design Make: Ruskin TED50.
11. Acceptable Manufacturers: Greenheck, Ruskin and Tamco.

## 2.3 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.

## 2.4 CONTROL WIRING AND INSTRUMENTATION TUBING

- A. All control wiring shall comply with requirements of "Electrical Wiring" in Section 230504.
- B. All instrumentation tubing in mechanical rooms shall be hard drawn type L copper.

## 2.5 CONTROLLERS

- A. The control system shall consist of a network of controllers. It is intended to allow cost-effective application of manufacturers' standard products while maintaining the integrity and reliability of the control functions commensurate with their application. 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. 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. 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. BACS 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.
- C. Building and system level controllers (for example, air handling units, hydronic systems, laboratory zones) 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. All points and functions that make up a functional system shall be included in one controller to qualify for this stand-alone functionality. Refer to control schematics for function point groups. Examples of required functional point groupings, by owner, are as follows:
1. Air Systems: All points and functions required to control an air handler with all directly associated supply fans, return fans, exhaust fans, airflows, heat recovery, coils and downstream static pressure sensors. This excludes the terminals that may be associated with that air handler.
  2. Hydronic Systems: All points and functions associated with the supply side of a hydronic system such as pumps, flow meters, temperature sensors, differential pressure sensors, proof indications, valves etc. This excludes the terminals on that hydronic system.
  3. Terminals: All points and functions required to control one terminal system including variable airflow devices, control dampers, valves, temperature and humidity sensors, etc. This does not include the scheduling period or any outside air that may be necessary for control.
- D. Where control sequences depend on global variables such as outside air temperature, the controller shall have the capability of either using the last value or a default value.

- E. Values that may be received across the network are as follows:
  - 1. Air Systems: Outside air temperature and humidity, emergency power source indications, terminal based reset parameters, VAV box commands, smoke modes.
  - 2. Hydronic Systems: Outside air temperature and humidity, emergency power source indication, and terminal based reset parameters, control valve commands.
- F. 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.
- G. Controllers storing their configuration in volatile memory shall not be used. Software stored in non-volatile memory will not have to be downloaded from the central server after an interruption of power occurs.
- H. 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 automatic updating, such as a Network Time Protocol (NTP) server or Precise Time Protocol (PTP) server, of the controllers' clocks via a time master.
- I. 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.
- J. 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, 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 UPS, the panel shall be provided with a means of monitoring the power source status to the controlled equipment to enable special emergency power logic. This can be a dedicated power monitor or a value coming from transfer switch contacts.
- K. 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, 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 UPS, the panel shall be provided with a means of monitoring the power source status to the controlled equipment to enable special emergency power logic. This can be a dedicated power monitor or a value coming from transfer switch contacts.

## PART 3 – EXECUTION

### 3.1 GENERAL SYSTEM REQUIREMENTS

- A. This section defines the requirements for configuration and installation of the BACS.
- B. 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 Specification 230901. No device will be connected to a Cornell network until these conventions have been understood and met.
- C. 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.
- D. 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).
- E. All existing BACS controllers and sensors removed from the project shall be turned over the Owner in good condition.
- F. This contract shall be responsible for decommissioning of the BACS being removed and modifications to existing system graphics and software programming.

### 3.2 SENSORS

- A. Room 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.
- B. 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.
- C. One outside air (OA) temperature / humidity sensor with a global networked point provided for each building. Generally, these shall be located on a north wall of the building and installed with stand-offs. On each 100% OA system, locate sensor with dewpoint calculations in outside air intake plenum.
- D. Refer to drawings for installation requirements for liquid differential pressure sensors.

- E. All pressure switches shall be mounted in accessible and, to the extent possible, vibration-free locations. Switches shall be installed in accordance with the manufacturer's installation instructions.
- F. Do not use liquid 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 ASDs.

### 3.3 CONTROL DAMPERS

- A. 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.

### 3.4 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 BACS 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.

### 3.5 CONTROL WIRING AND INSTRUMENTATION TUBING

- A. All control wiring shall comply with requirements of "Electrical Wiring" in Section 230504.
- B. It is extremely important that pneumatic tubing be properly terminated. Tubing shall be removed completely back to the main. Copper tubing shall be terminated with soldered end cap; poly tubing shall be terminated using brass plugs. Bending over copper tubing, pinching/brazing, and the use of sheetmetal screws to make terminations are not acceptable.

### 3.6 CONTROLLERS

- A. The controllers and system architecture shall be configured and programmed to carry out the sequences of operation contained in the project documents.

- 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. 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.
- D. 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.
- E. 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.

- F. 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.
- G. 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.

- H. Alarm Programming: Alarms shall be intelligent based upon the algorithm in this section
1. Alarm programming related to BACS 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 BACS 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 BACS 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 BACS 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 LOW AND HIGH LIMIT SAFETY FUNCTIONS

- A. Provide for where noted on drawings. Wiring to be directly to the motor starter. High limit controller (firestat) shall be located in the unit discharge. Low limit shall be strung on the upstream face of cooling coils.

### 3.9 SMOKE DAMPERS AND FIRE/FAN SHUT DOWN

- A. Provide control for smoke dampers as required. Division 26 "Electric" to provide 120 volt power wiring and associated signal wiring to close all smoke partition smoke dampers associated with a particular air handling unit upon alarm at any duct smoke detector in that particular system. Coordinate the voltage of the EP switch with Division 26 "Electric".
- B. Division 26 "Electric" to provide a signal to stop air handling unit fans and close air handling unit smoke dampers upon activation of the fire alarm system. Wiring to be directly to the motor starter.
- C. The BACS Contractor shall provide control wiring for a digital input point for an end switch that shall prevent the operation of the air handling unit fans until its corresponding smoke dampers are proven fully open.
- D. Division 26 "Electric" shall also provide a signal to the BACS control system that the fire alarm system is activated.
- E. 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.
  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.
- F. 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.
- G. 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. BACS (Building Automation Control System) Component Fault:
  - a. Upon activation of any of the following BACS component faults, the supply and return fans, or exhaust fan are de-energized via BACS.
    - 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 BACS 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 BACS 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.
- H. 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. BACS 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 BACS 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 BACS 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 BACS 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.

### 3.10 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.

### 3.11 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 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.

### 3.12 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.

### 3.13 CONTROL SEQUENCE

- A. Refer to plan for control diagrams, sequence of operation and points lists.

END OF SECTION



**SECTION 23 31 00**

**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. 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, etc.

B. Ductwork Shop Drawings

1. Prepare minimum 1/4 in. scale drawings:
  - a. 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.
  - b. Constructed from actual field inspections and measurements so as to assure a complete job.
  - c. Incorporate dimensions of actual equipment proposed for use on the project.
  - d. Showing adequate sections, elevations, and plan views and indicating the bottom of ductwork elevations from the finished floor.
  - e. Indicating all volume dampers, fire dampers, smoke dampers, damper access doors and other accessories required for a completed project.
  - f. Indicate roof, wall and floor opening dimensions and locations shown on shop drawings.
  - g. Indicate the location of the duct smoke detectors, increase duct size, ensure the minimum straight ductwork upstream or/and downstream at smoke detectors, where required for proper installation, per smoke detector manufacturer's recommendations. Coordinate minimum duct size required with 28 "Electronic Safety and Security".
2. Call to the attention of the Engineer immediately, any major deviations from the Contract Drawings, which must be made. All deviations shall be documented in writing. Resubmit with corrections for final Engineer review.
3. Submit prints to each Sub-Contractor of the other trades for review for interferences and coordination with their work.

- C. Prepare a duct pressure testing report similar to that suggested by SMACNA and submit for review. Duct testing shall be conducted in the presence of the Owner's Representative. Provide test reports indicating pressure tests performed. Include date, a ductwork approved shop drawings sheet with the section tested highlighted, test pressure and leakage rate.

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.           |

- B. Any new ductwork connected to existing systems must adhere to the requirements outlined above. Contractors are responsible for verifying the maximum static pressure of the existing systems to determine the appropriate pressure class for the new ductwork. Inform Owner's Representative and Engineer of any unknown conditions or discrepancies.

## PART 2 - PRODUCTS

### 2.1 DUCTWORK MATERIALS

- A. See Exhibit at the end of this section for where sheet metal materials shall be applied, and remarks.
1. Galvanized Sheet Steel: 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. Make: Semco, United Sheet Metal, unless noted otherwise, or approved equal.

## 2.2 SQUARE AND RECTANGULAR DUCTWORK

- A. 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.
- B. Corner closures shall be required as described and illustrated by SMACNA Duct Construction Standards.
- C. 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.
- D. Bracing and hanging of ductwork shall be per SMACNA Standards for size and system class of ductwork being used.
- E. 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. 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.
  2. No stovepipe will be allowed.
  3. 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.
4. 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.
5. 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.
- 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 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. Sealants and tapes shall be listed and labeled in accordance with UL 181A or UL181B and marked according to type, and per manufacturer product requirements for associated system and application/installation location.
  - 1. 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, or approved equal.
  - 2. Duct sealant for outdoor applications shall be fibrated, water based, Hardcast Versa-Grip VG-102, Ductmate Fiberseal, Foster 32-17 or Childers CP148, or approved equal.

## 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 AIR DUCTS

- A. Flexible air ducts and connectors shall be constructed in compliance with NFPA Bulletin 90A, 90B and UL Standard 181 and shall be listed and labeled as Class I Air Duct.
- B. Flexible air ducts and connectors shall be tri-laminate:
  - 1. Consisting of corrosion resistant galvanized steel helix encapsulated by a double lamination of polyethylene or spun bond nylon.
  - 2. Factory applied (R 6.0) fiberglass exterior insulation, sheathed in a seamless, tri-directionally reinforced, metalized polyester, exterior vapor barrier.
  - 3. R-value shall be classified by Underwriters Laboratories, and certified by the Air Diffusion Council, in accordance with ADC Flexible Duct Performance and Installation Standard (1991), using ASTM C-518, at installed wall thickness, on flat insulation only. Comply with ASHRAE/IESNA 90.1.
  - 4. Recommended operating pressure for flexible ductwork shall be three times maximum system press but not less than 6 in. w.g. positive pressure for 4 in. - 20 in. dia., 5 in. w.g. negative pressure through 16 in. dia., 1 in. negative pressure for 18 in. and 20 in. dia. Maximum velocity of 5500 fpm.
  - 5. Operating temperature range - 20°F to 250°F, intermittent @1/2 in. pos. w.g. max., -20°F to 140°F, continuous at maximum pressure.
  - 6. Flame Spread: 25 max. smoke developed rating: 50 max.
  - 7. Porous inner core flexible duct shall not be used.
- C. Static pressure and thermal performance shall be tested and certified in accordance with Air Diffusion Council (ADC) Test Code FD-72-R1 under conditions of 140°F for 164 hours and 180°F for 4 hours.

- D. Acoustical performance shall be certified in accordance with ASTM E 477 and/or Air Diffusion Council Test Code FD-72-R1.

1. Minimum Acoustic Performance:

- a. The insertion loss (dB) of a 6 foot length of duct when tested in accordance with ASTM E477 at a velocity of 1000 feet per minute shall be at least:

|             | <u>125</u><br><u>Hz</u> | <u>250</u><br><u>Hz</u> | <u>500</u><br><u>Hz</u> | <u>1000</u><br><u>Hz</u> | <u>2000</u><br><u>Hz</u> | <u>4000</u><br><u>Hz</u> |
|-------------|-------------------------|-------------------------|-------------------------|--------------------------|--------------------------|--------------------------|
| 8 inch dia. | 26                      | 27                      | 27                      | 31                       | 32                       | 27                       |
| 12 inch dia | 22                      | 26                      | 24                      | 31                       | 31                       | 20                       |

- E. Friction loss and leakage for flexible duct only shall be certified in accordance with Air Diffusion Council Test Code FD-72-R1. Leakage for connections shall be accordance with UL 181 requirements.

- F. Basis-of-Design: Flexmaster 6B (R-6.0).

- G. Acceptable Manufacturers:

1. Dundas-Jafine Type SPC R6.0
2. Hart & Cooley Type F216 (R-6.0)
3. Flexible Technologies, Inc. Thermaflex Type M-KE (R-6.0)
4. Atco Rubber Products, Inc. Type 036 (R-6.0)

## 2.8 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. 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.

## 2.9 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 in. high lettering reading "SMOKE DAMPER", "FIRE DAMPER" or "FIRE/SMOKE 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 metal edge for all Ductmate access doors.



## 2.10 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.
  - 1. 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 requirements 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. Where a return or exhaust duct is shown to be left open ended, provide hardware 05 inch aluminum mesh screen at opening.
- K. Do not utilize flexible ductwork or connection in any way to connect variable or constant volume boxes to ductwork.
- L. Penetrations:
  - 1. 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.
  - 2. 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.
  - 3. For duct penetrations of rated walls, see Specification Section 230500 - Basic Mechanical and Electrical Requirements.
- M. 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 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 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.
- D. Systems designed to operate in excess of 3-inches w.c.: The entire system shall be leak tested.
- E. Provide test reports indicating pressure tests performed. Include date, section tested, test pressure and leakage rate.
- F. 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. All joints and connections on this ductwork shall be sealed using the approved ductwork sealant. 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.

### 3.4 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.

### 3.5 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.

### 3.6 TURNING VANES

A. Install only in square elbows.

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.

### 3.7 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. Install fire and smoke dampers in accordance with "Fire and Smoke Dampers" Section and applicable codes.
- D. Install all dampers furnished as part of "Building Management System" Section.

### 3.8 FLEXIBLE AIR DUCTS

- A. "Air duct" applies to conduit or passageway for conveying air to or from heating, cooling, air conditioning or ventilating equipment but not including the plenum as defined in NFPA 90A. "Air connector" applies to conduit for transferring air between an air duct or plenum and an air terminal device or an air inlet or an air outlet as defined by the NFPA 90A.
- B. For round to oval connections, provide round-oval flexible adapter.
- C. Flexible air ducts and connectors shall be provided in fully extended condition, free from kinks.
- D. Flexible air ducts and connectors shall not be used in systems with entering air temperatures in excess of 250°F.
- E. Flexible air ducts and connectors shall use only the minimum length required to make the connection and shall be installed in the horizontal or vertical position. Flexible elbows are not acceptable. Do not exceed a maximum length of 36 in., fully extended.
- F. Flexible air ducts and connectors shall use minimum 1/2 in. wide positive locking, steel worm drive clamp, or nylon plenum rated straps for joints and connections. One clamp or strap for the inside core liner and one clamp or strap for the outer jacketing. When non-metallic (nylon) straps are used, they should be listed and labeled to standard UL 181B. Fastener package should be marked UL 181 B-C.
- G. Collars to which flexible duct is attached shall be beaded and a minimum of 2 in. in length. Wrap twice with UL 181 tape and secure with clamp or strap. Sleeves used for joining two sections of flexible duct shall be beaded and a minimum of 4 in. in length. The draw band shall be positioned behind the bead on the metal collar.
- H. Outer vapor barrier and insulation shall be slid over inner core and collar, wrapped twice with UL 151 tape and secured with a clamp or strap.

- I. Connections shall be per SMACNA "HVAC Duct Construction Standards - Metal and Flexible", Air Diffusion Council "Flexible Duct Performance and Installation Standards" and NAIMA Installation Standards.
- J. Flexible duct shall be supported at manufacturer's recommended intervals, but no greater distance than 2'-6" on center and prior to all 90 degree bends. Maximum permissible sag shall be 1/2 in. per foot of support spacing. Provide a minimum of one hanger on each run of flexible duct.
- K. A connection to rigid duct or equipment shall be considered a support joint. Long horizontal duct runs with sharp bends shall have additional supports before and after the bend approximately one duct diameter from the centerline of the bend.
- L. Hanger or saddle material in contact with the flexible duct shall be of sufficient width to prevent any restriction of the internal diameter of the duct when the weight of the supported section rests on the hanger or saddle material. In no case shall the material contacting the flexible duct be less than 1-1/2 in. wide. Factory installed suspension systems integral to the flexible duct are an acceptable alternative hanging method when the manufacturer's recommended procedures are followed.
- M. The hanger shall be strapped around the flexible duct and secured to the structure above. Hangers shall not be attached to other mechanical or electrical objects. Hangers may be attached to an approved trapeze. Ceiling grid shall not be used to fabricate a trapeze. Support hangers shall be installed horizontal. Screws shall not be used to penetrate the flexible duct to attach to the hanger.
- N. Provide flexible duct connections and splices in accordance with manufacturer's recommended installation instructions.
- O. Seal flexible duct connections with sealing materials listed and labeled in accordance with UL 181B. Mechanically secure connections with approved clamping materials.

### 3.9 FLEXIBLE CONNECTIONS TO FANS AND EQUIPMENT

- 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.

### 3.10 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.

### 3.11 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.

### 3.12 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.

### 3.13 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".



**EXHIBIT I - DUCTWORK MATERIALS**

| <b><u>SERVICE</u></b>                             | <b><u>MATERIAL</u></b>                                                                                       | <b><u>SPECIAL REQUIREMENTS</u></b> |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------|
| Supply, return, vent, relief, outside and exhaust | Lock forming quality, galvanized steel ASTM A653 and A924, galvaneal/paint grip if not insulated and exposed | 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                    |
| Corrosive exhaust                                 | Type 316 stainless steel                                                                                     | Braze or weld airtight/watertight  |

END OF SECTION



## **SECTION 23 33 13**

### **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.

##### **1.2 SUBMITTALS**

- A. Submit product data, types, schedule of sizes, locations, and installation arrangements of all dampers.
- B. Submit manufacturer's UL listed installation details for each mounting arrangement.

##### **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/ft<sup>2</sup> at 1 in. w.g. (8.0 cfm/ft<sup>2</sup> 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 CERTIFICATION

- A. Contractor shall certify that dampers are accessible for servicing, are installed properly, and are operational. Submit three (3) copies of signed certification to the Owner's Representative for review.

### 3.4 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 23 34 00**

**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. Submit product data for 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. Conventional 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.

- D. EC Motors:

1. Motors shall be Electronically Commutated Type (EC), variable speed, DC, brushless motors specifically designed for use with single phase, 277 volt (or 120 volt), 60 hertz electrical input.

2. Motor shall be complete with and operated by a single-phase integrated controller/inverter that operates the wound stator and senses rotor position to electronically commutate the stator.
3. Motors shall be designed for synchronous rotation. Motor rotor shall be permanent magnet type with near zero rotor losses. Motor shall have built-in-soft start and soft speed change ramps.
4. Motor shall be able to be mounted with shaft in horizontal or vertical orientation. Motor shall be permanently lubricated with ball bearings. Motors shall be direct coupled to the blower.
5. Motor shall maintain a minimum of 85% efficiency over its entire operating range and have a turndown to 20% of full speed, (80% turndown).
6. Provide manual fan speed output control for field adjustment of the fan airflow setpoint.
7. Inductors shall be provided to minimize harmonic distortion and line noise.
8. Provide isolation between fan motor assembly and unit casing to eliminate any vibration from the fan to the terminal unit casing.
9. Provide a motor that is designed to overcome reverse rotation and not affect life expectancy.
10. The fan manufacturer shall provide a factory installed PWM controller for either manual or DDC controlled fan CFM adjustment. The manual PWM controller shall be field adjustable with a standard screwdriver. The remote PWM controller shall be capable of receiving a 0-10 VDC signal from the DDC controller (provided by the controls contractor) to control the fan CFM. When the manual PWM controller is used, the factory shall present the fan CFMs as shown on the schedule.
11. Acceptable Manufacturers: Emerson Ultratech, U.S. Motors-Nidec, GE-ECM, A.O. Smith or equivalent.

E. 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.
  - h. Motors shall be isolated from the primary exhaust air stream and shall be visible from the fan exterior for inspection and service.
- F. 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. 7-1/2 HP to 20 HP: "B" section, 4.6 in. minimum pitch diameter.
  - 4. 25 HP and Larger: "C" section 7.0 in. minimum pitch diameter.
  - 5. Drive ratio not over 4:1.
- G. Bearings:
- 1. Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy-duty regreasable 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.
- H. 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.

I. 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.

J. Coating:

1. All steel fan components shall contain an electrostatically applied, baked polyester powder coating. Paint must exceed 1,000 hour salt spray under ASTM B117 test method.

K. Vibration isolation for units shall be furnished by the fan manufacturer unless otherwise noted. Provide rubber in shear type vibration isolators.

L. 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

### 2.1 CENTRIFUGAL BLOWER/CENTRIFUGAL VENT SETS

A. Manufacturers: Subject to compliance with requirements of this section, provide products by one of the following:

1. Acme, Cook, Greenheck, New York Blower, Twin City, PennBarry.

B. Centrifugal Blower:

1. Construction:

- a. Fan shall be bolted and welded construction utilizing corrosion resistant fasteners. The scroll wrapper and scroll side panels shall be minimum 12 gauge steel. The entire fan housing shall have continuously welded seams for leak proof operation and shall have a minimum 1-1/4 in. outlet discharge flange.
- b. A performance cut-off shall be furnished to prevent the recirculation of air in the fan housing.
- c. Bearing support shall be minimum 1/4 in. welded steel.

- d. Lifting eyes shall be provided for ease of installation.
- 2. Flat Blade Wheel:
  - a. Wheel shall be steel. Non-overloading, centrifugal backward inclined, flat blade type.
  - b. Basis-of-Design: Greenheck, 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 233516.11 - OVERHEAD RETRACTABLE VEHICLE EXHAUST SYSTEM

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 shop drawings and product data for all specified equipment, materials and accessories.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The vehicle exhaust system equipment and accessories shall be a standard product of a single manufacturer.
- B. Warranty: Two (2) year parts and labor.

2.2 CENTRIFUGAL FAN

- A. The fan shall be specifically designed for the conveyance of diesel smoke and gases in accordance with Federal, State, and local code requirements as it applies to conveying explosive and carcinogenic particulate and gases produced by internal combustion engines. The fan housing and all components exposed to the combustible properties of the atmosphere within the ductwork created by the vehicle exhaust are explosive proof. The housing as well as the fan impeller shall have a construction of non-sparking, non-ferrous metal (cast aluminum).
- B. Provide Teflon shaft seals to keep aluminum housing and fan drive shaft from making abrasive contact.
- C. The fan motor shall be provided with a totally enclosed fan cooled motor. The motor shall be located outside of the air stream.

2.3 DUCT SYSTEM

- A. All ductwork shall be 22 gauge galvanized spiral, with all hardware including screws also being stainless steel.
- B. A 4 in. diameter, 25-foot hose shall be provided for connection to the vehicle. The hose shall contain high visibility yellow strips, and be 400°F rated. Car-Mon Model LTX or equivalent.

- C. The exhaust system shall be designed to transport exhaust emissions in the main duct a minimum of 3,000 feet per minute and provide a capture velocity no less than 5,800 feet per minute. The velocities shall be calculated at an average temperature of 250°F and static resistance of water gauge.
- D. The duct system shall be substantially air-tight to comply with CLASS 2 Product-conveying duct codes established by BOCA - Building Officials Code Administrators, UMC - Uniform Mechanical Codes, ACGIH - American Conference of Governmental Industrial Hygienists, SMACNA - Sheet Metal Air Conditioning Contractors National Association.

## 2.4 MISCELLANEOUS VEHICLE EXHAUST SYSTEM MODIFICATIONS

- A. IT IS THE RESPONSIBILITY OF THE VEHICLE EXHAUST SYSTEM MANUFACTURER TO VISIT THE SITE AND FIELD VERIFY THE TAILPIPE EXHAUST ADAPTER DESIGN AND FABRICATION REQUIREMENTS AT NO ADDITIONAL COST TO THE OWNER. THE EXHAUST SYSTEM MANUFACTURER SHALL ADVISE THE OWNER OF THE MODIFICATIONS REQUIRED. THE OWNER IS REQUIRED TO MODIFY THE APPARATUS. FLEXIBLE HOSE ASSEMBLY SHALL NOT BE ALLOWED TO TOUCH OR RUB THE BODY OF THE VEHICLE AT ANY TIME. NO ATTACHMENTS TO THE BODY OF THE VEHICLE IS PERMITTED. NO MECHANICAL ATTACHMENTS OR ALTERNATION OF THE VEHICLE IS PERMITTED EXCEPT FOR THE TAILPIPE MODIFICATION AS OUTLINED ABOVE UNDER TAILPIPE TERMINATION.
- B. Motorized Hose Reel: Reel to be spring operated and have a pull-down cable and ring. Car-Mon Model TSR-S24 or equivalent. See drawings for mounting height.
- C. On/Off: Micro Switch Fan Control provided with hose reel. Car-Mon Model ZE-NJ-2S or equivalent.
- D. Tailpipe Adapter: Car-Mon Model RSC or equivalent.
- E. U.L. Listed Control Box: Provide U.L. Listed/Approved Control Box, manufactured in accordance with UL standard UL-508 for enclosed industrial control panels.
- F. Back Draft Damper: Provide a back draft damper at the top of exhaust stack to eliminate outside air from entering building when fan is not energized.

## 2.5 DESIGN EQUIPMENT

- A. Car-Mon Products, Inc.

## 2.6 MANUFACTURERS

- A. Car-Mon Products, Inc., Harvey Industries, Inc., and PlymoVent.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide equipment in accordance with manufacturer's instructions. Provide necessary support steel for associated ductwork. Provide guards for all exposed belts, shafts and fan wheels. Provide necessary power and control wiring from control unit to exhaust fan.

END OF SECTION





## **SECTION 23 37 13**

### **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 insure 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.

##### **1.4 REQUIREMENTS FOR REGISTERS**

- A. 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.
- B. 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.
- C. Finishes:
1. Baked enamel (of colors as selected from the manufacturer's standard color chart), as scheduled.
- D. Design Equipment: Titus unless otherwise noted.
- E. Manufacturers: Anemostat, Carnes, Krueger, Titus, Price, Tuttle and Bailey, Nailor.

## 1.5 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: Anemostat, Carnes, Krueger, Titus, Price, Tuttle and Bailey, Nailor.

## PART 2 - PRODUCTS

### 2.1 SUPPLY TYPES

A. Type 1 - (Round Face Type):

1. Steel 20 gauge construction.
2. Round neck with smudge cone where scheduled.
3. Model: Titus TMR.

B. Type 2 - (Supply Air Grille):

1. Steel 20 gauge frame construction with double deflection capability and the front blades shall be parallel to the long dimension. Solid extruded aluminum air foil blades mounted in friction pivots for individual blade adjustment, spaced on 3/4 in. centers.
2. 1-1/4 in. wide flange with sponge rubber gasket.
3. Model: Titus 272-RL.

### 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.

## 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.

- 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 26 05 00

### 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 steam, condensate, hot water, chilled, drain 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 **laboratory equipment** and 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, gas, air, vacuum, lab gas 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 laboratory 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 laboratory equipment and special equipment. Verify connection requirements before bidding.

END OF SECTION

## **SECTION 26 05 01**

### **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  $\pm 5\%$ .

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.

|             | <b>Three Phase<br/>120/208V</b> | <b>Three Phase<br/>277/480V</b> |
|-------------|---------------------------------|---------------------------------|
| Ground      | Green                           | Green                           |
| Neutral     | White                           | Gray                            |
| A or L1     | Black                           | Brown                           |
| B or L2     | Red                             | Orange                          |
| C or L3     | Blue                            | Yellow                          |
| Isolated EG | Green<br>w/Yellow<br>Tracer     | Green<br>w/Yellow<br>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. 30 in.

Do not install receptacle outlets above  
electric baseboard heaters

- |    |                                                                                                                                  |                                                   |
|----|----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| f. | Receptacle outlets, hazardous areas; also<br>for refrigerators                                                                   | 48 in.                                            |
| g. | Receptacle outlets, weatherproof, above-<br>grade                                                                                | 24 in.                                            |
| h. | Clock outlets (104 in. AFF or 10 in. below<br>ceiling, whichever is lower) For large, high<br>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<br>standalone visual device (entire strobe lens<br>at heights indicated)                 | 80 in. to bottom of<br>the notification<br>device |
| n. | Standalone fire alarm audio device                                                                                               | 90 in. (min) to 96 in.<br>(max)                   |
| o. | Distribution panelboards, to top of<br>backbox                                                                                   | 72 in.                                            |
| p. | Terminal cabinets, control cabinets, to top<br>of backbox                                                                        | 72 in.                                            |
| q. | Disconnect switches, motor starters,<br>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 lamicoid 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 lamicoid identification nameplates for each circuit breaker in the main distribution panel listing the panelboard or equipment connected to each device.
3. Provide engraved lamicoid 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 26 05 26

### 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 #4/0 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 26 20 00**

**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 TRANSFORMERS

- A. Dry-Type Transformers:
1. Transformers to be factory-assembled and tested, air-cooled ventilated units for 60 Hz service. Transformers that require internal or external fan assisted forced air cooling to obtain ambient air (AA) rated kVA are not acceptable. Transformers 15 kVA and less shall have 185°C insulation system and shall be designed not-to-exceed 115°C rise above 40°C ambient. Transformers 30 kVA and higher shall have 220°C insulation system and shall be designed not-to-exceed 115°C rise above 40°C ambient. Insulation systems shall be U.L. listed. Cores shall be manufactured from a high-grade, non-aging, silicon steel with high magnetic permeability, low hysteresis and eddy current losses, one leg per phase, and grounded to enclosure. Cores shall be clamped with structural angles and bolted to the enclosure to prevent damage during shipment or rough handling. Remove clamping after installation.

Coils shall be continuous winding except for taps, copper, vacuum impregnated with non-hydroscopic thermosetting varnish and shall have a final wrap of electrical insulating material designed to prevent injury to the magnet wire. Transformers having coils with magnet wire visible will not be acceptable. 30 KVA, and larger, floor mounted. Under 30 KVA, wall mounted. Provide Mason type ND, Korfund or Vibrex vibration isolation devices for each transformer. Provide ground bar kit or a ground bar installed on the inside of the transformer enclosure.

2. Ratings: Shall be as indicated on the "Transformer Schedule" or as noted on the drawings. IEEE #C57, NEMA and US Government requirements shall apply. The transformer efficiencies shall meet or exceed the requirements of New York State and the US Department of Energy.
3. For transformers up to 300 kVA, provide with 6-2-1/2% full capacity taps, 2-FCAN (for connections above nameplate) and 4-FCBN (for connections below nameplate). For transformers above 300 kVA, provide 4-2-1/2% fully rated taps, 2-FCAN and 2-FCBN.
4. Manufacturers: Subject to compliance with contract documents, the following manufacturers are acceptable:
  - a. Square D
  - b. Eaton Corporation
  - c. ABB

## 2.2 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 constructed using glass reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
2. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

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. Lugs shall be mechanical, rated for 60/75° AL/Cu.

3. Thermal Magnetic Circuit Breakers: Inverse time current element for low level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit breaker frame sizes 250A and larger.
4. Adjustable, Instantaneous Trip Circuit Breakers – Magnetic trip element with front mounted, field adjustable trip setting.
5. Electronic Trip Circuit Breakers (400A frame and above): 100% rated, RMS sensing, field replaceable rating plug or electronic trip, digital display of settings, trip targets, and indicated metering displays with multi-button keypad and ten-event, trip history log, and front field adjustable settings for long time, long time delay, short time, short time delay, instantaneous trip, ground fault, zone interlock for ground fault and short trip, programmable with handheld unit as indicated. Ability to turn instantaneous off.
  - 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. ABB Spectra RMS or MicroVersa trip unit.
  - d. Provide a test set for each type of solid state trip unit.
6. Shunt Trip: **120V** trip coil energized from separate circuit, with coil-clearing contact.
7. Key Interlock Kit: Externally mounted to prohibit circuit breaker operation; keying shall follow sequence indicated on drawings.
8. Handle Padlocking Device: Fixed attachment, for locking circuit breaker in on or off position.
9. Ground-Fault Circuit Interrupter (GFCI) circuit breakers shall be quick-make, quick-break, thermal-magnetic, Class A, 6 milliampere ground fault sensing and trip indicating, and multipole breakers shall have common trip. The ground fault circuit breakers shall not occupy any more space than a standard breaker of the same number of poles.
10. Ground Fault Equipment Protector (GFEP) circuit breakers shall be utilized for electric heating equipment and where indicated.

These shall be quick-make, quick-break, thermal-magnetic, Class B, 30 milliampere ground fault sensing and trip indicating, and multipole breakers shall have common trip. The ground fault circuit breakers shall not occupy any more space than a standard breaker of the same number of poles.

11. Arc-Fault Circuit Interrupter (AFCI) circuit breakers shall be quick-make, quick-break, thermal-magnetic, and trip indicating, and multipole breakers shall have common trip. Sensor shall recognize the unique current or voltage signatures associated with arcing faults and efficiently interrupt the circuit to reduce fire hazards. Sensor shall detect persistent low current arcing faults down to 5 amps with associated mitigation of fire hazards in the cords connected to the outlets.
12. Dual Function Circuit Breakers shall provide both GFCI and AFCI protection. Circuit breaker shall have the same electrical requirements as the individual devices listed above.
13. Arc Flash Energy Mitigation: Provide the following arc flash energy mitigation system for all circuit breakers 1200A and larger.
  - a. Arc Energy Reduction Maintenance Switch: Equipment main circuit breaker shall have a selector switch in the front of the unit enclosure and another remotely mounted at the entrance to the room for maintenance periods. The switch shall be 30mm metal Square D type K and labeled "Normal" and "Maintenance". The normal position shall utilize the standard trip settings of the breaker. The maintenance position shall utilize a quicker series of trip settings to reduce the potential arcing energy. The selector switch shall have a protective flip up cover. LED warning light on the face of the unit enclosure shall indicate when in the maintenance mode and have appropriate signage. The system shall be fully wired and tested by a factory authorized/trained technician.
14. Listed combination of coordinated circuit breakers shall be verified by the equipment manufacturer utilizing published data sheets. Confirmation listings shall be submitted.
15. Ratings shall be as indicated in the Contract Documents.
16. 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 phase. 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. UL listed as suitable for use as service equipment.

- a. Manufacturers: Subject to compliance with Contract Documents, the following manufacturers are acceptable:

- 1) Square D
- 2) Eaton Corporation
- 3) ABB

D. Power Meter:

1. Where indicated on the drawings, provide a factory installed unit mounted power meter with the following parameters:
  - a. LCD or LED display.
  - b. Line voltage control power.
  - c. Voltage input with overcurrent protection and disconnecting means.
  - d. True RMS voltage and current measurement.
  - e. Metered parameters: Phase current, line voltage, phase voltage, frequency, power factor per phase and three phase total, real power per phase and total, reactive power per phase and total, apparent power per phase and total, total real energy, total reactive energy, total apparent energy, user configured sliding window for real, reactive and apparent power peak demand. Sampling rate shall be 512 sample points per cycle minimum. Waveform capture with adjustable triggers.
  - f. Accuracy: Energy, and demand power: 0.2% in accordance with ANSI C12.20 Instrument current transformers shall be factory wired to shorting blocks to prevent open-circuiting the current transformers under energized conditions. The meter shall also be user programmable for current to any CT ratio.
  - g. Capable of metering up to 480 volts without external potential transformers. The meter shall also be user programmable for voltage range to any PT ratio.
  - h. Communications: Modbus RTU, TC/IP, etc.
  - i. Acceptable Manufacturers:
    - 1) Equipment (Unit Manufacturer)

- 2) Square D
- 3) Eaton Corporation
- 4) Shark

E. 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

F. 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.

G. Surge Protective Device:

1. Device shall be rated for location as shown on drawings.
2. Seven Mode Protection: Line-to-neutral (three), line-to-ground (three) and neutral-to-ground.

3. Provide test report from a recognized independent testing laboratory verifying the Surge Protective Devices (SPD) can survive published surge current rating on both a per mode and per phase basis. ANSI/UL 1449, latest edition.
4. Surge Current Capacity – The minimum total surge current tested with the ANSI/IEEE C42.41, 20 kA-8/20 microsecond waveform that the device is capable of withstanding shall be as shown in the following table:

| <u>Application</u> |                                  | <u>Peak<br/>Surge<br/>Current<br/>Per Phase</u> | <u>Nominal<br/>Discharge<br/>Current – In<br/>Per Mode</u> |
|--------------------|----------------------------------|-------------------------------------------------|------------------------------------------------------------|
| a.                 | Type 1 – Before Service Entrance | 250 kA                                          | 20 kA                                                      |
| b.                 | Type 2 – After Service Entrance  | 160 kA                                          | 20 kA                                                      |

5. Unit shall comply with ANSI/UL-1449, latest edition. Voltage Protection Rating (VPR) per Mode must not exceed the following for Type 1 SPD:
  - a. 208Y/120, L-N 700 volts, L-G 700 volts, N-G 800 volts, L-L 1000 volts.
  - b. 480Y/277, L-N 1200 volts, L-G 1200 volts, N-G 1200 volts, L-L 2000 volts.
6. Unit shall comply with ANSI/UL-1449, latest edition. Voltage Protection Rating (VPR) per Mode must not exceed the following for Type 2 SPD:
  - a. 208Y/120, L-N 800 volts, L-G 700 volts, N-G 800 volts, L-L 1000 volts.
  - b. 480Y/277, L-N 1000 volts, L-G 1200 volts, N-G 900 volts, L-L 1800 volts.
7. UL-1283 bi-directional high frequency noise attenuation for electric line noise shall be 50 dB at 10 kHz-100 MHz.
8. Short Circuit Current Rating: 200 KAIC.
9. Indication system:
  - a. A green/red LED indicator for each phase.
  - b. Flashing trouble light.
  - c. Shall alarm open circuit damage, thermal conditions and overcurrent.

10. Transient surge counter.
  - 1) Provide dry contact for remote monitoring.
11. External mounted model.
12. Manufacturers:
  - a. Square D
  - b. Eaton Corporation.
  - c. L.E.A./Dynatech.
  - d. Vertiv
  - e. Current Technology

## 2.3 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 competed 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 26 29 13**

**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

## 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 26 50 00**

### **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 tem 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



**SECTION 26 55 00**

**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 27 21 00**

**LOCAL AREA NETWORK SYSTEM**

**PART 1 - GENERAL**

**1.1 WORK INCLUDED**

- A. Provide labor, materials, equipment, services, etc. for a complete functional Local Area Network (LAN) and related work as required in the Contract Documents.
- B. The systems to be provided shall be for a switched LAN environment. The system shall hereafter be referred to as the Data Network System.
- C. Basic Intent:
  - 1. Located throughout the building as shown on the drawings, are places where computers and associated equipment are intended to be placed and connected to the network for the purposes of utilizing common resources.
  - 2. The telecommunications rooms for the data network in the building(s) are located as shown on the drawings.
  - 3. Located in various other places are additional Telecommunication Rooms. It is intended that these be connected with the Main Telecommunication Room by a fiber optic cable backbone. From each of these locations, data cable is to be run to the data jacks where computer equipment is connected.
  - 4. Patch panels shall be used as termination points for all fiber optic cabling. Provide backbone cabling between telecommunication rooms as indicated.
  - 5. Patch panels shall be used as termination points for all data cables and the individual fiber cables in telecommunication rooms.
- D. Description of System:
  - 1. The system shall include the items listed below, as described herein and as indicated on the Contract Documents:
    - a. Data network shall be compatible with existing network configuration and characteristics.
    - b. Campus service to the building(s).
    - c. Building Main Distribution Frame (MDF) for service entrance and distribution.

- d. Intermediate Distribution Frame (IDF) as indicated for cabling distribution.
- e. Backbone wiring from entrance facility to the MDF and from MDF to the IDFs.
- f. Complete raceway system (cable tray, J hooks, conduit) for cabling distribution as noted on Construction Drawings.
- g. Grounding of all racks, raceway and equipment.
- h. Power for the telecommunication rooms.

## 1.2 TELECOMMUNICATION ROOMS

- A. Each telecommunication room shall be furnished with 3/4 in. plywood backboard, floor to ceiling on all walls, with the plywood backboard painted with two (2) coats of fire resistant paint (UL/ASTM Class A), all surfaces.
  - 1. ANSI/TIA/EIA Telecommunications Building Wiring Standards.
  - 2. IEEE Telecommunications Standards.
  - 3. BICSI Methods Manuals.
  - 4. NFPA 70: NEC

## 1.3 QUALITY ASSURANCE

- A. Work shall be as specified herein and it shall be neat and orderly installation. 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. Unless specified elsewhere, standard factory inspection and operational tests will be acceptable.
- C. Installation shall be accordance with NFPA 70 (National Electrical Code), TIA/EIA, IEEE, IEC, state codes, local codes, and requirements of the Authority Having Jurisdiction.
- D. Equipment shall be designed, manufactured, assembled, and tested in accordance with the latest revisions of applicable published ANSI, NEMA/IEC, TIA/EIA and IEEE Standards.
- E. Each item shall be NRTL tested and listed.

F. The system 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 these systems, utilizing their standard products, for a period of five (5) years.
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 two (2) hours of an emergency call.
4. Maintain adequate spare parts inventory to provide both normal and emergency service.
5. Employ service technicians who are trained in accordance with the systems manufacturer's recommendations.
6. 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.
7. Provide all system programming to deliver a customized system to the Owner ready for use.
  - a. 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.
  - b. System shall be reprogrammed three months after occupancy/system turn over to incorporate all Owner desired modifications.
8. Any system being extended or connected to an existing system shall be tested for full functionality prior to beginning work and at the completion.

G. Contractor Qualifications:

1. This Contractor shall be a certified installer for the proposed equipment/system manufacturer(s) and be BICSI certified ITS Installer 2, Copper and Optical Fiber and shall be certified to terminate indicated fiber connectors.

2. The cable installer shall provide documentation and references from three (3) similar installations installed within the previous two (2) years within a 60 mile radius.
3. Contractor shall be trained through the Panduit certification for horizontal cabling.

H. Installer Qualifications:

1. Cabling installer must have personnel certified by BICSI on staff.
2. Cabling installed shall be trained through the Panduit certification for horizontal cabling.

1.4 SUBMITTALS

- A. Provide the following in a single clear and organized submittal. Package shall be submitted as specified in:
1. Manufacturers catalog sheets, specifications and installation instructions for all system components.
  2. Detailed description of system operation.
  3. Itemized list of all features and functions.
  4. Dimensioned drawings of all system control cabinets and layouts for all equipment rooms.
  5. Wiring diagrams showing typical connections for equipment.
  6. Contractor certification and qualifications.
  7. Riser diagrams showing all components, devices and interconnecting cable types.
  8. List of three (3) installations of equivalent or larger systems that have been installed within the past two (2) years and have been operating satisfactorily for a minimum of one (1) year.
  9. Warranty information.
  10. System test reports.
  11. Provide scaled elevation and plan drawings indicating walls, data racks, patch panels, wire management, cable trays, power strips, door swing, etc. for each cable closet/room.

## 1.5 SYSTEM DESCRIPTION

- A. Provide a complete and fully operational state of the art Local Area Network (LAN) system as described herein and indicated on the contract documents. Include any and all interface equipment to supply a complete network with complete equipment connections necessary to form a complete "turnkey" network system as outlined in these specifications.
- B. The complete system shall include, but is not limited to, the following:
  - 1. Equipment Room build-out.
  - 2. Telecommunications Room build-out.
  - 3. Equipment cabinets and racks.
  - 4. Patch panels and patch cables.
  - 5. Wire management.
  - 6. Horizontal cabling.
  - 7. Fiber optic backbone cabling.
  - 8. Modular jacks, backboxes and faceplates.
  - 9. Terminations and testing.
  - 10. Raceways, pathways, cable tray, sleeves, pull boxes.
  - 11. Firestopping.
  - 12. Training and system programming.
- C. Owner shall provide the network electronics.

## 1.6 WARRANTY

- A. All cable plant parts shall be warranted to the owner for a period of fifteen (15) years as a complete end-to-end system.
- B. All network equipment shall be warranted to the owner for a period of one (1) year. Provide technical support at no charge to the customer for a period of one (1) year after system has been commissioned.
- C. Make available an extended warranty to the customer.
- D. Warranties shall commence upon final acceptance of the system.
- E. Contractor to submit cable records to Panduit for warranty. Warranty shall be from Panduit and cover 25 years per Cornell University Division 270000 standards.

## PART 2 - PRODUCTS

### 2.1 HORIZONTAL CABLE

#### A. Augmented Category 6A UTP Cable:

1. Initially, the manufacturer shall perform qualification tests on each cable. These tests shall be performed in accordance with the latest revision of ANSI/TIA/EIA 568-C.2 standard prior to shipment.
2. Date of Manufacture: Cable shall be a maximum of one (1) year old, from date of manufacture when installed.
3. Cable shall have a ripcord.
4. Cable shall be plenum rated, 4 pair, 100 OHM, 23 AWG.
5. Cable shall meet all requirements of FCC 68, the latest revision of the TIA/EIA 568B-C.2 and Addenda.
6. Cable shall have blue colored thermoplastic jacket with overall diameter not to exceed .215 in. x .240 in.
7. Pulling tension shall be rated for 25 pounds minimum.
8. Cable shall be able to withstand a minimum bend radius of 1.2 in. at -20°C without insulation cracking.
9. Cable shall be color coded in accordance with the latest revision of the TIA/EIA T568B polarization sequence.
10. Cable shall not exceed maximum length of 90 meters.
11. Provide a printed report documenting testing based on ANSI/TIA 568-C.2 tested at 500 MHz. Testing parameters as follows:
  - a. Less than 21.0 ohm per 100 m DC resistance.
  - b. Return loss > 10.0 dB/100m at 500 MHz.
  - c. Insertion loss < 43.8 dB/100m at 500 MHz.
  - d. Near end cross talk (NEXT) > 26.7 dB at 500 MHz.
  - e. Power Sum - near end cross talk (PS-NEXT) > 23.8 dB at 500 MHz.
  - f. Attenuation to cross talk ration far end (ACRF) > 10.2 dB at 500 MHz.

- g. Power sum - attenuation to cross talk ratio (PS-ACRF) > 7.2 dB at 500 MZz.
  - h. DC resistance unbalance between any two (2) conductors of any pair shall not exceed 3%.
  - i. The capacitance unbalance of any pair to ground shall not exceed 65.6 pF per 100 meters.
  - j. Delay < 490 ns at 100MHz.
  - k. Delay skew < 44 ns at 100MHz.
  - l. Cable shall be ANSI/TIA/EIA-568-C.2 augmented Category 6 (Cat 6A) compliant. The cable shall be tested and characterized by the manufacture to 500 MHz.
- 12. Acceptable Manufacturers:
  - a. Panduit
  - b. Prysmian / General Cable
  - c. CommScope (Cornell Site-Specific)
- B. Single Mode Fiber (Indoor/Outdoor):
  - 1. Maximum Attenuation per KM:
    - a. 1310 nM- 0.5
    - b. 1550 nM - 0.5
  - 2. 1310/1550 nM.
  - 3. Shall be tight buffer, plenum rated, indoor-outdoor breakout style.
  - 4. Core Type: Single Mode.
  - 5. Core Diameter: 8.3 Microns.
  - 6. Clad Diameter: 125 Microns.
  - 7. Minimum bend radius shall be 20 times the diameter.
  - 8. Strength members shall be FGE/Aramid yarn.
  - 9. Shall meet requirements for plenum and vertical tray cable specifications of the NEC.

10. Provide number of fibers/cable as indicated in riser diagram on Drawings.
11. Shall have individual fiber tube colors per TIA/EIA-598 and an overall yellow jacket.
12. Acceptable Manufacturers:
  - a. Corning

## 2.2 PATCH PANELS

### A. UTP Cable Patch Panels:

1. All panels should consist of a faceplate, mounting, hardware, isolation bushings, connector assemblies and labels for all ports.
2. Provide patch panels in each enclosure or rack to which the cable is to be terminated. Patch panels shall be of the type, performance and Category to match the cabling.
3. Patch panels shall be mounted in standard 19 in. racks/cabinets.
  - a. Contractor shall provide Panduit CJ6X88TG for Cat 6A terminations 48-port patch panels having wiring configuration specified with insulation displacement connectors on the back and 8P8C universal modular jacks on the front. No substitutions allowed.
  - b. Contractor shall provide quantity of patch panels to terminate all UTP cable. There shall be a minimum of 25% spare capacity for future installation.
4. Jacks shall be Panduit CJ6X88TG for Cat 6A terminations, T568A only. No substitutions allowed.
5. Panels shall have factory labels for each port.
6. All cables are to be terminated per EIA/TIA 568A standards and dressed in a neat workmanship way. Match the Owner's standard configuration.
7. Modular jacks shall be mounted on PC boards to offer low insertion and NEXT loss.
8. Provide grounding screw assembly with serrated head screw and manufacturer recommended connection to the associated rack.
9. Shall exceed EIA/TIA-568, UL1863 and FCC Part 68 performance specified.



10. Acceptable Manufacturers:
  - a. Panduit CJ6X88TG for Cat 6A terminations.

B. Fiber Optic Patch Panels

1. Provide fiber optic rack mounted enclosure in where fiber optic cable is to be terminated.
2. Provide LC connector to match existing style panel base. Provide quantity of ports to terminate all strands of the fiber optic cable with additional 25% spare ports.
3. Shall mount in standard 19 in. rack and be constructed of 16 gauge steel and have gasketed openings and hinged door for easy access.
4. Provide wire management below and in rear of patch panel.
5. Patch panels to have modular ports with 12 minimum ports.
6. Acceptable Manufacturers:
  - a. Corning

2.3 OUTLETS AND CONNECTORS

A. UTP Outlets/Connectors:

1. Physical Specifications:
  - a. Shall be 8 position connector compatible with the cable characteristics.
  - b. Shall be modular and snap-in to user configurable faceplates for future retrofits meeting durability requirements specified in the latest revision of the CEI/IEC standard.
  - c. Shall be IDC type suitable for eight 22-24 AWG wires with a gas-tight connection.
  - d. Each contact surface shall have at a minimum, copper alloy with 50 micro-inches gold over nickel and a minimum contact force of 100g.
  - e. Conductors shall be separated and aligned internally by jack comb.
  - f. Shall have easy to read 568A/B color scheme to prevent termination errors.

- g. Wired in accordance with TIA/EIA polarization sequence specified in Patch Panel section of this specification.
      - h. Transmission characteristics shall meet the requirements for the UTP cabling specified.
      - i. Minimum durability shall be 1000 connecting cycles.
    - 2. Acceptable Manufacturers:
      - a. Panduit
  - B. Fiber Optic single mode Outlets/Connectors
    - 1. Physical Characteristics:
      - a. Shall be LC type with insertion release mechanism.
      - b. Shall terminate up to 125 micron fiber.
      - c. Shall meet dimensional criteria of the latest revision of ANSI/EIA/TIA.
      - d. Typical outlet box shall be sized to insure minimum bend radius and store 1 meter of two strand fiber cable.
    - 2. Transmission Characteristics:
      - a. Maximum loss of 0.3 dB per pair.
    - 3. Splicing shall be by pigtail fusion as opposed to uncam connections.
    - 4. Acceptable Manufacturers:
      - a. Corning

## 2.4 COLOR CODING

- A. Cable outer jacket shall follow the color coding scheme as follows. Jacket color shall be continuous. Patch cords shall match the cabling.
- B. Copper Cable:
  - 1. Data Communication:
    - a. Category 6A - Green (Preferred)  
- Blue (if green is not available)

2. Voice Communication:
    - a. Category 6A - Green (Preferred)  
- Blue (if green is not available)
  3. Wireless Network - Green (Preferred)  
- Blue (if green is not available)
- C. Fiber Optic Cable:
1. Backbone Cabling:
    - a. Single Mode - Yellow
  2. Horizontal Cabling:
    - a. Single Mode - Yellow

## 2.5 DISTRIBUTION ENCLOSURES/RACKS

- A. All enclosure/racks shall be properly sized and of the proper quantity to house all of the required components and 25% spare space capacity. Provide grounding stud for each vertical rack.
- B. Label each rack/enclosure designating it per the latest TIA/EIA standard:
  1. Adhered plastic electronic printed label with 1/2" high lettering minimum.
  2. Mount to top and bottom of each rack/enclosure.
- C. Enclosed, Floor Mounted Cabinet:
  1. Steel framed, smoked Plexiglas door with lock (keyed to the Owners standard), full length piano hinge and field adjustable swing.
  2. Steel Rear Door with Lock (lower half vented).
  3. Two (2) eight position vertical mounted power strips.
  4. Fan Assembly - Suitable top mounted fans (two minimum) for an ambient temperature of 85°F.
  5. Wire management brackets.
  6. Adjustable front and rear mounting rails.

7. Adjustable 19 in. wide mounting rails. Depth to accommodate the intended equipment (32 in. minimum).
  8. Color black.
  9. Verify swing of door in the field prior to ordering.
  10. Unit width shall accommodate racking, power strips and cable management.
  11. In locations requiring two or more enclosures, side panels shall be removed and cabinets shall be bolted together allowing access between cabinets.
- D. Open, Floor Mounted Racks:
1. Nominal size shall be 19 in. wide x 7 ft. high x 20 in. (minimum) deep. Rated for 2000 lb. minimum. Depth to match the intended equipment.
  2. Rack shall be constructed of 6061-T6 aluminum extrusion, with EIA = 3 in. x 1.265 in. channel, 1/4 in. thick flange.
  3. Provide base angles and top cross bars.
  4. The back of rack shall have wire management panels and cable tray to wall.
  5. Rack shall have baked enamel finish.
- E. Enclosed, Wall Mounted Cabinet:
1. Standard 19 in. wide, 24 in. deep cabinet.
  2. Height as required.
  3. 16 gauge cold rolled steel.
  4. Rack shall have locking front door.
  5. Ventilated side panels.
  6. Two (2) six position power strips.
  7. Rack construction shall match freestanding.
  8. Racks shall have dual piano hinges to allow access to front and rear.
  9. Provide vertical and horizontal wire management.
  10. Verify swing of door in field prior to ordering.

F. Floor Mounted Server Racks (Four Post Racks):

1. Racks shall have four vertical posts with top/bottom framing and be as specified above for open, floor mounted racks.
2. Racks shall be provided where shown on the drawings or identified in the equipment schedule.

G. Equipment Shelves:

1. Provide quantity of equipment shelves as indicated.
2. Shelves shall be made of .09 in. aluminum and shall support up to 30 lbs. on each side. All mounting hardware shall have baked enamel finish.

H. Acceptable Manufacturers:

1. Chatsworth
2. Mid-Atlantic
3. Great Lakes

2.6 CABLE MANAGEMENT

A. All racks are to be provided with cable management hardware to insure a neat, functional system when complete. Racks shall as a minimum, include the following:

1. PVC construction; duct fingers to manage cabling; color to match enclosure.

B. All racks shall have 8 in. wide vertical full height cable management, including cover, front and rear, on both sides of the rack.

C. All racks shall have 2RU space horizontal full width cable management, front and rear, above and below each patch panel and piece of equipment.

D. Cabinets shall have 1RU space horizontal panels, front and rear, above and below each patch panel and piece of equipment.

E. All data distribution frame plywood backboards shall be provided with vertical and horizontal wire management with capacities to house all possible future cabling and patch cords for a neat and orderly installation.

F. Acceptable manufacturers:

1. Panduit

## 2.7 INNERDUCT

- A. Innerduct shall be corrugated HDPE material, plenum rated, flexible, continuous, UV rated with flame/smoke spread in accordance with code and length markings on the outer surface.
- B. When in conduit minimum size shall be 3/4 in., otherwise 1 1/2 in. minimum.
- C. Acceptable manufacturers:
  - 1. Carlon
  - 2. Maxcell
  - 3. Opti-Com

## 2.8 LABELING

- A. General:
  - 1. Labeling system and structure shall match the Owners existing. System shall provide as built final conditions for each cable, port, panel, rack, etc. and utilize MS Excel or approved equal documentation. Provide hard and electronic copy of labeling documentation to the Owner as part of the O and M process.
  - 2. Each label shall contain the Telecommunication Room designated, the room number and the port number in the room. Verify color of label and size of font prior to completion. Provide samples as requested.
  - 3. Labels shall correspond to the room/names/numbers upon completion of the project. Contractor shall not necessarily utilize existing room/names/numbers or those indicated on the blueprints.
  - 4. Label each rack and patch panel with 1 in. high lettering, black on white, adhered electronically printed plastic type label with labels at top, bottom, front and back.
  - 5. Firestop used in vertical riser and horizontal conduit sleeves penetrating ceilings and floors shall be labeled. Provide and install labeling at each penetration including penetration type with UL listing used, material used, date of install, and name of installer.
  - 6. All cables shall be labeled per InfoComm's Standard "F501.01:2015 Cable Labeling for Audiovisual Systems". These labels shall match the labeling on the system as-built drawings.
  - 7. All AV connection plate jacks shall be labeled with engraving or printed labels.
  - 8. Cables pulled for future use shall be labeled as such.

B. Patch Panel

1. Individually label all patch panel ports. Port numbers shall match opposite end outlet/port number.

C. Outlets

1. Individually label all patch panel ports. Labels shall be installed in a workman-like manner and fit completely in the recessed area of the labeled location.
2. Contractor shall utilize adhered labels at poke-thru locations and any other locations that do not have a label location.

D. Cable

1. Fiber Optic:
  - a. Individually label fiber optic cables at each termination point indicating building, destination room, rack number, panel number, port number, strand number and strand color.
  - b. Each strand color shall match a specific fiber termination number in each closet, i.e. blue - fiber 1, orange - fiber 2, green - fiber 3, etc.
  - c. Cable label shall be adhered electronically printed plastic type with cable designation fully visible.
2. Copper
  - a. Specifically label cables at each termination point indicating the building, destination room, rack number, panel number and port number.

2.9 UTP CABLE TESTER

- A. Contractor shall utilize Fluke DSX 5000 tester or approved equal. Provide adapters for specified cables. Turn over to owner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Cable:

1. Provide a minimum of one horizontal UTP cable to each communication outlet jack from respective equipment/telecommunications room patch panel as called for. Quantity of data jacks equals minimum quantity of UTP cables (typical).

2. Provide a minimum of one (1) pair (2 strands) of single-mode fiber optic cable to each fiber jack from respective equipment/telecommunications room as called for. Quantity of fiber jacks equals minimum quantity of 2 strand cables (typical).
3. All risers, and wiring concealed in walls or soffits, shall be installed in metal conduits.
4. All cable above accessible ceilings shall be installed in cable tray or J-hook style cable rings 3 ft. O.C.
5. Provide wire management and Velcro cable wraps every 24 in. throughout closets.
6. Wiring/cabling shall be installed in accordance with the manufacturer's recommendations. If the manufacturer recommends larger wire sizes, they shall be provided. However, smaller sizes or lower cable categories are not acceptable.
7. All Contract Documents are schematic. The system supplier shall incorporate their wiring requirements on the system drawings. The Contractor in conjunction with the system manufacturer shall be responsible for complete wiring requirements and conduit sizes.
8. Install UTP cable in accordance with latest revision of TIA/EIA 568 standards.
9. The Contractor shall be responsible for replacing all cables that do not pass required bandwidth and throughput tests.
10. All raceways and closets shall be installed in accordance with latest revision of TIA/EIA-569.
11. All cables shall be labeled in accordance with latest revision of TIA/EIA 606 and these specifications.
12. All horizontal cables shall be terminated in patch panels at the distribution frames, and at the UTP jack at the telecommunications outlet.
13. Maximum length shall be 90 meters.

B. Terminations:

1. All terminations shall be made by a manufacturer's trained representative.
2. Use termination kits for fiber and UTP that are approved by the manufacturer of the cable.



3. All backbone cable shall be terminated in a patch panel and all connections between horizontal and backbone cables shall be through cross connect cable.

C. Equipment and Devices:

1. Install all devices where shown on drawings. Provide all necessary conduit outlet boxes, junction boxes, supports, etc. Verify all required box sizes with the system supplier and coordinate with bending radius needs. All devices shall be modular for future moves and changes.
2. Install all equipment in specified 19 in. racks/cabinets leaving minimum 30 in. of access space on sides and back of rack and 36 in. in front of rack.
3. Provide all power outlets and plug strips required for system operation but not shown on plans.

D. Raceways:

1. Minimum size raceway shall be 1 in.
2. Minimum backbox size for telecommunications outlet locations shall be two-gang with raised cover; no single-gang boxes allowed.
3. Provide no greater than 180° in bends or 100 linear feet without pull box in any raceway.
4. No flexible conduit raceways allowed unless explicitly approved by CIT.

E. Data Network Ground System:

1. Provide grounding system for all equipment rooms and telecommunication rooms as called for in Specification Section 260526.

F. Telecommunications Rooms:

1. Provide 3/4 in. x 4 ft. high continuous plywood backboard with two (2) coats of medium gray fireproof paint in telecommunications rooms.
2. Coordinate with other trades to avoid services being installed above telecommunications racks.

### 3.2 TESTING

- A. Copper Cable: System supplier shall channel test end-to-end each permanent link connection using latest 500 MHz for Cat 6A 1000 Mbps IEEE testing procedure.

Tester must conform to the latest standards at the time of testing not time of bid and be Fluke DTX-5000 with latest software version, or approved equal. Testing shall be performed by a technician trained with the specific testing equipment.

- B. Fiber Optic Cable: Provide an OTDR test for all fiber optic cable and connections per latest IEEE and ANSI accepted procedures. Test shall utilize Fluke Opti Fiber Pro OTDR.
- C. Replace any cables and connectors that do not meet or exceed standards referenced and stated herein and then tested. Testing shall be end-to-end / port-to-port for each cable.
- D. Test equipment shall be in good condition and working order, calibrated within one year of its use and utilize leads without twisting and kinks. Unit calibration shall be in accordance with Level III Field Tester per ANSI/TIA 1152.
- E. A representative of the end-user will select a random sample of 5% of the installed links. The representative (or his authorized delegate) shall test these randomly selected links. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the end-user representative shall repeat 100% testing at no additional cost. Cables and connectors that do not pass shall be replaced and retested until acceptable results are obtained.
- F. Test Reporting:
  - 1. The field testing shall be accurately documented for submission, inclusion in O&M Manuals and for Owner future use.
  - 2. Test reports shall include data directory table cross-referencing room numbers and cable numbers with the test report. Post copies of directory at telecommunications room location.
  - 3. Report shall utilize electronic Windows based documenting with a hard and electronic copy provided to the Owner.
  - 4. The report documentation for each cable test shall include the following as a minimum:
    - a. Project name.
    - b. Test equipment manufacturer and model number, and last calibration date.
    - c. Date and time of the test.
    - d. Patch panel identification.

- e. Cable identification.
- f. Cable type.
- g. Pass/Fail: Pass indicating meeting or exceeding the identified criteria or standard (whichever more stringent) for all parameters. Fail indicating test not meeting identified criteria for one or more parameters.
- h. Test pass criteria.
- i. Cable length.
- j. Propagation delay and attainable bandwidth.
- k. List of tested parameters with test and allowable values. Any failed parameters shall be noted or highlighted.

5. Test reports shall be submitted to Panduit for the horizontal cabling warranty.

### 3.3 TRAINING AND INSTRUCTION

- A. Provide brief overview of system of instruction to Owner personnel regarding system set up configuration and management. Training shall be sufficient for the Owner to understand the system operation, components, configuration, functions, testing and troubleshooting. All Owner questions shall be answered.
- B. Training agenda (estimated duration, intent, specifications to be covered) shall be submitted for approval prior to the training. A finalized agenda shall be issued to the Owner and construction representative one (1) week minimum prior to the scheduled training. Owner's comments shall be incorporated and agenda redistributed prior to the training.
- C. Two (2) hard copies and one (1) electronic (pdf) copy of the training materials shall be provided.
- D. Provide updated cable schedule and redline/as-built during training and instruction period 2-3 weeks prior to occupancy.

### 3.4 WARRANTY

- A. All cable plant parts shall be warranted to the owner for a period of fifteen (15) years as a complete end-to-end system.
- B. All network equipment shall be warranted to the owner for a period of one (1) year. Provide technical support at no charge to the customer for a period of one (1) year after system has been commissioned.

- C. Make available an extended warranty to the customer.
- D. Warranties shall commence upon final acceptance of the system.

END OF SECTION

## **SECTION 28 13 00**

### **SECURITY AND ACCESS CONTROL SYSTEMS**

#### **PART 1 - GENERAL**

##### **1.1 SYSTEM DESCRIPTION**

###### **A. Card Access Systems**

1. Wired: Card Access Systems (CAS), at the User End, are comprised of card reader, door contacts, electric hinge or power transfer (wired systems), door strike, latch, reader interface module, interconnecting power and communication wiring, head-end intelligent system controller. All systems, unless exempted from University policy, are centrally monitored transmitting data to and received by CUPD Access Control Services.
2. Wireless: Schlage AD400 – is comprised of an AD400 lockset, PIM400-1501 RSI wireless access point, LP-1501, communication wiring with power over Ethernet, and must be installed with an eight-cell battery pack. Every PIM must be installed with an external antenna. The series of AD400 installed must support a secure credential. Cornell IT policies must be adhered to when attaching devices to the University network.

##### **1.2 SYSTEM OPERATION AND PERFORMANCE**

###### **A. System operation and performance shall include, but not be limited to, the following features:**

1. Proper activation of door hardware when a valid credential is presented.
2. Appropriate shunting of the alarm upon exit from secured space.
3. Video signal being transmitted over IP.
4. Alarm initiation.
5. Trouble initiation.
6. Activation of alarm notification.
7. Activation of trouble notification.
8. Activation of fire safety functions.
9. Total supervision, monitoring of abnormal conditions in the system.

10. Activation of off-premise signals that are sent to the HDS via the Bosch Central Station (existing non-Access It! supported systems) or Ethernet (Access It! supported systems).
- B. Activation of the fire alarm system shall cause the following:
  1. Electric door hardware located on egress doors to lose power and allow egress/ingress where required by fire code.
  2. Electrical door hardware mounted to a fire door must close and latch upon activation of the fire alarm system.
  3. Delayed egress device must deactivate.
- C. Activation of any security device producing an alarm or trouble shall cause, but not be limited to:
  1. Transmission of the alarm or trouble signal to the Building ISC(s).
  2. Transmission of the selected alarm or trouble signal to the Head-End Database Server (HDS).
  3. Indication of the alarm or trouble condition at the computer monitor display at the CW, CPW, and HDS shall include the alarm or trouble description, time/date, building controller, device, input/output, priority code.
- D. Activation of any card access device shall cause, but not be limited to:
  1. Transmission of the data signal to the Building ISC(s) and HDS.
  2. Indication of the data signal including the alarm or trouble description, time/date, building controller, device, input/output, card, and priority code by the computer monitor display at the CW and HDS.
- E. Items C and D above define normal operations. In the event of a communication failure between an ISC and the HDS, these signals will be stored and forwarded to the HDS when the communication is restored.

### 1.3 CONTRACTOR REQUIREMENTS

- A. The Contractor providing the security and access system shall be certified NICET Level II, and per Article 6d of the New York State General Business Law.

#### 1.4 IDENTIFICATION

- A. Provide lettered identification plates on the following equipment, components, and accessories (Note: Lettered identification plates shall be approved by Cornell University's Planning, Design and Construction Department prior to installation):
  - 1. Building Intelligent System Controllers (ISCs);
  - 2. Control Modules;
  - 3. Interface Modules;
  - 4. Remote Power Supplies.
- B. Provide Lettered "Dyno 100" labels on system devices.
  - 1. The label shall indicate the address and must be located on the device or adjacent to the device if this is not practical.
  - 2. Cabling and devices terminating at the control equipment shall be appropriately labeled with the proper device number or device description. Terminal blocks that are active shall be labeled with their appropriate landing site on the terminal board.
- C. Identification Plates and Labels shall be as follows:
  - 1. DRIs shall be labeled DRI-UVWX, where U indicates its respective ISC numeral; and V is the ISC's respective buss, a value from 1 to 4; where WX are values from 01 to 32.
  - 2. Devices shall be labeled UVWXYZ, where U indicates its respective ISC numeral; and V is the ISC's respective buss, a value from 1 to 4; WX indicates its respective panel, values from 01 to 32; Y indicates the input or output terminals, a value of 1 for input and 0 for output; and Z indicates its respective input or output terminal, a value from 1 to 4.
  - 3. Examples:
    - a. DRI-2305 is the fifth Dual Reader Interface served from the third buss of the second Intelligent System Controller in the building.
    - b. Device #230503 is the device on the third output of the fifth panel served from the third buss of the second Intelligent System Controller in the building.

## 1.5 MISCELLANEOUS REQUIREMENTS

- A. Equipment shall be mounted in a manner consistent with the ability to work around such equipment, and to perform the normal duties required in that area without coming into contact with the control equipment. Control equipment shall be mounted at a convenient height for future servicing.
- B. Power transformers shall be mounted in such a way that shall prevent their disengaging, either by vibration, gravity, or an individual unplugging them.
- C. Equipment enclosures shall have locking mechanisms that are left locked. Two keys shall be provided. One key shall be supplied to the Building's Coordinator, and the other key must be supplied to Cornell Campus Police.

## 1.6 WARRANTY

- A. Cornell University Department of Planning, Design and Construction's (PDC) Sr. Electrical Engineer, and the Cornell Police shall approve security systems designs. Coordinate the approval process with the Department of Planning, Design and Construction's Project Manager on capital projects and the Sr. Electrical Engineer on non-capital projects.
- B. A final test of the respective security and card access equipment and hardware shall be performed prior to considering the installation to be "complete." Cornell's Sr. Electrical Engineer and Campus Police shall be notified two weeks prior to the completion of the installation of a tentative testing date. On that date, a full system test will be performed according to these guidelines.
- C. The Campus Police will give a pass or fail to the system after the test has been completed. When a portion of the system fails during the test, that portion, or the entire test will be tested again. The extent of the retest shall be up to the discretion of Cornell's Sr. Electrical Engineer and Campus Police.
- D. Cornell's Planning, Design and Construction Department shall accomplish the initial setup programming prior to the installation. A completed "Installation Checklist" for the facility shall be delivered and accepted by Cornell University's Sr. Electrical Engineer prior to the installation of the system and the actual system programming.
- E. Cornell University's building coordinator, for the building implementing the security and access measures, shall supply Cornell University's Sr. Electrical Engineer with the information pertaining to the population residing within, and the traffic patterns and times of operation therein.
- F. A warranty shall be provided for labor/workmanship and on hardware included in the installation, for a period of one (1) full year from the date of completion.



## PART 2 - PRODUCTS

### 2.1 CONDUIT, WIRE AND BOXES

- A. Communication conductors shall be shielded twisted pairs; #22 AWG (minimum) stranded copper between the ISC and each downstream device. Manufactured by Belden, model #6541FE or equivalent.
- B. Low-voltage power conductors shall be unshielded twisted pairs; #18 AWG (minimum) stranded copper between the power supplies and each downstream device. Manufactured by Belden, model #6342FE, or equivalent.
- C. Card reader conductors shall be a minimum of 22 AWG./8-conductor, shielded, between card reader and reader interface. Belden model #6563FE or equivalent.
- D. Door position switch conductors shall be a minimum of 22 AWG./4-conductor between egress device and reader interface module. Belden model #6541FE or equivalent.
- E. Electric locking hardware conductors shall be a minimum of 18 AWG./2-pair, twisted, shielded between head-end power supplies and each downstream device. Belden model #6342FE or equivalent.
- F. Security and Card Access circuits and wiring shall be installed in a separate and independent conduit system from other system circuits.
- G. System wiring, circuits, and conductors shall be color coded and identified by number at termination points (i.e., control panels, remote annunciators, etc.) and splice points (i.e., junction boxes, splice boxes, etc.).
- H. Junction and splice boxes containing card access system wiring, circuits, and conductors shall have black covers and marked "SECURITY" in  $\frac{3}{4}$ " (three-quarter inch) white letters.
- I. End-of-line resistors in shall be installed at the location of the door contact or other sensor, not at the ISC.

### 2.2 POWER REQUIREMENTS

- A. Provide 120VAC power to the system power supply locations. Where available, provide a dedicated emergency power circuit. This power supply shall be permanently labelled at all equipment it feeds.
- B. Provide 12VDC power supply for card access boards, and 24VDC power for other devices (crash bar, door hardware). Negative Reference of these power supplies shall not be used as an earth ground

- C. Power supplies for door hardware shall be located in the same enclosure as the RIM serving that door or in adjacent enclosures at the same secure location previously approved by ACP and FMOPS alarm techs.
- D. Power supply must be per hardware manufacturer's specification.
- E. Varying voltage supplies should be kept separate from each other.
- F. Panel power supplies must be kept independent of all other components and should be connected to the power supply monitor on the panel where available.
- G. Locking hardware should be directly wired to a distribution board; never a series.
- H. Battery backup is required for all intrusion, video surveillance and card access systems must be replaced a minimum of every 3 years.
- I. The Contractor shall provide power calculations, including load capability and maximum load per power supply, to Cornell Facilities Engineering during the submittal process and at the completion of the project.

## 2.3 DOOR HARDWARE

- A. Refer to Division 8 for responsibilities.
- B. New door installations, opening hardware must conform to the current Americans with Disabilities Act guidelines; either lever set, flip paddle, panic paddle or crash bar hardware is acceptable.
- C. Hinges on reverse beveled doors shall be non-removable pins (NRP).

## 2.4 ELECTRONIC LOCKING HARDWARE

- A. Refer to Division 8 for responsibilities. Division 26 shall coordinate electrical requirements with Division 8 specifications and plans.
- B. Use of magnetic locking hardware, electric strikes and standalone keypad locks is not permitted without obtaining an exemption from FM Operations Lock Shop Technician, CUPD Access Control and the Director of Risk Management.

- C. Electronic hardware in the building shall use one standard voltage. Applications shall operate on 24VDC voltage. Deviations from this voltage are unacceptable without prior written consent by the University's FM Operations Fire/Alarms & Security Technician and FM Operations Lock Shop Technician. Existing electronic hardware that is not feasible to replace is an acceptable reason to deviate from this voltage. In applications where the latch bolt of the locking mechanism can be accessed from the outside of the door, a latch guard, or astragal, must be installed over the locking mechanism to prevent retraction of the latch bolt, allowing release of the door to an open condition.
- D. Electronic locking hardware must be installed in a fail-secure configuration.
- E. Delayed egress devices must release to an unlocked position on any fire alarm activation where required by local fire or building codes.
- F. Fail-Safe operation will be permitted only in instances where dictated by local fire or building codes.
- G. On fire rated doors, latch retraction mechanisms must release to latched position and magnetic door hold open devices must release upon receipt of a signal from the building fire alarm system.
- H. For electric strike configurations, the strike must be installed in a flush-mounted configuration, properly adjusted to allow the anti-tamper mechanism on the lever set to be engaged. Surface-mount configuration will be allowed where warranted by the door configuration (i.e. concrete filled jamb) or by the hardware configuration (i.e. mechanical crash-bar).

## 2.5 INTELLIGENT SYSTEM CONTROLLERS (ISCs)

- A. General
  - 1. The project is responsible to pay the costs associated with providing the dedicated TCP/IP network connection to each ISC location. Request for data must be submitted by the end user or Project Manager at a minimum of two weeks prior to installation. Request should include project account number and monthly billing number. Access Control Program to provide VLAN information.
  - 2. Use of existing or single Intelligent System Controller (ISC) is preferred. Multiple ISCs are acceptable when specifically requested by the customer or approved in design by the CUPD Access Control Project Management team.
  - 3. The integrated system including equipment, components, and accessories shall be UL listed for the purpose for which the equipment, components, and accessories are used.

B. Enclosures

1. Enclosures shall be of the 22 ga. heavy-gauge, galvanized steel, dead-front construction with keyed, lockable panel cover type.
2. FM Operations Fire/Alarms & Security Group must approve panel locations. High Security installations shall have ISC's installed inside the high security space or be located in another secured location and have unique cabinet locks where the ACC is in possession of the keys.
3. All panels must have tamper switches on the enclosure wired to the cabinet tamper inputs on the controller board.

C. Intelligent System Controller Modules:

1. Host communications shall be direct wire TCP/IP, flash memory for real-time updates, with a minimum of 16MB onboard memory expandable to 64MB. The TCP/IP is over Ethernet at a minimum of 100mbps.
2. Supports up to eight different card formats, with issue code support for both Wiegand and magnetic formats.
3. Will support at least 64 readers or 32 downstream devices, and minimum 100,000 cardholders, 255 access levels, 255 Holidays with grouping, 255 time zones, each with 6 time intervals.
4. Alarm Masking, Individual shunt times, available 6-digit pin code.
5. Two dedicated inputs for tamper and power failure status.
6. Manufacturer: Access It! LP-2500, Access It! LP-1502 or Access It! LP-1501. (Use the Access It! LP-1501 only for Schlage AD400).

2.6 INPUT CONTROL MODULES

A. General

1. Locate its respective power source as close as physically possible, while maintaining proper service clearances.
2. Two inputs are available for cabinet tamper and power fault monitoring. Normally, the contacts are closed. Power fault monitoring should always be in place. The cabinet tamper may be shorted if not necessary.
3. Alarm inputs shall be supervised with end-of-line resistors that are 1000 ohm, 1% tolerance.

4. The Input Control Modules are intended for low voltage, class 2 circuits only.
- B. Cabinet: Refer to ISC requirements for Input Control Module cabinet requirements.
- C. Input Control Module:
  1. Line supervision, with 12VDC power supply.
  2. RS-485, 4-wire communications.
  3. Sixteen programmable supervised input contacts (use end-of-line resistors).
  4. Two form-C 5A, 30VDC contacts for load switching with contact protection.
  5. Two dedicated inputs for tamper and power failure status.
  6. Manufacturer: Access It! MR-16IN or Access It! MR-16OUT.

## 2.7 OUTPUT CONTROL MODULES

- A. General
  1. Locate its respective power source as close as physically possible, while maintaining proper service clearances.
  2. Two inputs are for cabinet tamper and power fault monitoring.
  3. Contact protection shall be used to minimize premature failure of the contacts and to increase system reliability.
  4. The Output Control Modules are intended for low voltage, class two circuits only.
- B. Cabinet: Refer to ISC requirements for Input Control Module cabinet requirements.
- C. Output Control Module
  1. Line supervision with 12VDC power supply.
  2. RS-485, 4-wire communications.
  3. Sixteen form-C 5A, 30VDC contacts for load switching that support “on”, “off”, and “pulse” control.
  4. Two dedicated inputs for tamper and power failure status.
  5. Manufacturer: Access It! MR-16OUT.

## 2.8 SINGLE READER INTERFACES (SRIs)

### A. General

1. Dual Reader Interfaces (DRI) are preferred whenever possible due to greater functionality and expansion potential. See section 2.13 below.
2. Locate its respective power source as close as physically possible, while maintaining proper service clearances.
3. Two supervised inputs are for exit request (normally open) and door contact (normally closed) monitoring.
4. Alarm inputs shall be supervised with end-of-line resistors that are 1000 ohm, 1% tolerance.
5. Two output relays support fail-safe and fail-secure operation. One relay shall be used for the strike (locking device) and is capable of 5A; the other relay may be used for auxiliary functions and is capable of 1A.
6. Provide end-of-line termination at the end of the communications line. If the Single Reader Interface is at the end of the RS-485 line, the J4 termination jumper must be set.

### B. Power

1. Provide a 12VDC, 125mA power input.
2. 80mA is available from Single Interface Reader for reader TTL power.
3. Circuit with 18AWG (minimum) twisted pair cable.

### C. Upstream Communication

1. Port 1, using 2-wire RS-485 interface, is used to communicate with the Intelligent System Controller.
2. RS-485 interface cable shall be a minimum 24 AWG twisted shielded pair.
3. Cable drops to devices from the Single Interface Reader should be kept to a minimum. Drops should not exceed 10 feet.

### D. Manufacturer: Access It! MR-50

## 2.9 DUAL READER INTERFACE MODULES (DRIs)

### A. General

1. Locate its respective power source as close as physically possible, while maintaining proper service clearances.
2. Eight supervised inputs, four per door. Inputs per door are for exit request (normally open), door contact (normally closed), and two auxiliary monitoring points (selectable through the software).
3. Alarm inputs shall be each supervised with two end-of-line resistors that are 1000 ohm, 1% tolerance for a total of 2000 ohms.
4. Six output relays support fail-safe and fail-secure operation. All six relays are capable of 5A apiece. Relays per door are for the strike and two auxiliary relays.
5. Provide end-of-line termination at the end of the communications line. If the Dual Reader Interface is at the end of the RS-485 line, the J5 and J6 termination jumpers must be set.

### B. Power

1. Provide a 12VDC, 450mA power input.
2. 80mA is available from Dual Interface Reader for reader TTL power.
3. Circuit with 18AWG (minimum) twisted pair cable.

### C. Upstream Communication

1. Port 1, use 2-wire RS-485 interface, used to communicate with the Intelligent System Controller.
2. RS-485 interface cable shall be a minimum 24 AWG (minimum) twisted shielded pair.
3. Cable drops to devices from the Dual-Interface Reader should be kept to a minimum. Drops should not exceed 10 feet.

### D. Manufacturer: Access It! MR-52.

## 2.10 IDENTIFICATION

- A. Provide lettered phenolic identification plates on the following equipment, components, and accessories as noted below:
  - 1. Building Intelligent System Controllers (ISCs)
  - 2. Control Modules
  - 3. Interface Modules
  - 4. Remote Power Supplies
  - 5. Provide computer-generated adhesive labels on system devices (Brady, Dymo, P-Touch). The label shall indicate the address and must be located on the device or adjacent to the device if this is not practical.
- B. Cabling and devices terminating at the control equipment shall be appropriately labeled with the proper device number or device description. Terminal blocks that are active shall be labeled with their appropriate landing site on the terminal board.
- C. System Labeling and Identification
  - 1. The description in the notes field of the Access It! access control system shall indicate the location of the ISC's, DRI's, power supplies, PIM's, SRI's, and Video devices and include the date of installation.
  - 2. The location shall include the room number and geographic location in the room itself.
- D. Identification Plates and Labels shall be as follows:
  - 1. ISCs shall be labeled ISC-U, where U is a value from 1-9.
  - 2. DRIs shall be labeled DRI-UVWX, where U indicates its respective ISC numeral; and V is the ISC's respective buss, a value from 1 to 4; where WX are values from 01 to 32.
  - 3. Devices shall be labeled UVWXYZ, where U indicates its respective ISC numeral; and V is the ISC's respective buss, a value from 1 to 4; WX indicates its respective panel, values from 01 to 32; Y indicates the input or output terminals, a value of 1 for input and 0 for output; and Z indicates its respective input or output terminal, a value from 1 to 4.



4. Examples

- a. ISC-2 is the second Intelligent System Controller in the building.
- b. RIM-2305 is the fifth Dual Reader Interface served from the third buss of the second Intelligent System Controller in the building.
- c. Device #230503 is the device on the third output of the fifth panel served from the third buss of the second Intelligent System Controller in the building.

PART 3 - INSTALLATION

3.1 CABLE AND RACEWAY SYSTEMS

- A. Provide communication system requirements for a fully operational card access system.
- B. Installations shall be performed to the current code requirements.
- C. Cables shall be routed in raceway systems. Free air, plenum rated cable is not acceptable.
- D. Raceway systems shall be installed in a concealed manner; they shall be brought in above an accessible ceiling and fished inside the walls. Surface raceway systems are permitted where ceilings are inaccessible and walls cannot be fished.
- E. Cabling shall be run in such a fashion so as to be kept at least 18" away from electric or data lines. In the event that a cable must cross over the path of an AC line, the cable must cross the path at a 90-degree angle to the AC line, thus keeping EMF interference to a minimum. Cabling must be kept at least 18" away from fluorescent lighting ballasts. Wiring installed in door frame components shall be installed to protect from damage and allow for future repairs or upgrades.
- F. Cornell University Facilities Engineering (FE) must approve any deviations in wire, raceway systems, or raceway hardware.
- G. Raceways shall be run from the field device to the head-end termination point in a professional manner, utilizing conduit, beam clamps, wire ties or other devices where necessary. In areas where the raceways are to be run above the drop ceiling, conduits shall be routed together where possible. Routing shall be in a workmanlike manner, with raceways mounted so as not to interfere with the servicing of other building infrastructure systems in the future. Electrical work shall conform to the latest local codes and the National Electric Code (NEC).

H. Specifications for Ethernet cabling: 1

1. All cable should comply with CIT cabling standards, be full copper and a minimum rating of CAT6. CCA (Copper Clad Aluminum) cabling shall not be used.
2. All cabling should adhere to current NFPA and NEC requirements for power over Ethernet.

I. Communication conductors shall be shielded twisted pairs; a minimum 24 AWG./2- pair stranded copper between the ISC and each downstream device. Manufactured by Belden, model #9842 or equivalent.

J. Adequate conductors shall be provided to allow for all functions the equipment is capable of providing regardless of use at the time of installation.

K. Low-voltage power conductors shall be unshielded twisted pairs; a minimum 18 AWG./4-conductor stranded copper between the power supplies and each downstream device. Manufactured by Belden, model #9157, or equivalent.

L. Card reader conductors shall be a minimum of 22 AWG./6-conductor, shielded, between card reader and reader interface. Belden model #9942 or equivalent.

M. Door position switch conductors shall be a minimum of 22 AWG./2-conductor between egress device and reader interface module. Belden model #8442 or equivalent.

N. Electric locking hardware conductors shall be a minimum of 18 AWG./2-conductor, between head-end power supplies and each downstream device. Belden model #8461 or equivalent.

O. System wiring, circuits, and conductors shall be identified by number at termination points (i.e., control panels, remote annunciators, etc.) and splice points (i.e., junction boxes, splice boxes, etc.).

P. Junction and splice boxes containing card access system wiring, circuits, and conductors shall have blue covers.

Q. End-of-line resistors shall be installed at the location of the door contact or other sensor, not at the ISC.

### 3.2 MOUNTING REQUIREMENTS

A. Equipment shall be mounted per manufacturer installation instructions and in a manner consistent with the ability to work around such equipment, and to perform the normal duties required in that area without coming into contact with the control equipment.

- B. Control equipment shall be mounted at a convenient height for future servicing. Control equipment shall be mounted in such a way that shall prevent their disengaging, by either vibration, gravity, or an individual unplugging them.
- C. Control equipment shall have at least 4 inches of clearance from any non-system component or structure, unless mounted adjacent to another access control panel.
- D. Power transformers shall be mounted in such a way that shall prevent their disengaging, by either vibration, gravity, or an individual unplugging them.
- E. Existing Equipment shall not be connected to, modified, or otherwise tied into without approval from FMOPS Alarm Techs prior to installation start.

### 3.3 SYSTEM PROGRAMMING – CARD ACCESS

- A. Cornell's Access Control Program (ACP) will perform the initial setup programming prior to the installation.
  - 1. Facilities Fire Alarms & Security Technician or a Access It!-certified installer will perform all required wiring and terminations on the board prior to ACP configuration.
  - 2. ACP will perform initial setup programming to include:
    - a. ISC configuration and labeling.
    - b. Device hardening.
    - c. User/Password configuration
    - d. Creation of the device instance in the access control software.
    - e. Creation or modification of the Emergency Response access level using the following naming convention (EMERGENCY RESPONSE – Segment Name).
  - 3. Facilities Fire Alarms & Security Technician or a Access It!-certified installer will:
    - a. RIM (reader interface module) configuration and labeling.
    - b. Initial test Time Zones and Access Levels.
    - c. Initially name devices: Facility Name, Room number, Room purpose, compass direction of installation, Interior or Exterior

- B. The building/unit access control coordinator (ACC), for the building implementing the security and access measures, shall supply CUPD Access Control Project manager with the information pertaining to the desired theory of operations for the space including population residing within, and the traffic patterns and times of operation therein. If it is determined that the authorized ACC's are failing to comply with policies or misusing the system, their privileges may be revoked.
- C. The security system installer is responsible for initial alarm programming and commissioning for intrusion devices with approval and collaboration of Cornell Police Telecommunications and CUPD Crime Prevention.

### 3.4 TESTING, COMMISSIONING AND ACCEPTANCE

- A. A final test of the respective security and card access equipment and hardware shall be performed prior to considering the installation "complete". In the case of a new building or renovation, this shall be done prior to building occupation.
- B. As-Builts shall be provided to FMOPS Alarm Group prior to commissioning
- C. Installation's project and/or construction manager shall schedule a systems commissioning with the Access Control Project Management team, Security Contractor/Installer, and Electrical contractor, preferable to have the actual installing employee on site if possible, when applicable, two weeks prior to the completion of the installation of a tentative testing date. On that date, a full system test will be performed according to these guidelines.
- D. The CUPD Access Control Project Management team will give a commissioning report to the project manager after the test has been completed. When a portion of the system fails during the test, that portion, or the entire system will be tested again. The extent of the retest shall be up to the discretion of Access Control Project Manager.
- E. If occupation occurs prior to Access Control commissioning, the Cornell Project Manager is responsible for obtaining CUPD approval and building occupants must be notified of potential security risks (by flier, email via the Unit/College department).

### 3.5 WARRANTY

- A. A warranty shall be provided for labor/workmanship and on hardware included in the installation, for a period of one (1) full year from the date of completion.

### 3.6 PROJECT CLOSE OUT

- A. At completion of the project, the Contractor shall provide the Cornell Project Manager with a complete set of security system "As-Built" drawings that includes, but is not limited to, the following information prior to the closeout of the project.

The project manager will ensure these documents are delivered to Facilities Inventory Group for archiving.

1. Head end equipment location and interface panel locations.
2. Power supply locations.
3. Battery calculations.
4. Device locations.
5. Circuit breaker locations: Include power panel and circuit numbers.
6. Complete system riser diagram that depicts all wiring, components, and interconnections. Include locations and labeling

END OF SECTION



**SECTION 28 31 02**

**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. 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. 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. FCI E3 (Existing)

### 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. The system shall be entirely solid state, microprocessor based, use digital transmission and shall be field programmable. All system programming including field modifications shall be stored in non-volatile memory. Field modifications shall be automatically stored without special actions. The panel shall be designed and manufactured expressly for the intent to detect the presence of fire and to provide indication of such detection. Panel shall contain as a minimum power supply(s), control module, main control printed circuit board, initiation modules, notification modules, terminals and back up battery(s). Control module shall have 80 character backlit LCD display and twelve control buttons (four being field assignable), minimum. Display shall indicate the battery voltage at all times.
- B. The system shall be modular in design to allow for future expansion with a minimum of hardware additions.

- C. The FACP shall be located where shown on the drawings. Enclosures shall accept all system items for an aesthetically suitable operator's console. 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. Enclosure shall have a red finish.
- D. Conditions of the system shall be indicated at the operator interface by LED's. These conditions shall be alarm, supervisory, trouble and alarm silenced. An LCD 2 line, 40 character per line display shall also be included. It shall display "SYSTEM IS NORMAL" with the date and time under normal circumstances. The LCD display shall also indicate type of alarm, point status, number of alarms and location. Through the use of function keys, historical data can also be displayed.
- E. The FACP shall include a password (three levels of protection with individual passwords, minimum) protected key pad for access to programming, special functions and all system features.
- F. Any event initiated by the FACP due to an alarm input shall be retained in nonvolatile EPROM memory. The FACP shall also have sufficient memory for 1200 individual alarm/trouble events.
- G. The FACP shall have the following user connection types:
  - 1. Ethernet connection for a computer, personal data device or printer. Connection shall allow for programming changes, history download, setting review/changes, etc.
  - 2. RS 232 port for connection of a serial printer.
- H. Provide modules for network interfacing.
- I. 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.
- J. Design Equipment: FCI E3

#### 2.4 REMOTE TRANSPONDER UNIT (RTU)

- A. 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: FCI E3 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.
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. Game Well / FCI M/N DNR with 151 remote test station.

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. Speakers:

1. 24 volts DC.
2. Basic grille type with powder coated red finish paint.
3. Speakers 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 Speaker-Strobe Units:
1. Unit shall be a combination of the speaker 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

- 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 sealed lead-calcium batteries, 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.
- B. Furnish and install a Digitize "Mux Pad" with one 3/4" conduit with pull line and communication cable to communications room and one 3/4" conduit with wiring per manufacturer requirements between FACP and Mux Pad.

## 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 to 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 to 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 to the smoke dampers installed by others. Provide an addressable control module for each. 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.
- K. Provide all elevator capture control wiring. 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.
- 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 exiting 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

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                                  |                                                    |                                                |                                                    |                                       |                             |                    |
| Sprinkler Water Flow in Elevator Equipment Room or Shaft | X                                     | X                            |                                             |                                    |                                         |                                | X                                   | X                                | X                                                     | X                                        |                                                |                                            |                                 |                                 | X                                    | X                                | X                             | X                               |                                    |                                                    |                                                |                                                    |                                       |                             |                    |
| Elevator Shaft Smoke Detector                            | X                                     | X                            |                                             |                                    |                                         |                                | X                                   | X                                | X                                                     | X                                        |                                                |                                            |                                 |                                 |                                      |                                  |                               |                                 |                                    |                                                    |                                                |                                                    |                                       | X                           |                    |
| Elevator Equipment Room Area Smoke Detector              | X                                     | X                            |                                             |                                    |                                         |                                | X                                   | X                                | X                                                     | X                                        |                                                |                                            | X                               | X                               |                                      | X                                |                               | X                               | X                                  |                                                    |                                                |                                                    |                                       |                             |                    |
| Elevator Shaft and Equipment Room Heat Detectors         | X                                     | X                            | X                                           | 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                             |                                 |                                    |                                                    |                                                |                                                    |                                       |                             |                    |
| 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                                              | X                                          |                                 |                                 |                                      |                                  |                               |                                 |                                    |                                                    |                                                |                                                    |                                       |                             |                    |
| Fire Pump Low Fuel                                       |                                       |                              | X                                           | X                                  |                                         |                                | X                                   |                                  | X                                                     | X                                        | X                                              |                                            | X                               | X                               |                                      |                                  |                               | X                               | X                                  |                                                    |                                                |                                                    |                                       |                             |                    |
| Fire Pump Running                                        | X                                     | X                            |                                             |                                    |                                         |                                | X                                   |                                  | 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                                        |                                                |                                            |                                 |                                 |                                      |                                  |                               |                                 |                                    |                                                    |                                                |                                                    |                                       |                             |                    |
| Smoke Detector Adjacent to Smoke Hatch                   | X                                     | X                            |                                             |                                    |                                         |                                | X                                   | X                                | X                                                     | X                                        |                                                |                                            | X                               | X                               |                                      |                                  |                               |                                 | X                                  |                                                    |                                                |                                                    |                                       |                             |                    |
| AHU Off, Any Reason                                      |                                       |                              |                                             |                                    |                                         |                                |                                     |                                  |                                                       |                                          |                                                |                                            |                                 |                                 |                                      |                                  |                               | X                               |                                    |                                                    |                                                |                                                    |                                       |                             |                    |
| CO Detection                                             |                                       |                              | X                                           | X                                  |                                         |                                | X                                   |                                  | X                                                     |                                          | X                                              |                                            |                                 |                                 |                                      |                                  |                               |                                 |                                    |                                                    |                                                |                                                    |                                       |                             | X                  |



## SECTION 321313

### CONCRETE PAVING

#### 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 and all University Standards.

##### 1.2 SUMMARY

- A. Section Includes Concrete Paving.
  - 1. Curbs and gutters.
  - 2. Walks.
  - 3. Detectable warnings.
- B. Related sections include the following:
  - 1. Division 31 Section "Earth Moving" for subgrade preparation, grading, and sub-base course.

##### 1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

##### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.

- B. Material Certificates: For the following, from manufacturer:
  - 1. Cementitious materials.
  - 2. Steel reinforcement and reinforcement accessories.
  - 3. Admixtures.
  - 4. Curing compounds.
  - 5. Bonding agent or epoxy adhesive.
  - 6. Joint fillers.
- C. Material Test Reports: For each of the following:
  - 1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- D. Field quality-control reports.

#### 1.6 QUALITY ASSURANCE

- A. Stamped Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.
- B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

#### 1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

#### 1.8 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
  - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.

2. Do not use frozen materials or materials containing ice or snow.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

## PART 2 - PRODUCTS

### 2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

### 2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

### 2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, fabricated from steel wire into flat sheets.
- B. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.

- C. Tie Bars: ASTM A 615/A 615M, Grade 60; deformed. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
  - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
  - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

## 2.4 CONCRETE MATERIALS

- A. Concrete materials shall be in accordance with the latest GDOT Standards and Specifications. Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. Admixtures: Concrete admixtures shall be in accordance with GDOT Standards and Specifications. Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- C. Water: Potable and complying with ASTM C 94/C 94M.

## 2.5 CURING MATERIALS

- A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- B. Water: Potable.

## 2.6 RELATED MATERIALS

- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy-Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:
  - 1. Types I and II, non-load bearing for bonding hardened or freshly mixed concrete to hardened concrete.



## 2.7 DETECTABLE WARNING MATERIALS

- A. Detectable Warning Stamp: Semirigid polyurethane mats with formed underside capable of imprinting detectable warning pattern on plastic concrete; perforated with a vent hole at each dome.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Advanced Surfaces Inc.
    - b. Matcrete Precision Stamped Concrete Tools.
    - c. Southern Color N.A., Inc.
    - d. Stampcrete International Ltd.
    - e. Superior Decorative by Dayton Superior.
- B. Liquid Release Agent: Manufacturer's standard, clear, evaporating formulation designed to facilitate release of stamp mats.
  - 1. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Division 01 Section "Product Requirements."
  - 2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Advanced Surfaces Inc.; Liquid Release.
    - b. Matcrete Precision Stamped Concrete Tools; Liquid Release Agent.
    - c. Southern Color N.A., Inc.; SCC Clear Liquid Release.
    - d. Stampcrete International Ltd.; Stampcrete Liquid Release.
    - e. Superior Decorative by Dayton Superior; Pro Liquid Release.

## 2.8 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to GDOT Standards and Specifications for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.

## 2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with the requirements and with ASTM C 94.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances. Inspect subgrade conditions for proper compaction and soft spots.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

#### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

#### 3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

### 3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
  - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
  - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
  - 2. Provide tie bars at sides of paving strips where indicated.
  - 3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
  - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
  - 1. Locate expansion joints at intervals of 50 feet, change of direction and adjacent to existing building unless otherwise indicated.
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
  - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
  - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  - 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
  - 7. Doweled Isolation Joints: Install 12-inch dowel bars and support assemblies at joints. Place two dowels per joint spaced 18 inches apart and no closer than 12 inches from edge.. Lubricate one-half of dowel length to prevent concrete bonding to one side of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of

the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
  - a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

### 3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
  1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement and joint devices.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do

not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

- J. Curbs and Gutters: Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

### 3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Rfloat surface immediately to uniform granular texture.
  - 1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

### 3.8 DETECTABLE WARNING MATERIALS

- A. Stamped Detectable Warnings: Install stamped detectable warnings as part of a continuous concrete paving placement and according to stamp-mat manufacturer's written instructions.
  - 1. Before using stamp mats, verify that the vent holes are unobstructed.
  - 2. Apply liquid release agent to the concrete surface and the stamp mat.
  - 3. Stamping: While initially finished concrete is plastic, accurately align and place stamp mats in sequence. Uniformly load, gently vibrate, and press mats into concrete to produce imprint pattern on concrete surface. Load and tamp mats directly perpendicular to the stamp-mat surface to prevent distortion in shape of domes. Press and tamp until mortar begins to come through all of the vent holes. Gently remove stamp mats.
  - 4. Trimming: After 24 hours, cut off the tips of mortar formed by the vent holes.
  - 5. Revise minimum time period in subparagraph below if required. The recommended time period to wait before removing residual release agent varies from 2 to 10 days among manufacturers. Concrete must be strong enough to not be damaged.
  - 6. Remove residual release agent according to manufacturer's written instructions, but no fewer than three days after stamping concrete. High-pressure-wash surface and joint patterns, taking care not to damage stamped concrete. Control, collect, and legally dispose of runoff.

### 3.9 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by curing compound as follows:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

### 3.10 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
  - 1. Elevation: 1/4 inch.
  - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
  - 3. Surface: Gap below 10-feet-long; unleveled straightedge not to exceed 1/4 inch.
  - 4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
  - 5. Lateral Alignment and Spacing of Tie Bars & Dowels: 1 inch.
  - 6. Vertical Alignment of Dowels: 1/4 inch.
  - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
  - 8. Joint Spacing: 3 inches.
  - 9. Contraction Joint Depth: Plus 1/4 inch, no minus.
  - 10. Joint Width: Plus 1/8 inch, no minus.

### 3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  - 3. Air Content: ASTM C 231/C 231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
  - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
  - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
    - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to COR, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by COR but will not be used as sole basis for approval or rejection of concrete.

- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by COR.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

### 3.12 REPAIR AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by COR.
- B. Drill test cores, where directed by COR, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION