WAR MEMORIAL PHASE 2 - RESTORATION

Project Manual & Specifications

February 15, 2023

Owner

Cornell University Ithaca, New York 14853

Architect

CVM Engineers 1002 West 9th Avenue King of Prussia, Pennsylvania 19406

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END OF DOCUMENT

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INSTRUCTIONS TO BIDDERS

Project: War Memorial Phase 2 - Restoration

Owner: Cornell University

Ithaca, New York 14853

Architect: CVM Engineers

1002 West 9th Avenue

King of Prussia, Pennsylvania 19406

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 eBuilder 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.

Bid Documents Terms of Use / Disclaimer - By accessing and/or using the Cornell University Document Files, You accept without limitation or qualifications, the following Terms of Use:

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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 eBuilder 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 eBuilder 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 11:00AM, August 15, 2023, in Room 102C of Humphreys Service Building or via Zoom at:

 $\frac{https://cornell.zoom.us/j/91075291978?pwd=bWRFOCtPMVNKcklmVmoyL3RhS1dsZz}{09\&from=addon}$

A Pre-bid walkthrough will follow and will meet at the War Memorial at Lyon & McFaddin Halls, 240 West Avenue; Ithaca, New York 14853.

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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.

5. BID SUBMISSION

Bid Submissions must include the following:

- a. Base Bid entered into the eBuilder 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. Unit Pricing
 - 8. 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 eBuilder 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.

6. 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.

7. FEDERAL EXCISE TAX

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

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8. 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.

9. 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.

10. 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 eBuilder 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 eBuilder 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.

11. 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 eBuilder 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.

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12. 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 eBuilder 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.

13. 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 eBuilder 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.

14. METHOD OF SUBMISSION

- a. Base Bid shall be prepared and electronically submitted via the eBuilder Bid Portal. All required fields and attachments in the eBuilder Bid Portal must be completed.
- b. Bid Proposal Certification Form shall be prepared electronically submitted as an attachment via the eBuilder Bid Portal Response Form Step 3 Additional Required Information Custom Fields.
- c. Completed and responsive Bid Proposals shall be submitted through the eBuilder Bid Portal no later than 2:00PM on August 31, 2023.
- 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.

15. BID OPENING

a. Completed and responsive Bid Proposals will be opened electronically via eBuilder Bid Portal. Responsive Bid results will be posted to the Facilities Contracts website at:

https://finance.fs.cornell.edu/contracts/pob/projects.cfm 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.

16. 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.

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- 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 eBuilder 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 sixty (60) calendar days following the award of a construction contract or such other time as may be agreed to by the Owner and Contractor.

17. 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.

18. 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.

19. START OF WORK

- a. Work at the site shall be started within ten (10) calendar days from the date of issuance of written authorization to proceed and shall achieve substantial completion of the project no later than December 1, 2024.
 - 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.

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20. ADDENDA AND BULLETINS

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

21. 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

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UNIT PRICES

This form shall be completed by the bidder and uploaded into the eBuilder Bid Portal Response Form – Step 3 – Additional Required Information Custom Fields

	UNIT PRICE	UNIT	ADD	DEDUCT
UP-1	Localized Stone Repointing (Vaulted Ceiling)(M2)	Linear Foot	\$	\$
UP-2	Localized Limestone Repointing (Vaulted Ceiling) (L2)	Linear Foot	\$	\$
UP-3	Replacing Field Stone Masonry (M3)	Each	\$	\$
UP-4	Limestone Patch Repair (L8)	Each	\$	\$
UP-5	Limestone Spall Repair (L9)	Each	\$	\$
UP-6	Limestone Dutchman Repair (L10)	Each	\$	\$
UP-7	Limestone Crack Repair (L11)	Linear Foot	\$	\$
UP-8	Limestone Stabilization via Cross Pins (L12)	Each	\$	\$
UP-9	Roof Deck Replacement (S3)	Square Foot	\$	\$
UP-10	Rafter Plate Replacement (S9)	Linear Foot	\$	\$
UP-11	Wood Rafter Reinforcement (S10)	Each	\$	\$
UP-12	Partial Width Concrete Repair (S2)	Square Foot	\$	\$

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WAR MEMORIAL PHASE 2 - RESTORATION

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 February 15, 2023, as prepared by CVM Engineers, 1002 West 9th Avenue, King of Prussia, Pennsylvania 19406, 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 eBuilder Bid Portal.
- 2. Minority and Women's Business Enterprises (M/WBEs)

Facilities and Campus Services supports Cornell University's ongoing commitment to encourage business opportunities and diversity among its vendor community by promoting minority owned and controlled business' development as a shared responsibility. The University's intention is to create and expand opportunities for minority, women, veteran, LGBTQ, small and locally owned businesses through construction labor opportunities and the procurement of goods and services.

Positive good faith efforts to advance the University's objectives shall be made by all Contractors, engaging, and maximizing these diverse enterprise goals, and to positively drive Cornell's economic impact.

Cornell University Diversity Council Statement:

"Cultivate partnerships with the widest spectrum of Off-Campus entities and include a fully diverse range of Off-Campus participants in Cornell's events, contracts, services, and initiatives."

3. Milestone Dates

a. The undersigned agrees, if awarded the Contract, to commence work at the site within ten (10) calendar days after date of issuance of written notice to proceed and to achieve substantial completion of the project no later than December 1, 2024.

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c.	Following are additional Milestone Dates:

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

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.

4. Proposed Principal Subcontractors

that meets the duration established.

- a. The undersigned agrees, if awarded the Contract, to employ subcontractors from the list submitted in the eBuilder 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.

5. Contractor Team:

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

6. Bonds

- a. Bid Bond. A Bid Bond in the amount of a minimum of 10% of Bid Amount is attached to the eBuilder 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 eBuilder Bid Portal Response Form Step 3 Additional Required Information Custom Fields

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d. Bonding Rate for Change Orders has been entered into the eBuilder Bid Portal Response Form – Step 3 – Additional Required Information Custom Fields

7. 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 eBuilder Bid Portal.

8. 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 eBuilder 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.

9. 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 eBuilder 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 eBuilder Bid Portal Response Form Step 3 Additional Required Information Custom Fields prior to the execution of the Contract.

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10. 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 eBuilder 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.
 - i. The undersigned acknowledges receipt of **Supplemental Conditions** to the Contract surrounding Contractor Response and Health & Safety Protocols for COVID-19, or other viral, bacterial, or microbial presence (as applicable).
 - ii. The undersigned acknowledges that no one will be permitted on the job site until the Health & Safety Plan has been submitted.

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.

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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 eBuilder 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
Unit Pricing

By:

Title:

Business Address:

2. It is understood that the Owner reserves the right to accept or reject any of the Alternate Proposals provided in the eBuilder Bid Portal within sixty (60) calendar days following the

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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:		

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CERTIFICATE AS TO CORPORATE BIDDER

I,	,	certify	that	I	am	the
	of the Corporation named as Bidder	within thi	s Bid F	orm	for Ge	neral
Contractors; that	, who signed	said Bid	Form of	on be	ehalf o	of the
bidder was then	of said Corporation	on; that I k	know hi	s sig	nature	; that
his signature thereto is genu	ine and that said Bid Form and attachmen	ts thereto	were o	duly	signed	l and
executed for and on behalf of	said Corporation by authority of its governi	ng body.				
(Secretary-Clerk)						
Dated:						

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GENERAL CONDITIONS

FOR

WAR MEMORIAL PHASE 2 - RESTORATION

CORNELL UNIVERSITY ITHACA, NEW YORK

GENERAL CONDITIONS

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G		Contractor Performance Evaluation

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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 eBuilder.
- 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'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. 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, "asbuilt" 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. <u>Work performed by the Contractor</u>: 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. <u>No Markup on Bonds and Insurance Costs</u>: 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 E-Builder 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 E-Builder.

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 e-Builder 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. <u>Indemnification</u>. 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. <u>Worker's Compensation Insurance</u>. A policy complying with the requirements of the laws of the State of New York and any other laws that may be applicable thereto, including Coverage B Employer's Liability with a limit of not less than \$1,000,000.

2. <u>Contractor's Comprehensive General Liability Insurance</u>. A standard comprehensive 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, all obligations assumed by the Contractor under this Contract and all damage to work performed by subcontractors on your behalf. <u>The Contractor shall provide Broad Form Comprehensive General Liability Insurance, and the Owner shall be an additional insured in the policy</u>. The policy shall include cross liability coverage and shall be endorsed to indicate that it is primary coverage. The completed operations coverage's shall be maintained for not less than two years after acceptance of the work. The coverage under such policy shall be not less than a combined single limit for Bodily Injury and Property Damage as follows, or such limits carried by the Contractor, whichever is greater:

BODILY INJURY AND PROPERTY DAMAGE LIABILITY (BROAD FORM)

\$ 5,000,000 Each Occurrence \$ 5,000,000 Aggregate

3. <u>Automobile Liability Insurance</u>. 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 circumstances under which they are being used, required by the Motor Vehicle Laws of the State of New York to bear license plates. The coverage under such policy shall be not less than a combined single limit for Bodily Injury and Property Damage of:

BODILY INJURY AND PROPERTY DAMAGE LIABILITY

\$ 1,000,000 Each Person \$ 1,000,000 Each Accident

- 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.

- 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

The Contractor shall purchase and maintain in force a builders risk insurance Α. 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.

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 E-Builder 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 E-Builder 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 (90%) 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 E-Builder 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 E-Builder.

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 H 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 ten percent (10%) 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 C, 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 "C" and made a part of the Contract Documents, has been submitted by the Contractor, each subcontractor and subsubcontractor, 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 "E". Upon completion of the project, the Contractor shall submit to the Owner a guarantee for the project on the form attached hereto as Exhibit "E".

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 (Jake Perno) shall be recognized by the Contractor.

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:

Facilities and Campus Services supports Cornell University's ongoing commitment to encourage business opportunities and diversity among its vendor community by promoting minority owned and controlled business' development as a shared responsibility. The University's intention is to create and expand opportunities for minority, women, veteran, LGBTQ, small and locally owned businesses through construction labor opportunities and the procurement of goods and services.

Positive good faith efforts to advance the University's objectives shall be made by all Contractors, engaging, and maximizing these diverse enterprise goals, and to positively drive Cornell's economic impact.

Cornell University Diversity Council Statement:

"Cultivate partnerships with the widest spectrum of Off-Campus entities and include a fully diverse range of Off-Campus participants in Cornell's events, contracts, services, and initiatives."

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. Affirmative Action Workforce Report
- B. The Contractor shall submit an Affirmative Action Workforce Report on a monthly basis, or as requested by Owner. 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.

<u>ARTICLE 18 – CONTRACTOR PERFORMANCE EVALUATION</u>

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 I. 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://fcs.cornell.edu/project-contractors-and-consultants This includes treating equally all persons and firms currently doing business with or seeking to do business with or for Cornell University, whether as contractors, subcontractors, or suppliers. Such persons and firms are respectfully reminded that Cornell University employees and their families may not personally benefit from Cornell University's business relationships by the acceptance of gifts or gratuities, defined as a gift in excess of \$75.00 given to a Cornell employee for personal use. Items not considered gifts/gratuities include occasional business meals, items of an advertising nature, and items that are generally distributed to all potential customers. In addition, it is expected that the Contractor's officers and employees shall conduct all business related to this Contract within the highest ethical standards, observing applicable policies, practices, regulations, law, and professional standards. All parties are expected to report violations of this policy to appropriate the university personnel. You mav file report a to on 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.

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 eBuilder 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.

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CONSTRUCTION CONTRACT CHANGE ORDER REQUEST

	DATE:		COR#		
PROJECT TITLE: Name of Contractor/Subcontractor performing Work:			CONTRACT NO.		
DESCRIPTION OF WORK:					
A. DIRECT COST OF WORK:					
1 LABOR (Attach Supporting Documentation)		LY WAGE	HOURS	TOTAL	
ASSIGNED PERSONNEL OR WORK CREW	RAI	E PAID	WORKED	COST	\$0
					\$0
					\$0
	_	LA	BOR TOTAL		\$0 \$0
2 MATERIAL (April Communication)	INTE	IDIT OF	PEOLIBER	TOTAL	\equiv
2 MATERIAL (Attach Supporting Documentation) MATERIAL REQUIRED FOR CHANGE	UNIT	UNIT OF MEASURE	REQUIRED UNITS	TOTAL COST	
					\$0
	_				\$0
			<u> </u>		\$0 \$0
	_	MATE	RIAL TOTAL		\$0
3 EQUIPMENT (Attach Supporting Documentation)	UNIT	UNIT OF	REQUIRED	TOTAL	\neg
EQUIPMENT REQUIRED FOR CHANGE	PRICE	MEASURE	UNITS	COST	
	_				\$0
	_		 		\$0 \$0
					\$0
		FOUR		•	\$0
		EQUIPM	IENT TOTAL		\$ 0
4	Г	IRECT COST	(SUM 1, 2, 3)		\$ 0
5		OH&P Rate			\$ 0
6 SUBCONTRACTOR (Attach Supporting Documentation)	cTT	B-SUB	SUB-SUB	TOTAL	$\overline{}$
SUB-SUBCONTRACTOR REQD FOR CHANGE		OF WORK	MARK UP %	COST	
					\$0
			<u> </u>		\$0 \$0
	SUB-S	UBCONTRAC	TOR TOTAL		\$0
7 OVERHEAD AND PROFIT		OH&P Rate	•		\$0
, overdens in our					
	TOTAL COST P	LUS OH&P (S	SUM 4, 5, 6, 7)		\$ 0
8 BOND PREMIUM (If applicable)	Bond	Premium Rate			\$ 0
		TOTA	L COR COST		\$0
TOTAL CONTRACT DAYS AD	DED/DELETED ED	OM PROTECT	r schedure I		0
TOTAL CONTRACT DATEAL	CLUIDLE LED IN	OMIT ROUEC	SCHLIDGE	1	•

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CONSTRUCTION CONTRACT CHANGE ORDER SUMMARY

	DATE:	
	PCO#	
PROJECT TITLE:	CONTE	RACT NO.
CONTRACTOR:		
DETAILED DESCRIPTION OF WORK:		
1 DIRECT COST OF WORK:		
NAME OF CONTRACTOR/SUBCONTRACTORS PERFORMING WORK		OTAL COST
TOTAL COST OF PROPOSE	D CHANGE ORDER ITEM	\$0
	<u></u>	
TOTAL CONTRACT DAYS ADDED/DELETED FRO	OM PROJECT SCHEDULE	



FINAL RELEASE

FINAL WAIVER OF CLAIMS AND LIENS AND RELEASE OF RIGHTS

Date	_	Contract Date	
Project	<u> </u>	Contract Price	
Address	Net Extra	as and Deductions	
City	Adjust	ted Contract Price	
County	Amour	nt Previously Paid	
State	_ Balance Du	e - Final Payment	
The undersigned hereby acknowledges that the a labor, materials, etc., furnished by the below named Project in accordance with the Contract. In consideration of the amounts and sums previous being the full and Final Payment amount due, the best the Owner from any and all claims and liens and improvements now or hereafter thereon, and upon the Owner or from any other person, firm or corporation services, materials, fixtures or apparatus heretoford Project. The premises as to which said claims and I	asly received, and low named Contra rights of liens u he monies or other n, said claims, lier e furnished by th	the payment of \$ actor or Supplier does pon the premises der considerations due as and rights of liens e below named Con	s hereby waive and release escribed above, and upon or to become due from the being on account of labor, attractor or Supplier to the
The undersigned further represents and warrants this waiver on his/her own behalf and on behalf of properly performed all work and furnished all mater good and workmanlike manner, fully and complet services that it has used or supplied, that it has no holdbacks, expenses employed in the prosecution of Owner as of the date of the aforementioned last an been supplied or incorporated into the above premifully paid for and supplied on the last and final payr. The undersigned further agrees to defend, in (including without limitation reasonable attorneys)	the company or berials of the specifically; that it has partially other outstanding of work, chargebard final payment a dises were either target application of the company	usiness for which he ed quality per plans a aid for all the labor, and unpaid applicated acks or unbilled worth application; and that aken from its fully-per invoice.	e/she is signing; that it has and specifications and in a materials, equipment and tions, invoices, retentions, ik or materials against the any materials which have aid or open stock or were
In addition, for and in consideration of the Supplier hereby waives, releases and relinquishes whatsoever arising out of through or under the abothereto.	e amounts and su any and all claim	ams received, the be	clow named Contractor or of action in equity or law
The below named Contractor or Supplier installed are in accordance with the Contract and the remain in effect for the period specified in said Contract and the contract and the contract and the contract are said to the period specified in said Contract and the contract are said to the contract a	hat the terms of the		
Sworn to before me this	_	Corp	oration or Business Name
Day of20	Ву:		
	Title:		



GUARANTEE

		Date:
-	nd specifications and the terms and c	onditions of our contract with Cornell , we hereby guarantee
for	(Project Title)	, Ithaca, New York to be free
	d workmanship for the period of, the date of acceptance by the Owner	
		(COMPANY)
	By:	
	Title:	

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MWBE Utilization Report

PART I – PROJECT INI	FORMATION
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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 (List your firm if also MBE or WBE) Number Contract Value Bid Date: Dollar Value of Description of Work or Subcontractor or Supplies Purchase Order Purchase Order Contract Value 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, Federal ID Dollar Value of Contact, Email, MBE or WBE Number Contract or Supplies Supplier Start and
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, Federal ID Dollar Value of Contact, Email, MBE or WBE Number Contract or Supplies Supplier Start and
PART II – MWBE LIST (Update as MWBE firms come under contract, sign and date, resubmit) Subcontractor Name, Address, Federal ID Dollar Value of Contact, Email, MBE or WBE Number Contract or Supplies Supplier Start and
PART II – MWBE LIST (Update as MWBE firms come under contract, sign and date, resubmit) Subcontractor Name, Address, Federal ID Dollar Value of Contact, Email, MBE or WBE Number Contract or Supplies Supplier Start and
PART II – MWBE LIST (Update as MWBE firms come under contract, sign and date, resubmit) Subcontractor Name, Address, Federal ID Dollar Value of Contact, Email, MBE or WBE Number Contract or Supplies Supplier Start and
Subcontractor Name, Address, Contact, Email, MBE or WBE Contact, Email, MBE or WBE Subcontractor Description of Work or Supplier Start and Suppl
Subcontractor Name, Address, Contact, Email, MBE or WBE Contact, Email, MBE or WBE Subcontractor Description of Work or Supplier Start and Suppl
Subcontractor Name, Address, Contact, Email, MBE or WBE Contact, Email, MBE or WBE Subcontractor Description of Work or Supplier Start and Suppl
Contact, Email, MBE or WBE Number Contract or Supplies Supplies Supplier Start and
Turing Gradi
(Update totals as MWBE firms are added/subtracted to above list)
Print Name of Principal or Officer: Title:
Signature: Date:

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MWBE Utilization Report

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.

Month/Year:

General Contractor, Subcontractor, Sub- Subcontractor, or Vendor	Trade	Dollar Value of SubContract or Purchase Order	MBE, WBE, or N/A	% of Total Contract
TOTALS		0		0

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SUMMARY OF BID ACTIVITY WITH MBE AND WBE SUBCONTRACTORS AND VENDORS

Please print or type <u>all</u> in	formation, excep	t where a signature is requ	uired.	
PROJECT:				
Name of Prime Contract B	idder:			
Address (Street, City, State	and Zip Code):			
Contact Person (Name, Titl	le and Telephone l	Number):		
MBE and WBE Subcontractor/Vendor (Indicate which)	Item/ Trade	Bid Submitted: Date Amount	Award Status Date Amount	Date of Elimination
EXPLANATION OF ELIN (Use additional sheet if nec		lude meetings held for nego	otiation, etc.	
OFFICER OF FIRM:				
Name and Title:			Date:	
Signature:				

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Please print or type all information.

									_		_	_	
	ar)	Total Number of Minority Employees	Female										
	(Month/Year)	Total Numbe of Minority Employees	Male										
	M	umber loyees	Female										
OR	Ţ,	Total Number of Employees	Male										
PRIME CONTRACTOR	For the period of	Minority Employee Hours as a Percentage of	Total Employee Hours										
PRID		ican an / Native	Hours Female										
		American Indian / Alaskan Native	Hours Male										
		Pacific	Hours Female										
		Asian / Pacific Islander	Hours Male										
		anic	Hours Female										
		Hispanic	Hours Male										
		Black	Hours Female										
		Bla	Hours Male										
	t No.	on-Hispanic / Caucasian	Hours Female										
	Contract No.	Non-Hispanic Caucasian	Hours Male										
		Total of All Employee Hours By	Trade										
PROJECT	ORT		Local Union #										
PR	FORCE REP		Craft and/or Trade										TOTALS
	AFFIRMATIVE ACTION WORKFORCE REPORT		Prime Contractor, Subcontractor and Sub-Subcontractor's Name										MONTHLY PROJECT TOTALS

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

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LABOR RATE BREAKDOWN

PROJECT TITLE:		CONTRACT NO.
CONTRACTOR:	TRADE:	
	EFFECTIVE DATE: EXPIRATION DATE:	
	EATINATION DATE.	
Base Hourly Rate:		\$
Payroll Taxes and Insurance	% per Hour	
F.I.C.A. Federal Unemployment (Base on 1500 hours of work) State Unemployment (Base on 1500 hours of work)		
* Worker's Compensation		
* Bodity Injury & Property Damage		
Disability		
TOTAL	%	
Payroll Taxes and Insurance Rates: Base Rate (x) Total % =		\$
* Rates are net Contractor cost after premium discounts modifications have been applied against manual rate.	and experience	
Supplemental Benefits	\$ per Hour	
Vacation Health & Welfare		
Pension		
Annuity		
Education / Training		
Industry		
		
	Total Hourly Fringe Benefits	\$
Hourly Labor Rate: Base Rate, Taxes/Ir	nsurance and Fringe Benefits	\$
Adjustment for a composite rate which includes appre	ntices:	\$
CONTRACTOR'S CERTIFICATION		
certify that the labor rates, insurance enumerations, labor fringe enuwith actual and true cost incurred.	merations and expenses are con	rrect and in accordance
Signature of Authorized Representative:		
Print Name:		
Print Title:		



STORED MATERIALS INVOICING DOCUMENTATION

PRO.	JECT TITLE:		
CON	TRACTOR:	SUBCONTRACTOR:	CONTRACT NO.
REAS	ON FOR REQUEST:		
APPI	JICATION 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 Va	lue.	\$
3	Certificate of Insurance		
	Attach a Certificate of Insurance for the above s "Cornell University" as a loss payee with respec		hall name
4	Transfer of Title		
	The Contractor hereby agrees to transfer comple time payment is made to Contractor for the above responsible for all contractual requirements for the providing of all warranties.	e referenced Application for Pay	ment. The Contractor remain
	Signed:		
	-		Date:





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 Con-	struction Manager

Project Comments/Description

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Performance Evaluation

Comments:

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

		Fails to Achieve	Needs	Fully Achieve	Freq Exceeds	Cons Exceed	
		Expectation		Expectation	Expectation		
		1	2	3	4	5	
1	Quality of Workmanship						
	Rate this contractor's performan	ce in regards t	o quality of	work			
	 Compliance with p 			fications			
	b. Workmanship qual	•	•				
	c. Tools- quality and						
	d. Equipment - suffici		nd operating	condition			
	e. Quality of jobsite of	raft personnel					
	C						
	Comments:						
2	Scheduling/Productivity						
_	Rate this contractor's performan	ce with regard	to producin	a and			
	meeting contract schedules and	-		y			
	a. Project schedule q		npleteness				
	b. Controlling of proje		•				
	c. Manpower allocation	on for maintain	ing schedul	е			
	d. Material deliveries	to support pro	ject schedu	le			
	e. Ability to meet sub	stantial comp	letion date a	and project n	nilestones		
	f. Productivity of work	force					
	g . Ability to deal with	added work a	nd unforese	en issues.			
	_						
	Comments:						
3	Subcontractor Management						
•	Rate this contractor's ability, effe	ort and succes	ss in manad	ing and coor	dinatina		
	subcontractors (if no subcontra		-	•	•		
	Comments:						
•	Matanasha anto atau		4 - 44 - 41	C1 0 1			
3A	Major subcontractor performa	nce(score no	t added in	final Contra	actor Evalu	ation	
	For contractor information only						
	a. Plumbing Contract	or overall Pend	ormance				
	Comments:						
	b. HVAC Contractor of	werall Darfa	ance				
		overall reliom	aille				
	Comments:						
	c. Electrical Contract	or overall Derf	ormance				
	C. Electrical Contract	oi overali Perio	Jillalice				

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	Fails to Achieve	Needs	Fully Achieve	Freq Exceeds	Cons Exceed
	Expectation	Improvement	Expectation	Expectation	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 complet and correct documentation required for insurance and bond
- b. Change order processing
- **c.** Timely submission of RFl'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:

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

8 Supervisory Personnel Rating

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

Comments:

9 Contract Close-Out

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

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

Comments:

Summary Sheet

Project:_______Contractor:______

	Performance Categories
1	Quality of Workmanship
2	Scheduling
3	Subcontractor Management
4	MBE/WBE Participation
5	Safety
6	Contract Administration
7	Working Relationships
8	On Site Supervisory Personnel Rating
	_
9	Contract Close Out

Rating Per Category		
	0	
	0	
	0	
	0	
	0	
	0	
	0	
	0	
	0	

Weight %
15.00%
10.00%
10.00%
10.00%
10.00%
10.00%
10.00%
18.00%
7.00%

Scoring
0
0
0
0
0
0
0
0
0

Over All Rating

Rating Reference	
Fails to achieve expectation	1
Needs improvement	2
ully achieves expectation	3
requently exceeds expectation	4
Consistently expends expectatio	-

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OWNER COMMENTS:
OWNER COMMENTS on 3A Ratings:
CONTRACTOR COMMENTS: (To be completed by Contractor prior to Owner/Contractor discussion meeting)

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HEALTH AND SAFETY PLAN REQUISITES FOR CONSTRUCTION ACTIVITY APPLICABLE TO HIGH IMPACT RESPIRATORY PATHOGEN PANDEMICS AND CONTAGIONS

Contractors are required to protect the health and safety of employees, including the prevention and mitigation of high impact respiratory pathogen pandemics and contagions. One element of Contractor compliance with these obligations is the development and implementation of a **High Impact Respiratory Pathogen Pandemic Exposure Prevention, Preparedness and Response Plan** (Plan) for all project jobsites.

The Plan must be based upon 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). Contractor may also amend the Plan based upon and consistent with articulated operational needs and requirements.

The Plan must include the following elements:

- o Responsibilities of Managers and Supervisors
- o Responsibilities of Subcontractors and Suppliers to the Jobsites
- o Responsibilities of Employees
- Jobsite Protective Measures
- Jobsite Visitors
- o Personal Protective Equipment and Work-Related Controls
- o Jobsite Cleaning and Disinfecting
- o Jobsite Exposure Situation and Response Protocols
- OSHA or Other Recordkeeping Related Compliance
- o Confidentiality/Privacy Protocols
- o Other Safety Responsibilities & Protocols Related to HIRPP

Contractors and businesses are further required to comply with any applicable and then current COVID mandatory, emergency or temporary directives, rules or health and safety practices issued by federal, state or local authorities.

- 1.0 Nothing contained herein shall alter or modify the Contractor's exclusive control over the job site, subcontractors, project labor, Health & Safety Plans, Protocols, Measures, or the Contractor's exclusive control over the methods and means associated with any and all of the foregoing elements.
 - 1.1 Cornell University possesses neither control nor any right of control over the job site, project labor, health & safety practices or programs, or methods and means of advancing the Contracted Work.
 - 1.2 These requirements are provided to the Contractor for the attainment of Contractor's fully compliant health and safety measures and practices communicated by applicable civil authorities as requirements, rules and/or guidance necessary to engage in qualifying construction activities.

- 2.0 Contractors, their subcontractors and suppliers, and workers are required to adhere to applicable and imposed federal, state, and/or local measures to prevent or limit the possible exposure or spread of COVID-19, pathogens, or contagions.
 - 2.1 To that end, Contractor shall develop a written Health & Safety Plan related to the protective measures and protocols Contractor shall employ on the Project necessary to manage and mitigate the exposure or transmission of COVID-19, pathogens, or contagions (as applicable).
 - 2.2 This Plan shall be submitted to the Owner prior to start of Construction Activity on the Campus. Owner's receipt of the subject Plan is to affirm measures and practices are in place, not for substantive review or approval.
 - 2.3 Health and safety practices constitute a continuing compliance obligation, Contractors and their subcontractors and suppliers must remain current with, and immediately implement updated health and safety rules, protocols and practices as they are published. The Campus may request updated elements of the Contractor's written safety plan to address evolving best practices for measures and/or practices designed to prevent or limit the spread of COVID or other pathogen.
 - 2.4 The Contractor must notify Cornell immediately upon discovery of any employees of their firm, subcontractors, or suppliers that are, or have been working on the Cornell Campus that have been confirmed to have COVID contagion.
 - 2.5 In addition to the foregoing, these requirements may include Contractor compliance and implementation of then applicable federal, state, or local authorities' emergency and/or temporary safety precautions and protocols surrounding COVID i.e., Federal EO 14042 and/or applicable OSHA COVID-19 Vaccination and Testing; Emergency Temporary Standard, as applicable.
 - 2.6 Further, Owner reserves the right to impose additional COVID or pathogen safety protocols and requirements warranted by worksite factors, including but not limited to, proximity to Cornell students, staff and faculty; activity duration; and jobsite location (i.e., internal spaces). These Owner health and safety requirements may be imposed without regard to the number of Contractor employees i.e., less than 100 employees.

3.0 Project Closure:

- 3.1 Where work is suspended on a project, contractors are directed to follow any additional project shut-down protocols as provided by the Owner. These protocols include but not limited to photographs, securing the work site, and a project status narrative.
- 4.0 Contractor expressly agrees to fully comply and remain exclusively responsible for the implementation of applicable Contractor Health and Safety Protocols and Measures. Contractor expressly agrees Contractor submission of the Plan is a condition precedent to engage in on-site construction activity.



GENERAL REQUIREMENTS

FOR

WAR MEMORIAL PHASE 2 - RESTORATION

CORNELL UNIVERSITY ITHACA, NEW YORK

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SECT	TION 0	01 11 00 SUMMARY OF WORK	1
1.0	GEN	NERAL	1
	1.1	DESCRIPTION	1
	1.2	WORK UNDER OTHER CONTRACTS	2
2.0	PRO	DDUCTS - NOT USED	2
3.0	EXE	CCUTION – NOT USED	2
		01 14 00 WORK RESTRICTIONS	
1.0		NERAL	
	1.1	RELATED DOCUMENTS	
	1.2	CONTRACTOR USE OF PREMISES	
	1.3	UNIVERSITY CLOSURES	
	1.4	WATER USE RESTRICTION	
	1.5	PARKING	
	1.6	CHANGEOVERS AND CONTINUITY OF SERVICES	
	1.7	OBSTACLES, INTERFERENCE AND COORDINATION	
	1.8	EQUIPMENT ARRANGEMENTS	
	1.9 1.10	EXISTING EQUIPMENT, MATERIALS, FIXTURES, ETCEXAMINATION OF PREMISES, DRAWINGS, ETC	
	1.10	STAND DOWN DATES	
	1.12		
2.0		DDUCTS – NOT USED	
3.0		CCUTION – NOT USED	
SECT	TON 0	01 21 00 ALLOWANCES	1
1.0		NERAL	
	1.1	RELATED DOCUMENTS	
	1.2	SUMMARY	
	1.3	SELECTION AND PURCHASE	
	1.4	SUBMITTALS	
	1.5	COORDINATION	
	1.6	LUMP SUM AND UNIT PRICE ALLOWANCES	
	1.7	ADJUSTMENT OF ALLOWANCES	3
2.0	PRO	DDUCTS - NOT USED	3
3.0	EXE	CCUTION	3
	3.1	EXAMINATION	3
	3.2	PREPARATION	
	3.3	SCHEDULE OF ALLOWANCES	4

SEC	TION 0	1 22 00	UNIT PRICING	1
1.0	GENI	ERAL		1
	1.1		TED DOCUMENTS	
	1.2	DESCI	RIPTION OF REQUIREMENTS	1
2.0	PROI	DUCTS	- NOT USED	1
3.0	EXE(CUTION	N	1
	3.1	SCHE	DULE OF UNIT PRICES	1
SEC	TION 0	1 23 00	ALTERNATES	1
1.0	GENI	ERAL		1
	1.1	RFI A'	TED DOCUMENTS	1
	1.2		RIPTION OF REQUIREMENTS	
2.0	PROI	DUCTS	- NOT USED	1
3.0			V	
	3.1		DULE OF ALTERNATES	
SEC	TION 0		SUBSTITUTIONS AND PRODUCT OPTIONS	
1.0				
200	1.1		RIPTION	
	1.1		VITIONS	
	1.3		ON SUBMITTALS	
	1.4		UCTS LIST	
	1.5		ITY ASSURANCE	
	1.6	PROC	EDURES	3
	1.7	EQUIV	VALENTS – APPROVED EQUAL	3
	1.8	CONT	RACTOR'S OPTIONS	4
	1.9	SUBST	TITUTIONS	6
	1.10		PARABLE PRODUCTS	
	1.11		RACTOR'S REPRESENTATION	
	1.12	ARCH	ITECT'S DUTIES	8
2.0	PROI	DUCTS	- NOT USED	8
3.0	EXEC	TITION	N – NOT USED	8

SECT	TION 01	1 31 19 PROJECT MEETINGS	.1
1.0	GENE	ERAL	.1
	1.1 1.2 1.3 1.4	DESCRIPTION	.1 .3
2.0	PROD	DUCTS - NOT USED	.4
3.0	EXEC	CUTION – NOT USED	.4
SECT	ΓΙΟΝ 01	1 31 50 ELECTRONIC PROJECT MANAGEMENT	.1
1.0	GENE	ERAL	.1
	1.1 1.2 1.3 1.4 1.5 1.6	SUMMARY RELATED SECTIONS DEFINITIONS PROCEDURES PROCESS OVERVIEW ADDITIONAL INFORMATION	.1 .1 .1
2.0	PROD	DUCTS - NOT USED	.4
3.0	EXEC	CUTION – NOT USED	.4
SECT	TION 01	1 32 16 CONSTRUCTION SCHEDULE	.1
1.0	GENE	ERAL	.1
	1.1 1.2 1.3	SUMMARY RELATED SECTIONS DEFINITIONS	. 1
2.0	PROD	DUCTS	.2
	2.1	SCHEDULING SOFTWARE	.2
3.0	EXEC	CUTION	.2
	3.1 3.2 3.3 3.4 3.5	PROJECT SCHEDULE REQUIREMENTS MEETING	.3 .4

SECT	ON 01 32 33 PHOTOGRAPHIC DOCUMENTATION	1
1.0	GENERAL	1
	1.1 DESCRIPTION	
2.0	PRODUCTS – NOT USED	1
3.0	EXECUTION	1
	3.1 EXISTING CONDITION PHOTOGRAPHS	1 1
SECT	ON 01 33 00 SUBMITTAL PROCEDURES	
1.0	GENERAL	1
	1.1 DESCRIPTION 1.2 SUBMITTAL REGISTRY AND SCHEDULE 1.3 SHOP DRAWINGS 1.4 PRODUCT DATA 1.5 SAMPLES 1.6 QUALITY ASSURANCE AND QUALITY CONTROL SUBMITTALS 1.7 COORDINATION DRAWINGS 1.8 CONTRACTOR RESPONSIBILITIES 1.9 SUBMITTAL PROCEDURES 1.10 RECORD SUBMITTALS 1.11 RESUBMISSION REQUIREMENTS 1.12 ARCHITECT'S DUTIES 1.13 DISTRIBUTION	1 3 4 5 6 8 10 11 12
2.0	PRODUCTS – NOT USED	
3.0	EXECUTION – NOT USED	
SECT	ON 01 35 29 GENERAL HEALTH & SAFETY	1
1.0	GENERAL	1
	1.1 DESCRIPTION	1 3 3
2.0	PRODUCTS - NOT USED	4
3.0	EXECUTION – NOT USED	4

SEC	TION 0	1 35 43 GENERAL ENVIRONMENTAL REQUIREMENTS	1
1.0	GEN	ERAL	1
	1.1	DESCRIPTION	1
	1.2	RELATED SECTIONS	
	1.3	SUBMITTALS	1
	1.4	JOB SITE ADMINISTRATION	
	1.5	CLEARING, SITE PREPARATION AND SITE USE	2
	1.6	SPOIL AND BORROW	
	1.7	NOISE AND VIBRATION	
	1.8	DUST CONTROL	
	1.9	PROTECTION OF THE ENVIRONMENT	_
	1.10	TEMPORARY RE-ROUTING OF PIPING AND DUCTWORK	4
	1.11	HAZARDOUS OR TOXIC MATERIALS	
	1.12	DISPOSAL OF WASTE MATERIAL AND TITLE	5
2.0	PRO	DUCTS – NOT USED	5
3.0	EXE	CUTION - NOT USED	5
SEC	ΓΙΟΝ 0	1 35 44 SPILL CONTROL	1
1.0	GEN	ERAL	1
	1.1	SPILL PREVENTION	1
	1.2	SPILL CONTROL PROCEDURES	
	1.3	SPILL REPORTING AND DOCUMENTATION	4
2.0	PRO	DUCTS – NOT USED	5
3.0	FXF	CUTION _ NOT USED	5

SECT	ΓΙΟΝ 01 35 91	HISTORIC TREATMENT PROCEDURES	1
1.0	GENERAL.		1
	1.1 RELA	ATED DOCUMENTS	1
		MARY	
		NITIONS	
		RDINATION	
		ECT MEETINGS FOR HISTORIC TREATMENT	
		ERIALS OWNERSHIP	
		RMATIONAL SUBMITTALS	
		ORIC PRESERVATION	
		LITY ASSURANCE RAGE AND HANDLING OF HISTORIC MATERIALS	
		D CONDITIONS	
2.0		S - NOT USED	
3.0		N	
3.0			
	•	TECTION	
		TECTION FROM FIRE TECTION DURING APPLICATION OF CHEMICALS	
		ERAL HISTORIC TREATMENT	_
		ORIC TREATMENT SCHEDULE	
SECT		REGULATORY REQUIREMENTS	
1.0			
		MITS AND LICENSES	
		ECTIONS	
		PLIANCE	
	1.4 OWN	ER'S REQUIREMENTS	2
2.0		S – NOT USED	
3.0	EXECUTIO	N – NOT USED	2
SECT	ΓΙΟΝ 01 42 00	REFERENCES	1
1.0	GENERAL.		1
	1.1 INTE	NT OF CONTRACT DOCUMENTS	1
		ATED DOCUMENTS	
		NITIONS	
		ER AGREEMENTS	
		JSTRY STANDARDS	
	1.6 ABBI	REVIATIONS AND ACRONYMS	5
2.0	PRODUCTS	S - NOT USED	17
3.0	EXECUTIO	N - NOT USED	17

SEC	TION 01	45 00 QUALITY CONTROL	1
1.0	GENE	RAL	1
	1.1	DESCRIPTION	1
	1.2	CONTROL OF ON-SITE CONSTRUCTION	1
	1.3	CONTROL OF OFF-SITE OPERATIONS	2
		TESTING	
	1.5	OWNER'S REPRESENTATIVE	3
2.0	PROD	UCTS - NOT USED	3
3.0	EXEC	UTION – NOT USED	3
SEC	TION 01	45 29 TESTING LABORATORY SERVICES	1
1.0	GENE	RAL	1
		DESCRIPTION	
	1.2	QUALIFICATIONS OF LABORATORY	1
		LABORATORY DUTIES	
	1.4	LIMITATIONS OF AUTHORITY OF TESTING LABORATORY	3
	1.5	CONTRACTOR'S RESPONSIBILITIES	3
2.0	PROD	UCTS – NOT USED	3
3.0		UTION – NOT USED	
		50 00 TEMPORARY FACILITIES AND CONTROLS	
1.0		RAL	
1.0			
		DESCRIPTION	
		REQUIREMENTS OF REGULATORY AGENCIES	
2.0	PROD	UCTS	1
	2.1	MATERIALS, GENERAL	1
		TEMPORARY FIRST AID FACILITIES	
	2.3	TEMPORARY FIRE PROTECTION	1
		CONSTRUCTION AIDS	
		SUPPORTS	
	-	TEMPORARY ENCLOSURES	
		TEMPORARY WATER CONTROL	
		TREE, PLANT AND LAWN PROTECTION	
		PERSONNEL, PUBLIC AND EMPLOYEE PROTECTION	
		PROJECT IDENTIFICATION AND SIGNS	
		SECURITY	
		FIELD OFFICES	
3.0		UTION	
		PREPARATION	
		GENERAL	
	3.3	REMOVAL	9

SEC	FION 01 51 00 TEMPORARY UTILITIES	1
1.0	GENERAL	1
	1.1 DESCRIPTION	1
	1.2 REQUIREMENTS OF REGULATORY AGENCIES	
2.0	PRODUCTS	
2.0		
	2.1 MATERIALS, GENERAL	
	2.2 TEMPORARY ELECTRICITY, LIGHTING AND WATER	
	2.3 TEMPORARY HEAT AND VENTILATION 2.4 TEMPORARY CONTRACTOR TELEPHONE SERVICE	2
	2.5 TEMPORARY SANITARY FACILITIES	
3.0	EXECUTION	3
	3.1 REMOVAL	3
CEC		_
SEC	TION 01 51 23 HEAT DURING CONSTRUCTION	1
1.0	GENERAL	1
	1.1 DESCRIPTION	1
	1.2 RESPONSIBILITY	
2.0	PRODUCTS – NOT USED	
3.0	EXECUTION – NOT USED	
	FION 01 57 13 SOIL EROSION AND SEDIMENT CONTROL	
1.0	GENERAL	1
	1.1 DESCRIPTION	1
	1.2 SUBMITTALS	
	1.3 PLAN AND IMPLEMENTATION GENERAL REQUIREMENTS	
	1.4 PERFORMANCE STANDARDS	
	1.5 EROSION AND SEDIMENT CONTROL PLAN COMPONENTS	
	1.6 INSPECTIONS	
2.0	PRODUCTS – NOT USED	3
2.0	EVECUTION NOT USED	

SEC	ΓΙΟΝ 01 66 00	STORAGE AND PROTECTION	1
1.0	GENERAL		1
	1.1 DESC 1.2 TRAN 1.3 ON-SI 1.4 CAME 1.5 PROT	RIPTIONISPORTATION AND HANDLINGITE STORAGEPUS SITE / PALM ROAD STORAGEECTIONECTION AFTER INSTALLATION	1 1 2
2.0	PRODUCTS	- NOT USED	4
3.0		N – NOT USED	
SEC	ΓΙΟΝ 01 71 23	FIELD ENGINEERING	1
1.0	GENERAL		1
	 1.1 DESC 1.2 QUAL 1.3 SURV 1.4 PROJE 1.5 RECO 	RIPTIONIFICATION OF SURVEYOR ZEY REFERENCE POINTS ECT SURVEY REQUIREMENTS PRDS MITTALS	1 1 2
2.0		- NOT USED	
3.0	EXECUTION	N – NOT USED	3
SEC		CUTTING, PATCHING AND REPAIRING	
1.0			
	1.1 DESC 1.2 SUBM 1.3 QUAL	RIPTIONITTALSLITY ASSURANCERANTIES	1 2
2.0	PRODUCTS		4
	2.1 MATE	ERIALS	4
3.0	EXECUTION	N	4
	3.2 PREPA	ECTION	5

SECT	ΓΙΟΝ 01 77 0	00 PROJECT CLOSEOUT	1
1.0	GENERAL	L	1
	1.1 INSI	SPECTIONS	1
		BMITTALS	
		VAL CLEAN UP	
		AINTENANCE STOCK	
2.0	PRODUCT	TS – NOT USED	4
3.0	EXECUTION	ION – NOT USED	4
SECT	ΓΙΟΝ 01 78 2	22 FIXED EQUIPMENT INVENTORY	1
1.0	GENERAL	L	1
	1.1 FIXI	KED EQUIPMENT INVENTORY	1
		OF SYSTEM INVENTORY	
2.0		TS – NOT USED	
3.0		ION – NOT USED	
		23 OPERATING AND MAINTENANCE DATA	
1.0		L	
100		SCRIPTION	
		RM OF SUBMITTALS	
		NTENT OF MANUAL	
		ANUAL FOR MATERIALS AND FINISHES	
		ANUAL FOR EQUIPMENT AND SYSTEMS	
		BMITTAL REQUIREMENTS	
		STRUCTIONS OF OWNER'S PERSONNEL	
		ERATING INSTRUCTIONS	
2.0	PRODUCT	TS – NOT USED	7
3.0	EVECUTIO	ION NOT USED	7

SEC '	TION 0	01 78 36 WARRANTIES AND BONDS	1			
1.0	GEN	NERAL	1			
	1.1	DESCRIPTION	1			
	1.2	SUMMARY				
	1.3	DEFINITIONS				
	1.4	QUALITY ASSURANCE				
	1.5	WARRANTY REQUIREMENTS				
	1.6	SUBMITTAL REQUIREMENTS	3			
	1.7	SUBMITTALS REQUIRED	4			
2.0	PRO	DDUCTS – NOT USED	4			
3.0	EXE	EXECUTION				
	3.1	FORM OF SUBMITTALS	4			
	3.2	TIME OF SUBMITTALS				
	3.3	ROOF WARRANTY PACKAGE	5			
SEC'	TION 0	01 78 39 RECORD DOCUMENTS	1			
1.0	GEN	NERAL	1			
	1.1	DESCRIPTION	1			
	1.2	MAINTENANCE OF DOCUMENTS AND SAMPLES				
	1.3	RECORDING				
	1.4	SUBMITTAL				
2.0	PRO	DDUCTS – NOT USED	4			
3.0	EXE	ECUTION - NOT USED	Δ			

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SECTION 01 11 00 SUMMARY OF WORK

1.0 GENERAL

1.1 DESCRIPTION

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
 - 1. This project is a restoration that includes a full masonry repair program, including replacement of decorative carved stone elements. The slate roof is scheduled for replacement including its flashing and rainwater collection and drainage. The concrete utility tunnel that forms the foundation for the cloister that runs between the two residential halls is in poor condition and requires extensive repairs. To enable the concrete repairs a major MEP project is needed to facilitate demolition and rebuilding. Also included in the scope is lighting and paving upgrades. The steps down to the plaza will be rebuilt and a new handrail will be installed.

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.

2.0 PRODUCTS – NOT USED

3.0 <u>EXECUTION - NOT USED</u>

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 radio communication devices, 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.
- 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 Palm Road 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 Palm Road must be registered with Transportation Services. Due to ongoing work at the Palm Road lot, parking may be limited.

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 possible and the maintenance of roads and walks will not be to normal operating standards.
- B. With your safety as a top priority, the Cornell University Police allows you the ability to take advantage of our Emergency Mass Notification System that enables your cellphone to become a personal safety device for you. Contractor's wishing to participate may text the following: CornellAlert to 67283 and you will be set up to receive alert messages. Be advised that you may stop receiving messages at any time by sending "stop" to CornellAlert. There will also be a system generated "stop" every year on August 1st at which point you will need to send the text CornellAlert to re-enlist.

1.4 WATER USE RESTRICTION

A. The Contractor shall adhere to any University issued Water Use Restrictions in place at the time of construction.

1.5 PARKING

A. The Owner may designate an area for parking of essential Contractor vehicles on the project site. Park Mobile parking is available in the small lot across from Founders Hall. Contractor Parking is available at the Palm Road lot.

- 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 (Jake Perno) 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 http://finance.fs.cornell.edu/contracts/forms/contractors.cfm.
- 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, affecting life safety or outside contract limit lines, shutdowns of utilities 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 Environmental Health and Safety (EH&S), and City of Ithaca Fire Department.
- 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.

- WORK RESTRICTIONS
- B. If Contractor elects to use specified equipment other than "design equipment" which differs in arrangement, size, etc., the Contractor does so subject to following conditions:
 - 1. Submit detailed drawings indicating proposed installations of equipment and showing maintenance and service space required.
 - 2. If revised arrangement meets approval, make all required changes in the work of all trades, including but not limited to louvers, panels, structural supports, pads, etc. at no increase in Contract. Provide larger motors and any additional control devices, valves, fittings and other miscellaneous equipment required for proper operation of revised layout, and assumes responsibility for proper location of roughing in and connections by other trades.
 - 3. If revised arrangement does not meet approval because of increase in pressure loss, possibility of increase in noise, lack of space or headroom, insufficient clearance for removal of parts, or for any other reason, provide equipment which conforms to Contract Drawings and Specifications.

1.9 EXISTING EQUIPMENT, MATERIALS, FIXTURES, ETC.

A. Where existing equipment, piping, fittings, etc. are to be removed, Contractor shall submit complete list to Owner. All items that Owner wishes to retain shall be carefully removed and salvaged and delivered to building storage where directed by Owner. Items that Owner does not wish to retain shall be removed from the site and legally disposed.

1.10 EXAMINATION OF PREMISES, DRAWINGS, ETC.

- A. Before Submitting Proposal
 - 1. Examine all Drawings and Specifications relating to Work of all trades to determine scope and relation to other work.
 - 2. Examine all existing conditions affecting compliance with Plans and Specifications, by visiting site and/or building.
 - 3. Ascertain access to site, available storage and delivery facilities.
- B. Before Commencing Work on Any Phase or in any Area
 - 1. Verify all governing dimensions at site and/or building.
 - 2. Inspect all adjacent work.

3.

All work is to be conducted in such a manner as to cause a minimum degree of interference with the Campus' operation and academic schedule. Prior to the commencement of each phase, submit Shutdown / Demo action plans that clearly describe the steps required to safely shut down utilities, systems and infrastructure that are within the work area (or effecting the work area); and those outside the work area and within approximately 25 feet of the work area limits, as approved by the Owner. The Shutdown / Demo action plan shall identify the shut off point(s) for each utility, system and infrastructure as well as the secondary shut off point(s) to account if the primary points fail or are otherwise inaccessible. To identify shutoff points, trace each utility, system and infrastructure in the presence of the campus representative from the work area to the shutoff points and place clear label on same indicating what the shutoff point is and what it effects and whether it is the primary or secondary shut off. The Shutdown / Demo action plan shall describe the shutdown procedure, identify tools and material required for shutdown, sequence of activities required for proper shutdown, the name of the person(s) or trade(s) deemed competent to perform each activity in the shutdown sequence and names and telephone numbers of the campus staff required to provide access to shut off points, assist in the shut off or perform portions of the shutdown activities. Additionally, the plan will address the Contractor's plan for maintaining MEP to adjacent occupied areas, inclusive of planned tie-in points for any and all necessary, temporary infrastructure, alarming, monitoring etc. Submit the Shutdown / Demo action plan for review and approval at least two weeks prior to field work in the work area. Field work shall not begin until the Shutdown / Demo action plan is reviewed. Contractor is to assign and include a competent crew, knowledgeable of each unique system involved (i.e. Mechanic, Electrician, Sheet metal, Plumber, Controls, IT, etc.). Field investigation is to include any and all necessary ladders, scaffold, temp lighting, cutting tools, photos, labels, PPE, etc. needed to properly locate, access and label shut off points. The University is explicitly requesting heightened awareness and an earnest mitigation of impact. This requirement supplements all other contractual obligations, and requires the dedication of no less than an aggregate 40 hours.

C. Tender of Proposal Confirms Agreement

- 1. All items and conditions referred to herein and/or indicated on accompanying Drawings.
- 2. No consideration, additional monies or time extensions will be granted for alleged misunderstanding.

D. Existing or Archived Drawings

 Existing or Archived drawings of impacted buildings are appended in electronic format only for reference and informational purposes. These historic drawings are not to be considered contract drawings and are provided "FOR INFORMATION ONLY". The Owner makes no representation as to the accuracy of the drawings as representing current conditions.

1.11 STAND DOWN DATES

- A. Strict and effective enforcement by Contractor's management and supervision of the following dates and hours is required.
 - 1. **Stand-Down Dates** (No construction work and no deliveries on site):
 - a. Commencement Weekend
 - Saturday, May 25, 2024
 - Sunday, May 26, 2024
 - b. Reunion Weekend
 - Thursday, June 6, 2024
 - Friday, June 7, 2024
 - Saturday, June 8, 2024
 - Sunday, June 9, 2024
 - 2. **Restricted Work Dates** (delivery & demolition restrictions but otherwise work as usual):

Friday, May 24, 2024 Commencement weekend- deliveries and work

outside fence stop at noon

Thursday, Friday June 6 - 7, 2024 Reunion guest arrivals- no work outside fence;

no demo or utility work inside fence

Friday, June 7, 2024 Reunion weekend- deliveries and work outside

fence stop at noon

3. Student and Campus Life

Residence Halls Open

August 14, 2023

- No deliveries, no hauling materials into or out of the project site.
- All work to be contained to the fenced area of the project site.

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.

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WORK RESTRICTIONS

- B. During Construction periods, no work shall take place prior to 9AM in a Residence Hall, Fraternity, Co-Op, Sorority, or any type of Housing Unit. Residence Halls require 72 hours notification to the Student & Academic Services representative prior to entering a Residence Hall or Student Room. This does not apply to Fraternity, Co-Op or Sorority House which require 24 hours notification to the Facilities Manager.
- 2.0 PRODUCTS NOT USED
- 3.0 <u>EXECUTION NOT USED</u>

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 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 <u>LUMP SUM AND UNIT PRICE ALLOWANCES</u>

- 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 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 <u>EXECUTION</u>

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 <u>SCHEDULE OF ALLOWANCES</u>

A. Allowance No. 1:

Lump Sum Allowance: Include a sum of \$1,950 for localized stone repointing on vaulted ceiling, per Detail A/FR4.13. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

B. Allowance No. 2:

Lump Sum Allowance: Include a sum of \$3,250 for replacement of cracked stones, per Detail G/FR4.13. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

C. Allowance No. 3:

Lump Sum Allowance: Include a sum of \$1,950 for limestone repointing on vaulted ceiling, per Detail A/FR4.13. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

D. Allowance No. 4:

Lump Sum Allowance: Include sum of \$6,500 for limestone patch repair, per Detail C/FR4.12. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

E. Allowance No. 5:

Lump Sum Allowance: Include a sum of \$325 for limestone spall repair, per Detail D/FR4.12. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

F. Allowance No. 6:

Lump Sum Allowance: Lump Sum Allowance: Include a sum of \$1,950 for limestone Dutchman repair, per Detail E/FR4.12. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

G. Allowance No. 7:

Lump Sum Allowance: Lump Sum Allowance: Include a sum of \$3,900 for limestone crack repair, per Detail F/FR4.12. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

H. Allowance No. 8:

Lump Sum Allowance: Lump Sum Allowance: Include a sum of \$1,300 for limestone stabilization via cross pins, per Detail 4/FR4.11. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

I. Allowance No. 9:

Lump Sum Allowance: Lump Sum Allowance: Include sum of \$650 for roof deck replacement, per Detail 4/FR4.01. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

J. Allowance No. 10:

Lump Sum Allowance: Lump Sum Allowance: Include a sum of \$5,850 for rafter plate replacement, per Detail 2/FR4.01. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

K. Allowance No. 11:

Lump Sum Allowance: Lump Sum Allowance: Include a sum of \$13,000 for wood rafter reinforcement, per Detail 3/FR4.01. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

L. Allowance No. 12:

Lump Sum Allowance: Lump Sum Allowance: Include a sum of \$26,000 for partial width concrete slab repair, per Detail 4/FR4.50. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

END OF SECTION 01 21 00

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SECTION 01 22 00 UNIT PRICING

1.0 GENERAL

1.1 RELATED DOCUMENTS

- A. This Section describes Unit Pricing requested by the Owner.
- 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: Unit price is an amount proposed by bidders, stated on the Bid Proposal Submission Form and in the eBuilder Bid Module, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.
- B. Procedures. Unit Prices are for work complete, measured in place and cover profit and all other costs and expenses of the subcontractor. 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 of the subcontractor.
- C. To the extent that a subcontractor's Unit Prices are applicable, as determined by the Architect and Cornell University, 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 subcontract work which is either reduced or increased by more than 25%. Said Unit Prices shall be valid for the duration of the subcontractor's activity on the project as applicable, unless stipulated elsewhere in the Contract Documents.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price 1: Localized Stone Repointing (Vaulted Ceiling) (M2)

Description: Repointing open mortar joints in vaulted ceiling in accordance with Drawings and Section 040120 "Historic Masonry Restoration".

Unit of Measure: Linear Foot.

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Unit Price 2: Localized Limestone Repointing (Vaulted Ceiling) (L2)

Description: Repointing open mortar joints in vaulted ceiling in accordance with Drawings and Section 040120 "Historic Masonry Restoration".

Unit of Measure: Linear Foot

C. Unit Price 3: Replacing Field Stone Masonry (M3)

Description: Cutting out of existing deteriorated field stone masonry units and replacing with new units to match in accordance with Drawings and Section 040120 "Historic Masonry Restoration".

Unit of Measure: Each

D. Unit Price 4: Limestone Patch Repair (L8)

Description: Cut out deteriorated limestone and patch in accordance with Drawings and Section 040120 "Historic Masonry Restoration".

Unit of Measure: Each. Average repair area of 3"x 3" per location.

E. Unit Price 5: Limestone Spall Repair (L9)

Description: Remove limestone spall and repair using pins and stone adhesive in accordance with Drawings and Section 040120 "Historic Masonry Restoration".

Unit of Measure: Each.

F. Unit Price 6: Limestone Dutchman Repair (L10)

Description: Cut out deteriorated limestone and install stone dutchman with stone to match existing in accordance with Drawings and Section 040120 "Historic Masonry Restoration".

Unit of Measure: Each. Assume as average repair area of 3"x3"x6" per location.

G. Unit Price 7: Limestone Crack Repair (L11)

Description: Repair crack in limestone via injection grouting in accordance with Drawings and Section 040120 "Historic Masonry Restoration".

Unit of Measure: Linear Foot.

H. Unit Price 8: Limestone Stabilization via Cross Pins (L12)

Description: Repair cracked limestone with cross pins and adhesive in accordance with Drawings and Section 040120 "Historic Masonry Restoration".

Unit of Measure: Each.

I. Unit Price 9: Roof Deck Replacement (S3)

Description: Remove existing wood roof deck boards and replace with new plywood sheathing in accordance with Drawings and according to Section 061000 "Carpentry".

Unit of Measure: Square Foot.

J. Unit Price 10: Rafter Plate Replacement (S9)

Description: Remove existing wood rafter plate and replace with new pressure treated dimensional lumber in accordance with Drawings and according to Section 061000 "Carpentry".

Unit of Measure: Linear Foot.

K. Unit Price 11: Wood Rafter Reinforcement (S10)

Description: Reinforce deteriorated rafter end with new dimensional lumber in accordance with Drawings and according to Section 061000 "Carpentry"

Unit of Measure: Each. Length of sister to be 3'-0"

L. Unit Price 12: Partial Width Concrete Repair (S2)

Description: Remove sections of spalled concrete slab per Engineer's review in field; provide new reinforced concrete repair material and sacrificial anodes in accordance with Drawings and according to Sections 030130 "Concrete Repair" and 030190 "Galvanic Anodes".

Unit of Measure: Square Foot.

END OF SECTION 01 22 00

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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 <u>DESCRIPTION OF REQUIREMENTS</u>

- A. Definition: An alternate is an amount proposed by Bidders and stated on the Bid Proposal Submission Form and in the eBuilder 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 <u>EXECUTION</u>

3.1 <u>SCHEDULE OF ALTERNATES</u>

- A. ALTERNATE NO. 1: New Snow-Melt System at Cloister Paving Assembly, West Stairs, and Site Paving
 - 1. Base Bid: Provide snow-melt system piping only as part of new Cloister paving assembly as indicated on Drawing FR1.01B and as specified in Section 336100. Paving at East and West approaches to War Memorial to remain. West stair treads to remain and be cleaned and re-sealed as indicated on Drawing FRD1.01 and FR1.01B.
 - 2. Alternate: Provide new snow-melt system, including associated mechanical equipment, extending through Cloister paving assembly, new concrete paving at East and West approaches to War Memorial, and new concrete and stone assembly at the West stair, as indicated on Drawing FRD1.01 and FR1.01B and as specified in Section 033000 "Concrete", 324100 "Unit Paving", and Section 336100 "Exterior Snow Melting Systems."
- B. ALTERNATE NO. 2: Replace Additional Inscribed Limestone Dedication Plaques
 - 1. Base Bid: Remove and replace seven (7) inscribed limestone dedication plaques in kind as indicated on Drawing FR2.01 and as specified in Section 040120.
 - 2. Alternate: Remove and replace nine (9) additional inscribed limestone dedication plaques in kind as indicated on Drawing FR2.01 and as specified in Section 040120.
- C. ALTERNATE NO. 3: Remove and Replace Existing Downspout Assemblies
 - Base Bid: Remove existing exterior metal downspouts and locally repair exterior masonry. Remove existing abandoned interior rain-water conductors (RWCs) within the wall chases and provide new internal RWCs as indicated on Drawing FRD1.02, FR1.02, M105 and as specified in Section 221400 "Interior Storm Drainage System".
 - 2. Alternate: In lieu of new internal rain-water conductors (RWC), remove and replace existing metal downspouts with Z-T coated copper as indicated on Drawing FR1.02 and specified in Section 076000 "Sheet Metal Flashing and Trim".
- D. ALTERNATE NO 4. Relocation of Existing Flagpole
 - 1. Base Bid: Existing flagpole to remain and be refurbished in place. Provide new flagpole lighting.
 - 2. Alternate: Dismantle and relocate existing flagpole and stone base. Refurbish flagpole components per base bid work. Provide new flagpole foundation and restore paving as indicated on Drawing FR4.14. Provide new flagpole lighting.

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- E. ALTERNATE NO 5. – Reuse 50% of existing slate and provide 50% new
 - Base Bid: Dismantle existing slates. Cull acceptable slates suitable for reuse, sort and label into pallets, and deliver to Owner. Deliver to Cornell main campus location. Provide all new slate for roofing installation.
 - Alternate: In lieu of all new slate, dismantle and salvage sufficient slate needed to 2. complete West elevation slopes (50%), and provide new slate for East slope (50%) (or vice versa). All slate work shall comply with specified coursing and layouts, regardless of new or existing slates. Provide 100% new slate cap slates, regardless of East or West elevation. Should any acceptable slates remain after 50% reuse, sort and label remainder into pallets, and deliver to Owner. Deliver to Cornell main campus location.

END OF SECTION 01 23 00

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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 <u>DEFINITIONS</u>

- 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: Submit indicated number of copies of each Substitution Request Form, attached hereto, for consideration. 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 five copies of 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
 - 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 duct work, 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.

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:

- 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.
- Non-restricted List (Available Manufacturers): Where Specifications include b. 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.
- Basis-of-Design Product: Where Specifications name a product, or refer to a product 3. 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.
 - 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 eBuilder. 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.
 - 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 <u>EXECUTION - NOT USED</u>

END OF SECTION 01 25 00

SECTION 01 31 19 PROJECT MEETINGS

1.0 GENERAL

1.1 <u>DESCRIPTION</u>

- 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 written notice of each meeting four days in advance of meeting date.
 - 3. Make physical arrangements for meetings.
 - 4. Preside at meetings.
 - 5. Record the minutes; include all significant proceedings and decisions.
 - 6. Duplicate and distribute copies of minutes after each meeting.
 - a. To all participants in the meeting.
 - b. To all parties affected by decisions made at the meeting.
 - c. To the Architect.
- 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

PROJECT MEETINGS

D. Minimum Agendum:

- 1. Distribution and discussion of:
 - a. List of major subcontractors and suppliers
 - b. Projected Construction Schedules
- 2. Critical work sequencing
 - a. Identification of major shut downs 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

- 12. Security procedures
- 13. Housekeeping procedures
- 14. Affirmative Action Plan and Reporting requirements

1.3 PROGRESS MEETINGS

A. Schedule regular periodic meetings on the site, not less than once every two weeks throughout the Construction period.

B. Attendance:

- 1. Architect
- 2. Architect's professional consultants when, in the opinion of the Owner, needed
- 3. General Contractor, including Site Superintendent
- 4. Owner's Representatives
- 5. Commissioning Agent, as appropriate to agenda
- 6. Subcontractors as appropriate to the agenda
- 7. Suppliers as appropriate to the agenda
- 8. Safety Representative

C. Minimum Agenda:

- 1. Review, approval of minutes of previous meeting
- 2. Review percentage of work to be in place by next meeting by individual trades
- 3. Review of work progress since previous meeting
- 4. Field observations, problems, and conflicts
- 5. Problems which impede Construction Schedule
- 6. Review of off-site fabrication, delivery schedules
- 7. Corrective measures and procedures to regain projected schedule
- 8. Revisions to Construction Schedule
- 9. Planned progress and schedule, during succeeding work period
- 10. Coordination of schedules
- 11. Review submittal schedules; expedite as required
- 12. Maintenance of quality standards

- 13. Review status of all issued proposal requests and change orders
- 14. Review proposed changes for:
 - a. Effect on Construction Schedule and on completion date
 - b. Effect on other contracts of the Project
- 15. 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 CONFERENCE(S)

- A. The Contractor to hold pre-installation conferences 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 <u>EXECUTION - NOT USED</u>

****END OF SECTION 01 31 19***

SECTION 01 31 50 ELECTRONIC PROJECT MANAGEMENT

1.0 **GENERAL**

1.1 **SUMMARY**

- Owner Provided System: The Contractor will utilize the Owner's electronic Project Management (e-PM) system eBuilder on this project.
 - The Owner shall manage the day to day use of the Owner provided ePM system and 1. 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.
- There are no fees to utilize this system. B.

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**

Users will be provided a username and password. The Contractor shall log into the A. ePM system to enter project documentation. All documentation should be communicated through the ePM system.

В. Training

- The Owner will provide training to familiarize team members with the system, and 1. 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 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

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- 2. Color printer and plotter capable of full-size document production
- 3. Scanner: capable of scanning a high volume of project documents clearly and quickly
- 4. Digital Camera: (1) single lens reflex (SLR) type camera
- 5. Portable Document Format (PDF) Reader/writer software
- D. Contractor shall log on to the ePM system on a daily basis, and as necessary to be kept fully appraised of the project developments, correspondence, assigned tasks and other matters that occur on the site. These may include but are not limited to RFI's, action items, meeting minutes, discussion threads, schedule updates, submittals, submittal log, punch list items, daily reports, site photos and/or videos and pre-construction surveys.

1.5 **PROCESS OVERVIEW**

- A. The Contractor is required to timely and accurately post, review, respond, and collaborate with other team members using the following features and/or workflow processes within the ePM system.
- B. Project Team Directory Contractor shall provide an updated directory of contact information for all companies, subcontractors and project team members who are engaged on this project.
- C. Request for Information (RFI): All project RFI's will be submitted using the ePM 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 system and attached to the RFI electronically.
- D. Meeting Minutes: Contractor shall enter meeting agendas, records and minutes in the 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 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 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 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 Register and Contractor shall review and update on a daily basis and shall close all approved items.

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- 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 ePM 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 both pencil and official payment applications (PA) electrically via the ePM system for review by the Owner.
- Q. Budget and Cost Management Contractor to provide estimates and work breakdown structure (WBS) to provide Owner with accurate budget/cost analysis.

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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 <u>EXECUTION - NOT USED</u>

****END OF SECTION 01 31 50***

SECTION 01 32 16 CONSTRUCTION SCHEDULE

1.0 GENERAL

1.1 SUMMARY

- A. This Section establishes the Contractor's obligation to prepare, use and update a Critical Path Method ("CPM") network plan for the entire Work and related activities which are essential to the progress of the Work to be designated as the Project Schedule. This Section describes the requirements for development, approval, utilization, and updating of the Project Schedule.
- B. Submit monthly Project Schedule updates.
- C. Submit to Owner and Architect a cash flow projection in accordance with Schedule of Values.
- D. Submit electronic versions of all schedules, including updates, as well as all back-up to the submitted schedules.

1.2 RELATED SECTIONS

- A. General Conditions Article 5 Time of Completion.
- B. General Conditions Article 9 Coordination and Cooperation.
- C. Section 01 33 00 Submittal Procedures.

1.3 **DEFINITIONS**

- A. Critical Path Method (CPM): A method of planning and scheduling a construction project where activities are arranged based on activity relationships and network calculations determine when activities can be performed and the critical path of the Project.
- B. Critical Path: The longest continuous chain of activities through the network at a given data date for the Schedule to a Contract Milestone or Contract Completion. Where the path to a specific Milestone has become negative, the Critical Path shall be the longest continuous chain of activities with the greatest amount of negative float.
- C. Near Critical Path: Any continuous series of activities through the network to the Contract Milestone or the Contract Completion Date where the Total Float of the activity at the data date along that path is within 10 days of the Total Float possessed by the activity at the data date along the Critical Path.

- D. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path.
 - 2. Predecessor activity is an activity that must be completed before a given activity can be started.
- E. Milestone: A key or critical point in time for reference or measurement.
- F. Float is the measure of flexibility in an activity. Float time belongs to the Project.
 - 1. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
 - 2. Total float is the amount of time in starting or completing an activity without adversely affecting the planned project completion date, or an interim milestone that has a constraint.
- G. Fragnet: The sequence of new activity(ies) and/or activity revisions, logic or resource changes that are proposed to be added to the existing schedule to demonstrate the influence of impacts to the schedule. The Fragnet shall identify the predecessors to the new activities and demonstrate the impacts to successor activities.

2.0 PRODUCTS

2.1 <u>SCHEDULING SOFTWARE</u>

- A. The Contractor shall use the current version of Primavera Project Planner Version 3.1 or later to develop and update the Project Schedule, and all submissions of Project Schedule data in electronic form required in this Section shall be in Primavera Project Planner format. An alternate program may be proposed as a substitute "or equal" program to the Owner for review.
- B. In order to be acceptable as a substitute for the use of Primavera Project Planner, the Contractor's software must be capable of exporting all Project Schedule data in a format that may be opened, read, and modified using the current version of Primavera Project Planner without loss of functionality or information.
- C. Terms used herein with reference to the Project Schedule shall have the same definitions as those used within the Primavera Project Planner software.

3.0 EXECUTION

3.1 PROJECT SCHEDULE REQUIREMENTS MEETING

A. The Contractor shall meet with the Owner within five (5) work days after notice to proceed to conduct a joint review of the Project Schedule requirements in this section.

3.2 SCHEDULE SUBMISSIONS

A. General Requirements:

- 1. Prepare a Critical Path Method (CPM) Project Schedule
- 2. Activity durations shall be in units of whole work days. Unless a longer duration is approved by the Owner, durations for activities other than submittal and procurement activities shall not exceed fifteen (15) work days.
- 3. Except for the first and last activities in the Project Schedule, each activity shall have at least one predecessor and one successor relationship to form a logically connected network plan from Notice to Proceed (NTP) to the Contract completion date.
- 4. Each activity shall be cost and resource loaded. Labor, material and equipment shall be clearly identified and valued.
- 5. The Contractor shall provide the native electronic files of the CPM schedule, graphics, cost and resource reports required under this Section and/or as requested by the Owner at no additional cost throughout the entire project performance period until Project completion is achieved. Contractor shall also provide all documents in PDF electronically created from the native files to PDFs (not scans).

B. Preliminary Schedule:

- 1. Within twenty one (21) calendar days of Notice to Proceed ("NTP"), the Contractor shall submit a Preliminary Schedule in the form and requirements specified in 3.04 with respect to the planned work activities to be performed during the first one hundred twenty (120) calendar days following NTP. Activities beyond the first on hundred twenty (120) calendar days may be depicted in summary form.
- 2. The Owner will review schedules and return review copy within ten (10) days after receipt.
- 3. If required, resubmit within seven (7) days after return of review copy.

C. Baseline Project Schedule:

- 1. Within sixty (60) calendar days following NTP, the Contractor shall submit a proposed Project Schedule in the form specified in 3.04.
- 2. The Owner will review schedules and return review copy within ten (10) days after receipt.
- 3. If required, resubmit within seven (7) days after return of review copy.

D. Technical Requirements:

1. Show the complete sequence of construction by activity.

- 2. At a minimum show the dates for the beginning, and completion of, each major element of construction. Specifically list:
 - a. All submittal and review activities, including preparation of shop drawings, calculations, samples, and mockups, testing of mockups, and Owner review of submittals;
 - b. All procurement activities, including awarding of subcontracts and fabrication, testing, and delivery of materials and equipment;
 - c. All field activities, including mobilization, demobilization, construction, site clearing, site utilities, foundation work, structural framing, subcontractor work, equipment installations, finishes, pre-installation meetings, start-up, testing, balancing, commissioning, and punchlist.
- 3. Show projected percentages of completion for each item, as of the first day of each month.
- 4. Show estimated dates for the beginning and completion of work which must be completed by or coordinated with the Owner such as hazardous materials abatement, moving, training and other such items as they are identified.
- E. Submittals Schedule for Shop Drawings, Product Data and Samples: Submit Submittals Schedule within thirty (30) calendar days after date of commencement of work. Confer with the Architect and agree on all elements of the Submittals Schedule. The schedule will be based on the understanding that minimum turn-around time in the Architect's office is ten (10) working days. Some submittals or groups of submittals may take longer to review. Submittals which do not conform to the agreed schedule may be subject to delays in processing. Show:
 - 1. The dates for Contractor's submittals.
 - 2. The dates reviewed submittals will be required from the Architect.
 - 3. Confirmed lead time for manufacturing, production, fabrication and shipment to the project site of all materials which have an impact on the critical path of the Project's construction schedule.

3.3 SCHEDULE UPDATES

- A. Submit progress update schedules to accompany each application for payment.
- B. Indicate progress of each activity to date of submission.
- C. Show changes occurring since previous submission of schedule:
 - 1. Major changes in scope
 - 2. Activities modified since previous submission
 - 3. Revised projections of progress and completion

- 4. Other identifiable changes
- D. When change orders are proposed, potential delays are anticipated, or delays are experienced, the Contractor shall submit a written Time Impact Analysis (TIA) describing the effect of each potential change order, potential delay, delay, or Contractor request on the Substantial Completion Date:
 - 1. The Time Impact Analysis shall meet the requirements for submittal of a Schedule Revision including a fragnet with sufficient supporting documentation to enable the Owner to make a determination on the Contractor's request for time extension.
 - 2. The TIA shall be performed by inserting a fragnet into a copy of the current schedule at the time the impact was identified or occurred.
 - 3. All TIAs shall be incorporated into the current schedule and not prior schedules. Thus, the current schedule shall be updated, accepted, and TIAs incorporated each month.
- E. All approved change orders must be incorporated in the following month's schedule update.

3.4 FORM OF SUBMISSION OF PROJECT SCHEDULE AND UPDATES

- A. All proposed versions of the Project Schedule shall be submitted as follows.
 - 1. The Contractor shall submit an electronic copy of native file and PDF versions of all generated reports.
 - 2. The Preliminary Schedule and proposed Project Schedules shall have the NTP date as the data date, and shall reflect no progress of work activities;
 - 3. Format of column listings: The chronological order of the start of each item of work, activity ID, activity description, early start, late start, early finish, late finish, original duration, remaining duration, percent completion, area code, responsibility code, total float, budgeted cost, budgeted quantity, and calendar ID.
 - 4. Narrative: The Contractor shall submit a narrative including explanation of the following:
 - a. The contract substantial completion date;
 - b. The approach used to plan and sequence the work, including considerations of site logistics, Contract milestones, and where applicable, phasing and coordination with other contractors;
 - c. Steps taken to address exceptions to prior submissions; and
 - d. Identification of all intentional deviations from the specific requirements of this Section, together with a justification for approval of the deviation.
 - e. Description of the activities on the primary and secondary critical paths.

- B. Project Schedule Updates shall be submitted as follows:
 - 1. The Contractor shall submit an electronic copy of the Project Schedule Update
 - 2. The Contractor shall submit all proposed revisions after the initial Project Baseline Schedule submission in fragnet form.
 - 3. The Contractor shall submit with all Preliminary Schedule and Project Schedule Updates a narrative addressing the following:
 - a. Current projected substantial completion date and the number of days ahead/behind the contract substantial completion date;
 - b. Variance from prior schedule forecasted (substantial) completion date
 - c. Progress achieved against the planned critical path during the period;
 - d. Description of major work activities performed during the month prior to the Update;
 - e. Description of major work activities anticipated to be performed during the month following the Update;
 - f. The approach used to plan and sequence the work, including considerations of site logistics, Contract milestones, and where applicable, phasing and coordination with other contractors;
 - g. Description of the activities on the primary and secondary critical paths during the month prior to the Update. Any changes to the primary Critical Path since the prior month's update with reason as to why it is now the critical path;
 - h. Sources of potential Project delay, including activities or groups of activities whose float has diminished over the course of prior Updates and their potential impact on the schedule;
 - i. Pending items (submittal reviews, answers to requests for information, change orders, requests for time-extensions, etc.) affecting critical path activities and activities with limited or diminishing available float;
 - j. All revisions introduced into the Project Schedule since the prior Update, the reason for the revision, the Activity ID of all activities affected by the revision, and the impact, if any, to the float for each such activity, as well as the Project completion date; and
 - k. All exceptions taken by the Owner to the Contractor's prior Update and whether they were resolved or not.
 - 1. Identification of all intentional deviations from the specific requirements of this Section, together with a justification for approval of the deviation
 - m. Steps taken to address exceptions to prior submissions;
 - n. The effect of new changes on schedule.

3.5 <u>DISTRIBUTION</u>

- A. Distribute copies of the reviewed schedules to:
 - 1. Owner Job Site personnel
 - 2. Subcontractors
 - 3. Other concerned parties
- B. Instruct recipients to report to the Contractor, in writing, any problems anticipated by the projections of the schedule.

END OF SECTION 01 32 16

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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**

Progress Submittals A.

- Key Plan: Submit key plan of Project area and building with notation of vantage points 1. marked for location and direction of each photograph.
- 2. Submit digital photograph electronic files, organizationally filed by week, to E-Builder within five (5) days of taking photographs.
- Each photograph shall be identified with project title, date, and a description of the 3. view.

PRODUCTS - NOT USED 2.0

3.0 **EXECUTION**

3.1 **EXISTING CONDITION PHOTOGRAPHS**

Before commencement of selective demolition, take photographs of Project area and A. surrounding areas, including existing items to remain during construction.

3.2 PROGRESS PHOTOGRAPHS

- Photographs shall be taken weekly in a manner which completely documents the work. A.
- The photographs shall be submitted to the Owner at the end of the first week for review. В.
- 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

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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. Product Data
 - 3. Samples
 - 4. Quality Assurance and Quality Control Submittals
 - 5. Coordination Drawings
 - 6. Certification of Asbestos free products
 - 7. Owner audio/visual
 - 8. 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 electronic project management 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 for eBuilder importation. 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.

SUBMITTAL PROCEDURES

- 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 electronic Project Management 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.

SUBMITTAL PROCEDURES

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 draftsperson 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 electronic project management 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 being 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 electronic project management system and will be reviewed and returned electronically marked with action taken.
 - b. Maintain one (1) copy as a "Record Document".

1.5 **SAMPLES**

- 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 when directed by the Architect.
 - 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.

SUBMITTAL PROCEDURES

- 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 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. Additionally, for electronic transmittal, photograph sample and its label and attached to the submittal item electronically via the electronic project management.

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 electronic project management system and will be reviewed and returned electronically marked with action taken.
- 2. Maintain one (1) additional copy as "Record Document".

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.

SUBMITTAL PROCEDURES

- 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.

SUBMITTAL PROCEDURES

- 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 Contact 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. Certify that only asbestos free material is used in the execution of all work. Reference Section 01 35 39.

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 electronic project management 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 (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 1.8, paragraph 5 of this Section.
- B. Notations on the Submittal Review Stamp or eBuilder 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 electronic project management system to:

Ithaca, New York

SUBMITTAL PROCEDURES

- 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 <u>EXECUTION NOT USED</u>

END OF SECTION 01 33 00

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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 sub-contractors involved in the project.
 - 1. General Emergency Information It is recommended that both Contractor and all subtiers:
 - 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 e-Builder 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 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 Environmental Safety and Health Department. The OHSIP division can be contacted at (607)-255-8200 or by email at askEHS@cornell.edu
- 4. SME: The University's subject matter expert.

1.3 **AERIAL WORK PLATFORMS**

A. The preferred method for Aerial Work Platforms (AWPs) boom storage is fully retracted and fully lowered to the ground.

- B. In some circumstances booms may need to be stored in the air because of vandalism concerns, minimal size of storage location, etc.
 - 1. If this is case, the area under the elevated boom must be blocked or arranged such that prevents people from walking, standing, working or parking vehicles underneath.
 - 2. When booms are stored in the air consult the extended weather forecast. Booms should not be stored in the air during predicted high winds, or severe storms. AWPs 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 products provided for use in construction at Cornell University are to be free of asbestos. At Substantial Completion, prior to beneficial service, the Contractor shall provide a signed certification form "Exhibit AC" stating that all Contractor supplied & installed products are 100% asbestos free. The Contractor has to 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 product 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.

1.6 SITE VISITS

A. The undertaking of periodic Site Visits by Architects, Engineers or the Owner shall not be construed as supervision of actual construction, or make them responsible for the safety of any persons; or make them responsible for means, methods, techniques, sequences or procedures of construction selected by the Contractor or its Subcontractors; or make them responsible for safety programs and precautions incident to the Work, or for the safe access, visit, use, Work, travel or occupancy of any person.

Ithaca, New York

GENERAL HEALTH & SAFETY

1.7 CONFINED SPACE

A. The Contractor shall be responsible for the identification of confined space in accordance with OSHA requirements.

2.0 PRODUCTS – NOT USED

3.0 <u>EXECUTION - NOT USED</u>

END OF SECTION 01 35 29

GENERAL HEALTH & SAFETY

	Cornell University PS CERTIFICATION OF EE MATERIALS	Distribution to:	OWNER ARCHITECT CONTRACTOR FIELD OTHER	
PROJECT:		CONTRACT NU	MBER:	
		CONTRACT FOR	R:	
		CONTRACT DA	TE:	
		DATE OF ISSUA	NCE:	
TO OWNER: (Name & Address)	CORNELL UNIVERSITY Facilities Contracts 121 Humphreys Service Building Ithaca, New York 14853			

The undersigned hereby certifies that all materials and equipment furnished for or installed in connection with all work, labor, and services provided with respect to the performance of the Contract referenced above shall be free of asbestos and any asbestos containing material. The undersigned shall provide any and all documents supporting such certification which may reasonably be required the Owner, including where applicable Safety Data Sheets and/or Material Safety Data Sheets.

SUPPORTING DOCUMENTS ATTACHED HERETO:

Material Safety Data Sheets

CONTRACTOR: (Name & Address)

	BY: (Signature of authorized representative)
	NAME: (Printed name)
	TITLE:
State of:)	
County of:	
Subscribed and sworn to before me this	
Day of20	

	·	





December 16, 2019

Mr. Dale Houseknecht, Facilities Coordinator Projects II Cornell University IPP-Facilities Management FM Administration 116 Humphreys Service Building Ithaca, New York 14853-3701

Re: War Memorial (3013) Restoration Project

Pre-Renovation Asbestos Inspection / Survey Report

Cornell Task Authorization No. TA-205, Work Order No. 12247557

Delta Project No.: 2019.003.201

Dear Mr. Houseknecht:

Enclosed, please find the Asbestos Bulk Sample Report Form, the associated Laboratory Analytical Result Sheets, and the Sample Location Drawings for the bulk sampling performed by Delta Certified Inspectors Thomas Ferro and Patrick Reardon. The sampling was performed on December 13th, 2019 and addressed suspect materials with the potential to be impacted by the upcoming War Memorial Restoration Project. Based on a review of the project drawing set (dated 10/22/19), a review of existing bulk sample information for the building, and a visual inspection of the affected areas / associated suspect materials, a total of sixteen (16) bulk samples were collected representing eight (8) separate homogenous materials. Fourteen (14) of the samples collected were "Non-Friable Organically Bound" (NOB) representing seven (7) homogenous materials. The remaining two (2) samples collected were non-NOB, "friable" materials representing one (1) homogenous material. The Wall Flashing and Repair Tar applied to this flashing present on the Center sloped asphalt roof section were both reported as being Asbestos Containing. Results for all other samples collected samples were reported as being either "Non-Asbestos" or as "No Asbestos Detected".

In addition to the samples collected, other suspect materials with the potential to be impacted were observed to be present but were addressed through previous sampling efforts and reported as being "Non-Asbestos". These included:

- Jacketing & end sealant from non-suspect fiberglass pipe / pipe fitting insulation present on various pipe runs in the basement pipe tunnel.
- Hard-packed pipe and pipe fitting insulation present on the high pressure steam line in the basement pipe tunnel.
- The thermal insulation blanket material present on the high pressure steam line in the basement pipe tunnel.
- The black waterproofing sealant present on the concrete surfaces in the in the basement pipe tunnel.
- The felt paper vapor barrier present beneath the 1st floor pavers.

All visually accessible wiring present in the basement pipe tunnel and the roof lights was observed to be non-suspect vinyl coated. The majority of the accessible wiring present in the 1st floor covered walkway was also observed to be non-suspect vinyl coated. However sections of the accessible wiring present on the interior and exterior 1st floor covered walkway supplying the several light fixtures were observed to be suspect cloth-wrapped (2 types). As these lines were energized at the time of the survey, the suspect cloth wire wraps could not be sampled and therefore must be "assumed" asbestos containing until the circuits can be de-energized and the materials sampled / analyzed. The light fixtures with suspect cloth wraps included:

- The 4 exterior fixtures present at the East and West Center Entry Openings.
- One interior fixture located to the immediately upon entering the covered 1st floor walkways' West Entrance on the North wall.

Bulk sample analysis was performed by AmeriSci 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). Analysis of all Non-Friable Organically Bound (NOB) materials was initially performed by Polarized Light Microscopy (PLM) following the NYS DOH ELAP 198.6 Methodologies. If the PLM results were reported as "non-asbestos", the sample was then analyzed by Transmission Electron Microscopy (TEM) following the NYS DOH ELAP 198.4 Methodology. Analysis of all Non-NOB materials were performed by Polarized Light Microscopy (PLM) following the NYS DOH ELAP 198.1 Methodology. "Positive Stop" sample analysis protocol was utilized for a given homogenous material set with multiple samples and based on this; 14 of the 16 samples collected were analyzed. Please reference the Asbestos Bulk Sample Report Form for sample particulars and details.

I have also attached Delta Company, Personnel, and Laboratory Licenses/Certifications. If you have any questions or require any other information, please feel free to contact me at your convenience.

Respectfully,

DELTA ENGINEERS, ARCHITECTS, & LAND SURVEYORS, DPC

Stephen Prislupsky

Director of Environmental Services

Att: Project Paperwork

Attachment A

Asbestos Bulk Sample Report Form

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Client: Cornell University	Task Authorization No.: $\overline{1A-205}$ / Work Order No.: $\overline{12247557}$	Delta Proj. No.: 2019.003.201
Project: War Memorial Restoration	Dates Sampling Performed: 12/13/2019	Asbestos Inspector: Thomas Ferro / Patrick Reardon
Survey	Date of Report: <u>12/17/2019</u>	Number of Samples Collected: 16
Building Code: 3013	Laboratory: AmeriSci Labs	Number of Samples Analyzed: PLM - 14 / TEM - 10

Survey				Date of Report: 12/1/2013	,		Number of Sam	Number of Samples Collected: 10
Building Code: 3013	3013			Laboratory: AmeriSci Labs		Number of Sar	nples Analyzed: 🛚	Number of Samples Analyzed: PLM - 14 / TEM - 10
				Asbestos Bulk Sample Report Form	Report Form			
Sample					Material	Asbestos	PLM Result	TEM Result
Number		* H	Floor	Bulk Sample Description / Details	Type	Type	% Asbestos	% Asbestos
				Black Slate Roof Vapor Barrier / Slate Roof				
2019.003.201 01A	01A		Roof	North Center	Miscellaneous	ND	ND	ND
				Black Slate Roof Vapor Barrier / Slate Roof				
2019.003.201 01B	01B		Roof	North Center	Miscellaneous	ND	ND	ND
				Tan/Off White Seam Caulk / Slate Roof				
2019.003.201 02A	02A		Roof	North	Miscellaneous	ND	ND	ND
				Tan/Off White Seam Caulk / Slate Roof				
2019.003.201 02B	02B		Roof	Northeast	Miscellaneous	ND	ND	ND
				Black Repair Lap Sealant / Slate Roof				
2019.003.201 03A	03A		Roof	Northeast	Miscellaneous	ND	ND	ND
				Black Repair Lap Sealant / Slate Roof				
2019.003.201 03B	03B		Roof	Northeast	Miscellaneous	ND	ND	ND
2019.003.201	04A		Roof	Black Main Field Roofing / Flat Center Roof	Miscellaneous	N Q	Q	N Q
2019.003.201 04B	04B		Roof	Black Main Field Roofing / Flat Center Roof	Miscellaneous	ND	ND	ND
				Black Roof Wall Flashing / Flat Center				
2019.003.201 05A	05A		Roof	Roof	Miscellaneous	Chrycotilo	%8'6	NA/PS
				Black Roof Wall Flashing / Flat Center		olli yaqille		
2019.003.201 05B	05B		Roof	Roof	Miscellaneous		NA/PS	NA/PS
				Homosote Board under Wall Flashing / Flat				
2019.003.201 06A	06A		Roof	Center Roof	Miscellaneous	ND	ND	ΝΑ
				Homosote Board under Wall Flashing / Flat				
2019.003.201 06B	06B		Roof	Center Roof	Miscellaneous	ND	ND	NA



Client: Cornell University	Task Authorization No.: TA-205 / Work Order No.: 12247557	Delta Proj. No.: 2019.003.201
Project: War Memorial Restoration	Dates Sampling Performed: 12/13/2019	Asbestos Inspector: Thomas Ferro / Patrick Reardon
Froject Fre-Refloyation Aspestos Survey	Date of Report: <u>12/17/2019</u>	Number of Samples Collected: 16
Building Code: 3013	Laboratory: AmeriSci Labs	Number of Samples Analyzed: PLM - 14 / TEM - 10

Asbestos Bulk Sample Report Form

Sample				Material	Asbestos	PLM Result	TEM Result
Number	HA*	Floor	Bulk Sample Description / Details	Туре	Туре	% Asbestos	% Asbestos
2019.003.201 07A		Roof	Roof Black Repair Tar / Flat Center Roof	Miscellaneous	Obrycotilo	17.1%	NA/PS
					olli yaqılle		
2019.003.201 07B		Roof	Roof Black Repair Tar / Flat Center Roof	Miscellaneous		NA/PS	NA/PS
			Gray Counter Flashing Caulk / Flat Roof				
2019.003.201 08A		Roof	Roof Section	Miscellaneous	ND	ND	ND
			Gray Counter Flashing Caulk / Flat Roof				
2019.003.201 08B		Roof	Roof Section	Miscellaneous	Non-Asbestos	Trace	< 1.0%

HA - Homogenous Area ND - No Asbestos Detected

TSI - Thermal System Insulation

NA - Not Analyzed by Methodology

NA/PS - Not Analyzed, Positive Stop

Trace / < 1% - Non-asbestos by definition

Misc - Miscellaneous Material

Attachment B

Laboratory Analytical Result Sheets

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AmeriSci New York

117 EAST 30TH ST. NEW YORK, NY 10016 TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Delta Engineers

Attn: Stephen Prislupsky

860 Hooper Road

Endwell, NY 13760

Date Received

12/16/19

11480

AmeriSci Job #

219122412

Date Examined 12/16/19 ELAP#

P.O. #

Page

1 of

RE: 2019.003.201; Cornell University; War Memorial Renovations

Asbestos Bulk Sampling

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbesto
2019.003.201-01A	219122412-01	No	NAD ¹
1 Location: S	late Roof / North Center - Slate Roo	of Vapor Barrier (Black)	(by NYS ELAP 198.6) by Tara L. Fisher on 12/16/19
Analyst Description: Black, Ho Asbestos Types: Other Material: Non-fibro	omogeneous, Non-Fibrous, Bulk Ma us 5.7 %	terial	011 12/10/19
2019.003.201-01B	219122412-02	No	NAD
1 Location: SI	ate Roof / North Center - Slate Roo	f Vapor Barrier (Black)	(by NYS ELAP 198.6) by Tara L. Fisher on 12/16/19
Analyst Description: Black, Ho Asbestos Types: Other Material: Non-fibro	mogeneous, Non-Fibrous, Bulk Ma us 8.5 %	terial	311 12/10/19
2019.003.201-02A	219122412-03	No	NAD
2 Location: Sl	ate Roof / North - Seam Caulk (Tan	/ Off-White)	(by NYS ELAP 198.6) by Tara L. Fisher
Analyst Description: Tan, Hom Asbestos Types: Other Material: Non-fibrou	ogeneous, Non-Fibrous, Bulk Mater us 5.8 %	rial	on 12/16/19
2019.003.201-02B	219122412-04	No	NAD
2 Location: Sla	ate Roof / Northeast - Seam Caulk (Tan / Off-White)	(by NYS ELAP 198.6) by Tara L. Fisher on 12/16/19
Analyst Description: Tan, Home Asbestos Types: Other Material: Non-fibrou	ogeneous, Non-Fibrous, Bulk Mater s 5.9 %	ial	011 12/10/19
2019.003.201-03A	219122412-05	No	NAD
Location: Sla	te Roof / Northeast - Repair Lap Se	-	(by NYS ELAP 198.6) by Tara L. Fisher on 12/16/19

Asbestos Types:

Other Material: Non-fibrous 12.6 %

PLM Bulk Asbestos Report

2019.003.201; Cornell University; War Memorial Renovations Asbestos Bulk Sampling

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
2019.003.201-03B	219122412-06	No	NAD
	ate Roof / Northeast - Repair Lap S	, ,	(by NYS ELAP 198.6) by Tara L. Fisher on 12/16/19
Analyst Description: Black, Ho Asbestos Types: Other Material: Non-fibro	mogeneous, Non-Fibrous, Bulk Mat us 13.5 %	erial	7
2019.003.201-04A	219122412-07	No	NAD
	at Center Roof - Main Field Roofing	(Black)	(by NYS ELAP 198.6) by Tara L. Fisher on 12/16/19
Analyst Description: Black, Ho Asbestos Types: Other Material: Non-fibro	mogeneous, Non-Fibrous, Bulk Mate us 10.6 %	erial	
2019.003.201-04B	219122412-08	No	NAD
4 Location: Fla	at Center Roof - Main Field Roofing ((Black)	(by NYS ELAP 198.6) by Tara L. Fisher on 12/16/19
			011 12/10/19
Analyst Description: Black, Hor Asbestos Types: Other Material: Non-fibrou	mogeneous, Non-Fibrous, Bulk Mate	erial	OII 12/10/19
Asbestos Types: Other Material: Non-fibrou		erial Yes	9.8 %
Asbestos Types: Other Material: Non-fibrou	s 16.4 %	Yes	9.8 % (by NYS ELAP 198.6) by Tara L. Fisher
Asbestos Types: Other Material: Non-fibrou 2019.003.201-05A Location: Fla	219122412-09 It Center Roof - Roof Wall Flashing (nogeneous, Non-Fibrous, Bulk Mate 9.8 %	Yes (Black)	9.8 % (by NYS ELAP 198.6)
Asbestos Types: Other Material: Non-fibrou 2019.003.201-05A Location: Fla Analyst Description: Black, Hor Asbestos Types: Chrysotile Other Material: Non-fibrou	219122412-09 It Center Roof - Roof Wall Flashing (nogeneous, Non-Fibrous, Bulk Mate 9.8 %	Yes (Black)	9.8 % (by NYS ELAP 198.6) by Tara L. Fisher on 12/16/19
Asbestos Types: Other Material: Non-fibrou 2019.003.201-05A Location: Fla Analyst Description: Black, Hor Asbestos Types: Chrysotile Other Material: Non-fibrou 2019.003.201-05B	219122412-09 It Center Roof - Roof Wall Flashing (Inogeneous, Non-Fibrous, Bulk Mate 9.8 % s 17.2 %	Yes (Black) erial	9.8 % (by NYS ELAP 198.6) by Tara L. Fisher
Asbestos Types: Other Material: Non-fibrou 2019.003.201-05A Location: Fla Analyst Description: Black, Hor Asbestos Types: Chrysotile Other Material: Non-fibrou 2019.003.201-05B	219122412-09 It Center Roof - Roof Wall Flashing (Inogeneous, Non-Fibrous, Bulk Mate 9.8 % Is 17.2 % 219122412-10 It Center Roof - Roof Wall Flashing (Yes (Black) erial	9.8 % (by NYS ELAP 198.6) by Tara L. Fisher on 12/16/19
Asbestos Types: Other Material: Non-fibrous 2019.003.201-05A Location: Flat Analyst Description: Black, Hor Asbestos Types: Chrysotile Other Material: Non-fibrous 2019.003.201-05B Location: Flat Analyst Description: Bulk Mater Asbestos Types: Other Material:	219122412-09 It Center Roof - Roof Wall Flashing (Inogeneous, Non-Fibrous, Bulk Mate 9.8 % Is 17.2 % 219122412-10 It Center Roof - Roof Wall Flashing (Yes (Black) erial	9.8 % (by NYS ELAP 198.6) by Tara L. Fisher on 12/16/19 NA/PS
Asbestos Types: Other Material: Non-fibrous 2019.003.201-05A Location: Flat Analyst Description: Black, Hor Asbestos Types: Chrysotile Other Material: Non-fibrous 2019.003.201-05B Location: Flat Analyst Description: Bulk Mater Asbestos Types: Other Material:	219122412-09 It Center Roof - Roof Wall Flashing (Inogeneous, Non-Fibrous, Bulk Mate 9.8 % Is 17.2 % 219122412-10 It Center Roof - Roof Wall Flashing (It	Yes (Black) (Black)	9.8 % (by NYS ELAP 198.6) by Tara L. Fisher on 12/16/19

Client Name: Delta Engineers

PLM Bulk Asbestos Report

2019.003.201; Cornell University; War Memorial Renovations Asbestos Bulk Sampling

	Lab No.	Asbestos Present	Total % Asbestos
2019.003.201-06B 6 Loca	219122412-12	No	NAD
	tion: Flat Center Roof - Homosote Board Und	der Wall Flashing	(by NYS ELAP 198.1) by Tara L. Fisher on 12/16/19
Other Material: C	ellulose 95 %, Non-fibrous 5 %		
2019.003.201-07A	219122412-13	Yes	17.1 %
	tion: Flat Center Roof - Repair Tar (Black)		(by NYS ELAP 198.6) by Tara L. Fisher on 12/16/19
Asbestos Types: Cl Other Material: No	•	al	
2019.003.201-07B	219122412-14		NA/PS
7 Locat	ion: Flat Center Roof - Repair Tar (Black)		_
Analyst Description: Bu Asbestos Types: Other Material:	ulk Material		
Asbestos Types: Other Material: 2019.003.201-08A	219122412-15	No	NAD
Asbestos Types: Other Material: 2019.003.201-08A			(by NYS ELAP 198.6) by Tara L. Fisher
Asbestos Types: Other Material: 2019.003.201-08A Locat	219122412-15 ion: Flat Roof Section - Counter Flashing Cat rey, Homogeneous, Non-Fibrous, Bulk Materia	ulk (Gray)	(by NYS ELAP 198.6)
Asbestos Types: Other Material: 2019.003.201-08A Locat Analyst Description: Gr Asbestos Types: Other Material: No	219122412-15 ion: Flat Roof Section - Counter Flashing Cat rey, Homogeneous, Non-Fibrous, Bulk Materia	ulk (Gray)	(by NYS ELAP 198.6) by Tara L. Fisher on 12/16/19
Asbestos Types: Other Material: 2019.003.201-08A Locat Analyst Description: Gr Asbestos Types: Other Material: No	219122412-15 ion: Flat Roof Section - Counter Flashing Cau ey, Homogeneous, Non-Fibrous, Bulk Materia on-fibrous 7.6 %	ulk (Gray) ul Yes	(by NYS ELAP 198.6) by Tara L. Fisher

AmeriSci Job #: 219122412

Page 4 of 4

Client Name: Delta Engineers

PLM Bulk Asbestos Report

2019.003.201; Cornell University; War Memorial Renovations Asbestos Bulk Sampling

Reporting Notes:
(1) This job was - Analyzed using LECIA DMEP S/N 13595
Analyzed by: Tara L. Fisher Dua Hand
*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 by Appd E to Subpt E, 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or 198.6 for NOB samples or EPA 400 pt ct by Appd E to Subpt E, 40 CFR 763 (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 file, FR 59 146 38970 8/1/94)
National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab. This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.
Reviewed By:END OF REPORT

Client Name: Delta Engineers

Table i

Summary of Bulk Asbestos Analysis Results 2019.003.201; Cornell University; War Memorial Renovations Asbestos Bulk Sampling

AmeriSci Sample #	Client Sample#	HG	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by
10	2019.003.201-01A	-	0.176	91.8	2.4	5.7	CAN	
Location:	: Slate Roof / North Center - Slate Roof Vapor Barrier (Black)	Slate Roof Vapo	or Barrier (Black)				į	2
05	2019.003.201-01B	-	0.231	88.5	3.0	8.5	CAZ	
Location:	: Slate Roof / North Center - Slate Roof Vapor Barrier (Black)	Slate Roof Vapo	or Barrier (Black)			}		2
03	2019.003.201-02A	7	0.173	58.0	36.2	20	2	2
Location:	: Slate Roof / North - Seam Caulk (Tan / Off-White)	¦aulk (Tan / Off-	White)			3		Q V
4	2019.003.201-02B	7	0.147	58.4	35.7	ς. G	2	2
Location:	: Slate Roof / Northeast - Seam Caulk (Tan / Off-White)	am Caulk (Tan /	Off-White)			2		2
90	2019.003.201-03A	က	0.126	57.5	29.8	12.6	C	
Location:	Slate Roof / Northeast - Repair Lap Sealant (Black)	vair Lap Sealant	(Black)					2
98	2019.003.201-03B	က	0.165	58.4	28.2	13.5	042	2
Location:	Slate Roof / Northeast - Repair Lap Sealant (Black)	vair Lap Sealant	(Black)		<u> </u>	2		Q Q
07	2019.003.201-04A	4	0.270	74.0	15.3	10.6	C 4 2	2
Location:	Flat Center Roof - Main Field Roofing (Black)	d Roofing (Black			!	2		
80	2019.003.201-04B	4	0.304	70.7	12.9	16.4	C 4 2	CV
Location:	Flat Center Roof - Main Field Roofing (Black)	d Roofing (Black	0			•)	Š
60	2019.003.201-05A	ro.	0.243	68.2	4.8	17.2	Chosotile 9.8	2
Location:	Flat Center Roof - Roof Wall Flashing (Black)	I Flashing (Black	⊋			<u>!</u>	0.5000000000000000000000000000000000000	Š
9	2019.003.201-05B	ις.	0.279	76.9	5.4	17.7	NA/PS	Š
Location:	Flat Center Roof - Roof Wall Flashing (Black)	I Flashing (Black	\$;	Š
7	2019.003.201-06A	9	1			1	CAN	ØZ.
Location:	Flat Center Roof - Homosote Board Under Wall Flashing	e Board Under V	Vall Flashing)	Š
12	2019.003.201-06B	9	1			ļ	CAN	δN
Location:	Flat Center Roof - Homosote Board Under Wall Flashing	e Board Under V	Vall Flashing)	\$
13	2019.003.201-07A	7	0.263	41.6	7.2	34.1	Choseotile 17 4	Š
Location:	Flat Center Roof - Repair Tar (Black)	ır (Black)						\$
14	2019.003.201-07B	7	0.318	53.0	6.7	40.3	SQ/4N	V
Location:	Flat Center Roof - Repair Tar (Black)	ır (Black)					2	2
15	2019.003.201-08A	∞	0.264	37.9	54.5	7.6	CAN	
Location:	Flat Roof Section - Counter Flashing Caulk (Gray)	Flashing Caulk ((Gray)			•)	חלי
16	2019.003.201-08B	œ	0.212	38.3	53.7	7.8	Chrysotile <0.25	Chaveotile < 1.0
Location:	Flat Roof Section - Counter Flashing Caulk (Gray)	Flashing Caulk ((Gray)			!		Oilyacuid / 1.0

See Reporting notes on last page

AmeriSci Job #: 219122412

Client Name: Delta Engineers

Summary of Bulk Asbestos Analysis Results **Table** I

2019.003.201; Cornell University; War Memorial Renovations Asbestos Bulk Sampling

** Asbestos % by TEM
** Asbestos % by PLM/DS
Insoluble Non-Asbestos Inorganic %
Acid Soluble Inorganic %
Heat Sensitive Organic %
Sample Weight (gram)
HG Area
Client Sample#
AmeriSci Sample #

Analyzed by: Khaalid W. Perine

containing Vermiculite; (SM-V) = Surfacil Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis **Quantitative Analysis (Semi/Full); Bulk Aspestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or ELAP 198.1 for New York friable samples or ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or ELAP 198.4; for New York samples; NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing 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, AIHA-LAP, LLC (PLM) Lab ID 102843. ; Date Analyzed 12/17/2019

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 heterogenous materials).

Reviewed By:



860 Hooper Road, Endwell, NY 13760 Tel: 607.231.6600 Fax 607.231.6640 www.delta-eas.com

Date: 12/13/2019	Turnaround Time: 24 Hours	219122412
Delta Project No.: 2019.003.201	Cornell Work Order No.: N/A	Collected By: Tom Ferro / Patrick Reardon
Client: Cornell University	Project: War Memorial	Renovations Asbestos Bulk Samplng

Sample Number		Material Type	Material Condition	Floor	Description / Sample Location
2019.003.201	01A	2019.003.201 01A Miscellaneous	Good	Roof	Roof Black Slate Roof Vapor Barrier / Slate Roof North Center
2019.003.201 01B	01B	Miscellaneous	Good	Roof	Roof Black Slate Roof Vapor Barrier / Slate Roof North Center
2019.003.201	02A	Miscellaneous	Good	Roof	Roof Tan/Off White Seam Caulk / Slate Roof North
2019.003.201	02B	Miscellaneous	Good	Roof	Roof Tan/Off White Seam Caulk / Slate Boof Northoont
2019.003.201	03A	Miscellaneous	Good	Roof	Roof (Black Repair I an Sealant / State Roof Northeast
2019 003 201	03B		poor	Poof	Block Bosois I on Cooleast / Class D. (1911)
2019.003.201 04A		1	Good	Roof	Roof Black Main Field Roofing / Flat Center Roof
2019.003.201 04B		Miscellaneous	Good	Roof	Roof Black Main Field Roofing / Flat Center Roof

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, sprislupsky@delta-eas.com, rcherevko@delta-eas.com

Notes:

Submitted By:

Received By:

Patrick Reardon

The state of the s

Sígnature)

(Signature)

Date: 12/13/2019

Date: 12-16-19 1125

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Page 1 of 2



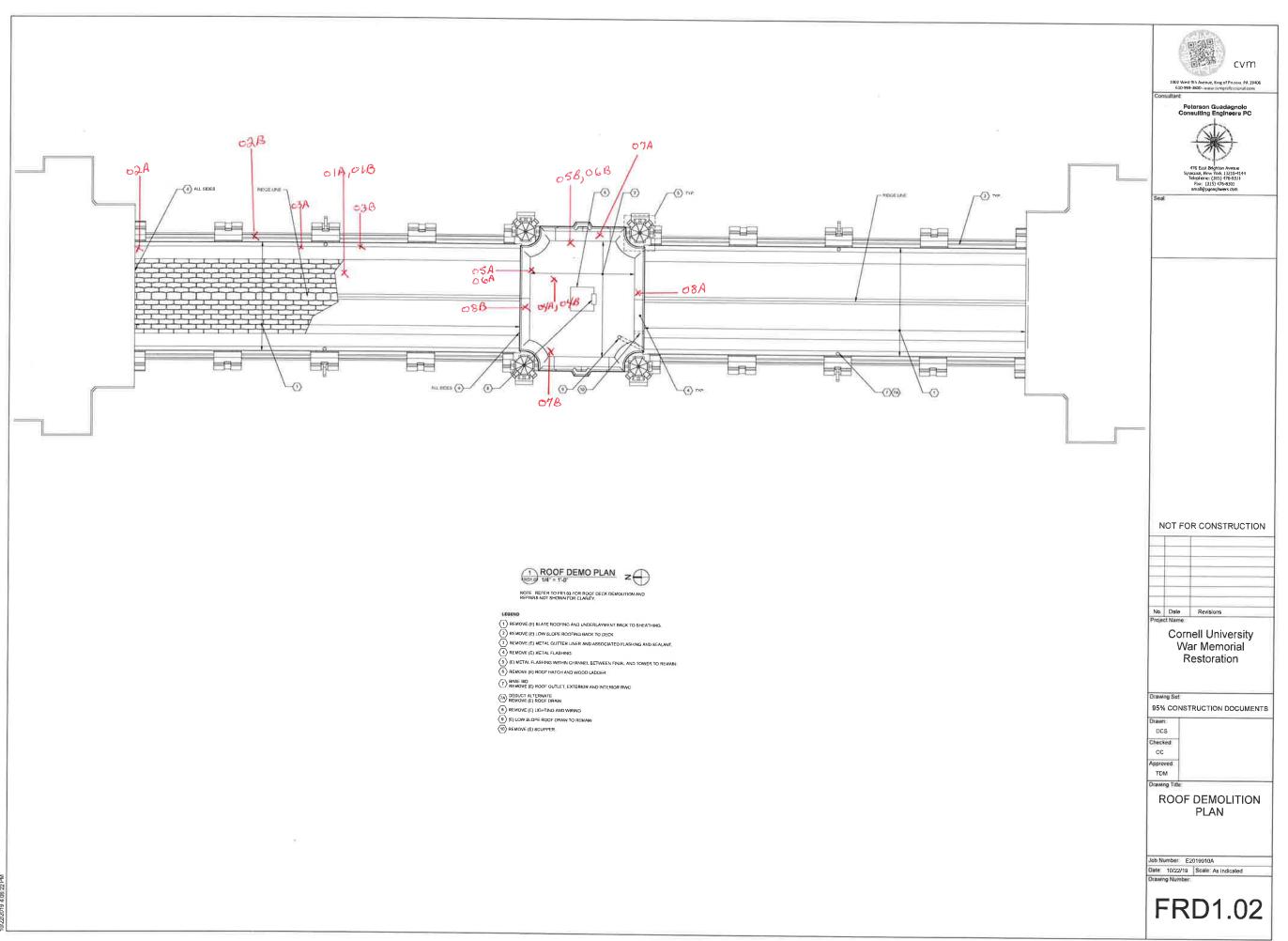
 Date: 12/13/2010		Turnaround Time: 24 Hours		940109710	7-17-0-1
2019.003.201	47,14	₹/Z			irro / Patrick Reardon
Delta Project No.:	Mark O.J. M.	Cornell Work Order No.:	1100		Collected By: Tom Ferro /
Cornell University	Project. Workshopping	ם ואים וכום	Renovations Asbestos Bulk		
Client:	Droint. W	יייייייייייייייייייייייייייייייייייייי	Renovations	Samplng)

Sample Number		Material Type	Condition	Floor	Description / Sample Location
2019.003.201 05A	05A	Miscellaneous	Good	Roof	Roof Black Roof Wall Flashing / Flat Contor Boof
2019.003.201 05B	05B	Miscellaneous	Good	Roof	Roof Black Roof Wall Flashing / Flat Center Boof
2019.003.201 06A	06A	Miscellaneous	Good	Roof	Roof Homosote Board under Well Flashing / Flat Contact Doct
2019.003.201 06B	06B		Good	Roof	Roof Homosote Board under Wall Flashing / Flat Center Rool
2019.003.201 07A	07A	Miscellaneous	Good	Roof	Roof Black Renair Tar / Flat Center Boof
2019.003.201 07B		Miscellaneous	poor	Poof	Shock Bonoir Tor / Flot Control
2019.003.201 08A		Miscellaneous	Good	Roof	Roof Gray Counter Flashing Cault / Elat Doof Scoting
2019.003.201 08B		Miscellaneous	Good	Roof	Roof Gray Counter Flashing Caulk / Flat Roof Section

Attachment C

Sample Location Drawings

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AN ISO 9001:2015 CERTIFIED COMPANY

Attachment D

Photos

		·



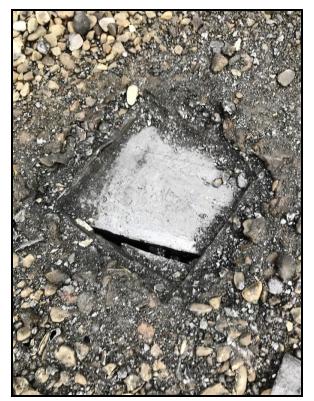
HA 01 – Slate Roof Felt Paper Vapor Barrier - "No Asbestos Detected"



HA 02 - Slate Roof Tan/Off-White Seam Caulk - "No Asbestos Detected"



HA 03 - Slate Roof Black Repair Lap Sealant - "No Asbestos Detected"



 $HA\ 04-Center\ Roof\ Main\ Field\ Roofing$ - "No Asbestos Detected"



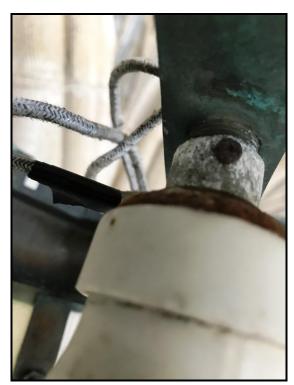
HA 05 – Center Roof Wall Flashing - Asbestos Containing
HA 06 – Center Roof Homosote Board under Wall Flashing - "No Asbestos Detected"



HA 07 – Black Center Roof Wall Flashing Repair Tar - Asbestos Containing



HA 08 – Center Roof Gray Counter Flashing Caulk - "Non-Asbestos"



Interior Fixture Suspect / Assumed ACM Gray Cloth Wire Wrap
Present at 1 Fixture



Exterior Fixture Suspect / Assumed ACM Black Cloth Wire Wrap
Present at 4 Fixtures

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AN ISO 9001:2015 CERTIFIED COMPANY

Attachment E

Delta / Laboratory Licenses and Certifications

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New York State - Department of Labor

Division of Safety and Health License and Certificate Unit State Campus, Building 12 Albany, NY 12240

ASBESTOS HANDLING LICENSE

Delta Engineers, Architects & Land Surveyors, D.P.C.

860 Hooper Road

Endwell, NY 13760

FILE NUMBER: 05-0851 LICENSE NUMBER: 29322

LICENSE CLASS: RESTRICTED DATE OF ISSUE: 08/28/2019 EXPIRATION DATE: 09/30/2020

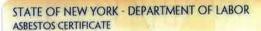
Duly Authorized Representative – Stephen Prislupsky:

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.

Eileen M. Franko, Director For the Commissioner of Labor

SH 432 (8/12)







THOMAS P FERRO CLASS(EXPIRES) C ATEC(12/19) D INSP(12/19) H PM (12/19)

> CERT# 99-11328 DMV# 404844888

MUST BE CARRIED ON ASBESTOS PROJECTS

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01213 **00-87**2354 81

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16T 5' 08"

IF FOUND RETURN TO: NYSDOL - L6C UNIT ROOM 161A BUILDING 12 STATE OFFICE CAMPUS ALBANY NY 12240

STATE OF NEW YORK - DEPARTMENT OF LABOR ASBESTOS CERTIFICATE





PATRICK M REARDON CLASS(EXPIRES) C ATEC(07/20) D INSP(07/20) E MGPL(07/19) H PM (07/20)

CERT# 17-41735 DMV# 573242332

MUST BE CARRIED ON ASBESTOS PROJECTS



01213 005124556 17

EYES BLU
HAIR RED
HGT 5' 10"

IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

NEW YORK STATE DEPARTMENT OF HEALTH WADSWORTH CENTER



Expires 12:01 AM April 01, 2020 Issued April 01, 2019

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. PAUL J. MUCHA 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

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.: 59674

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 sub-contractors 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
- B. Section 01 57 13 Soil Erosion and Sediment Control

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 Submittals:
 - 1. Analytical laboratory sample results and material Certifications for all imported soil and granular materials ("borrow").
 - 2. Contractor's Waste Material Disposal Plan.
 - 3. Weight tickets from the Borrow Material Supplier.
 - 4. Proposed methods for dewatering and construction water management.
 - 5. Analytical laboratory sample results for all waste materials.
 - 6. Copies of manifests for all waste materials disposed of off-site.

1.4 **JOB SITE ADMINISTRATION**

A. In accordance with Article 2 of the General Conditions, provide a competent supervisory representative with full authority to act for the Contractor at the site.

GENERAL ENVIRONMENTAL REQUIREMENTS

- B. If at any time operations under the representative's supervision do not comply with this Section, or the representative is otherwise unsatisfactory to the Owner, replace, if requested by the Owner, said representative with another representative satisfactory to the Owner. There shall be no change in superintendent without the Owner's approval.
- C. Remove from the Work any employee of the Contractor or any Subcontractor when so directed by the Owner. The Owner may request the removal of any employee who does not comply with these specifications.

1.5 CLEARING, SITE PREPARATION AND SITE USE

- A. In accordance with Section 01 14 00, only that portion of the working area that is absolutely necessary and essential for the work shall be cleared for construction. All clearing should be approved and performed to provide minimum practical exposure of soils.
- B. The Contractor shall make every effort to avoid the destruction of plants, trees, shrubs and lawns outside the area of construction so as not to unduly disturb the ecological or environmental quality of the area.
- C. Topsoil excavated as part of the Project, which can be reused as part of the Project, shall be stockpiled for future use and temporarily stabilized to prevent erosion.

1.6 SPOIL AND BORROW

A. Spoil

- 1. Dispose of excavated material which, in the opinion of the Owner's Representative, is unfit to be used as backfill or embankment or which is in excess of the amount required under the Contract.
- 2. All spoil areas shall be graded and seeded to match the surrounding area.
- 3. Spoil areas shall be covered and protected from erosion into adjacent storm sewers, drainage ways, land areas, or water bodies.

B. Borrow Material

1. Borrow material shall be provided from a clean source. Submittals of proposed borrow material shall be reviewed by the Owner prior to delivery on-site. Submittals shall include the quantity of materials, source location and certification by the material supplier that it is free of chemicals or other foreign matter.

1.7 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

1.8 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.

1.9 PROTECTION OF THE ENVIRONMENT

- A. Construction procedures observed by the Contractor, its subcontractors and other employees shall include protection of the environment, in accordance with all pertinent Cornell standards, policies, local laws, executive orders, ordinances, and federal and state regulations. Construction procedures that are prohibited in the undertaking of work associated with this Contract include, but are not limited to:
 - 1. Dumping of spoil material or any liquid or solid pollutant into any storm or sanitary sewer, drainage way, stream sewer, any wetlands (as defined by federal and state regulations), any surface waters, or at unspecified locations.
 - 2. Indiscriminate, arbitrary, or capricious operation of equipment in any stream corridors, any wetlands, or any surface waters.
 - 3. Pumping of any silt-laden water from trenches or other excavations into any storm sewers, sanitary sewers, drainage ways, wetlands, or surface waters.
 - 4. Damaging vegetation beyond the extent necessary for construction of the facilities.
 - 5. Disposal of trees, brush, and other debris in any location on University property, unless such areas are specifically identified on the drawing or in the specifications or specifically approved by the Owner's site representative.
 - 6. Permanent or unspecified alteration of the flow line of a stream.
 - 7. Burning trash, project debris, or waste materials.
- B. Take all necessary precautions to prevent silt or waste of any kind from entering any drainage or waterways or downstream properties as a result of the Work.

GENERAL ENVIRONMENTAL REQUIREMENTS

- 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.

1.10 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.

1.11 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 Environmental Health and Safety (EH&S) 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 EH&S prior to disposal of any on-site disposal.

1.12 DISPOSAL OF WASTE MATERIAL AND TITLE

- 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/sites/default/files/FRM-CWMDP-Contractor-Waste-Material-Disposal-Plan-IPDF.pdf
- 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 EH&S 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

EXECUTION – NOT USED 3.0

END OF SECTION 01 35 43

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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 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 safety codes.
- 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).

SPILL CONTROL

- 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 rope 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 by using vacuum, pump, sorbents, or shovel 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.

Ithaca, New York

SPILL CONTROL

- 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 picked up with a shovel 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 sorbents 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 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 provided in Appendix B.

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 response personnel (e.g., ambulance, police) have been notified.
 - 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.
 - d. Ensure that fires are safely extinguished (if possible), valves closed, and other immediate actions necessary to mitigate the emergency, 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 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 Environmental Health and Safety (EH&S), 607.255.8200, within 24 hours of reporting the release. The Contractor will be expected to provide EH&S 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 the soil or groundwater or onto surface 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" of oil to navigable waters must be reported to the federal **National Response Center**, 1-800-424-8802.

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.

SPILL CONTROL

- 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 or 1-202-426-2675.
- 2. Within 14 days of the release, submit a written description of the release. The description should include: (1) a description of the release, (2) the type of material released, (3) estimated amount of the spill; (4) the date of the release, (5) an explanation of why the release occurred; and (6) a description of the measures to be implemented to prevent and control future releases.

(1) Reportable Quantity: A Reportable Quantity is the quantity of a hazardous substance or oil that triggers reporting requirements under the Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA) (USEPA, September 1992). While the Contractor is legally responsible for knowing the risks of materials that are part of construction, members of the owner's spill response team have access to information that may help identify these quantities with you.

(2) Harmful Quantity: A Harmful Quantity of oil includes discharges that violate applicable water quality standards; cause a film, sheen, or discoloration on a water surface or adjoining shoreline; or cause a sludge or emulsion to be deposited beneath the water surface or shoreline (40 CFR 110.3).

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

END OF SECTION 01 35 44

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SECTION 01 35 91 HISTORIC TREATMENT PROCEDURES

1.0 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 **SUMMARY**

A. Section includes general protection and treatment procedures for designated historic spaces, areas, rooms, and surfaces in the Project.

1.3 <u>DEFINITIONS</u>

- A. Consolidate: To strengthen loose or deteriorated materials in place.
- B. Design Reference Sample: A sample that represents Engineer's prebid selection of work to be matched; it may be existing work or work specially produced for Project.
- C. Dismantle: To disassemble or detach a historic item from a surface, or a non-historic item from a historic surface, using gentle methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- D. Historic: Spaces, areas, surfaces, materials, finishes, and overall appearance that are important to the successful preservation as determined by Engineer. Designated historic spaces areas rooms and surfaces scheduled in Part 3.
 - 1. Restoration Zone: Areas of greatest Restoration Architectural importance, integrity, and visibility; to be preserved and restored to the original 1930's, design and finish as indicated on Drawings.
 - 2. Alteration Zones: Areas of slight Restoration Architectural importance, integrity, and visibility; to leave any remaining original fabric untouched insofar as is consistent with accommodating modern uses for the building as indicated on Drawings.
- E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Engineer.
- F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- G. Reinstall: To protect removed or dismantled item, repair and clean it as indicated for reuse, and reinstall it in original position, or where indicated.

- H. Remove: To take down or detach a non-historic item located within a historic space, area, or room, using methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled
- I. Repair: To correct damage and defects, retaining existing materials, features, and finishes while employing as little new material as possible. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- J. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- K. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- L. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- M. Restore: To consolidate, replicate, reproduce, repair, and refinish as required to achieve the indicated results.
- N. Retain: To keep existing items that are not to be removed or dismantled.
- O. Reversible: New construction work, treatments, or processes that can be removed or undone in the future without damaging historic materials unless otherwise indicated.
- P. Salvage: To protect removed or dismantled items and deliver them to Owner or set aside for reinstallation.
- Q. Stabilize: To provide structural reinforcement of unsafe or deteriorated items while maintaining the essential form as it exists at present; also, to reestablish a weather-resistant enclosure.
- R. Strip: To remove existing finish down to base material unless otherwise indicated.

1.4 COORDINATION

- A. Historic Treatment Schedule: A construction schedule coordinating the sequencing and scheduling of historic treatment work for entire Project, including each activity to be performed in historic spaces, areas, and rooms, and on historic surfaces; and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for historic treatment work.
 - 1. Schedule construction operations in sequence required to obtain best historic treatment results.
 - 2. Coordinate sequence of historic treatment work activities to accommodate the following:
 - a. Owner's continuing occupancy of portions of adjacent existing buildings.
 - b. Other known work in progress.
 - c. Tests and inspections.

- 3. Detail sequence of historic treatment work, with start and end dates.
- 4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
- 5. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.
- B. Pedestrian: Coordinate historic treatment work with circulation patterns within Project building(s) and site. Some work is near circulation patterns for pedestrians circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.5 PROJECT MEETINGS FOR HISTORIC TREATMENT

- A. Preliminary Historic Treatment Conference: Before starting historic treatment work, Engineer will conduct conference at Project site.
 - 1. Attendees: In addition to representatives of Owner, Construction Manager, Engineer, and Contractor, historic treatment specialists, and installers whose work interfaces with or affects historic treatment shall be represented at the meeting.
 - 2. Agenda: Discuss items of significance that could affect progress of historic treatment work, including review of the following:
 - a. Historic Treatment Schedule: Discuss and finalize; verify availability of materials, historic treatment specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Fire-prevention plan.
 - c. Governing regulations.
 - d. Areas where existing construction is to remain and the required protection.
 - e. Hauling routes.
 - f. Sequence of historic treatment work operations.
 - g. Storage, protection, and accounting for salvaged and specially fabricated items.
 - h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
 - i. Qualifications of personnel assigned to historic treatment work and assigned duties.
 - j. Requirements for extent and quality of work, tolerances, and required clearances.

- k. Methods and procedures related to historic treatments, including product manufacturers' written instructions and precautions regarding historic treatment procedures and their effects on materials, components, and vegetation.
- 1. Embedded work such as flashings and lintels, special details, collection of wastes, protection of occupants and the public, and condition of other construction that affect the Work or will affect the work.
- 3. Reporting: Construction Manager will record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.
- B. Coordination Meetings: Conduct specifically for historic treatment work at bi-monthly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 - Attendees: In addition to representatives of Owner, Construction Manager, Engineer, and Contractor, each historic treatment specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of historic treatment work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to historic treatment work.
 - 2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of historic treatment work. Include topics for discussion as appropriate to status of Project.
 - a. Historic Treatment Schedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.
 - b. Schedule Updating: Revise Contractor's Historic Treatment Schedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each entity present, including review items listed in the "Preliminary Historic Treatment Conference" Paragraph in this article and the following:
 - Interface requirements of historic treatment work with other Project Work.
 - Status of submittals for historic treatment work.
 - Access to historic treatment work.
 - Effectiveness of fire-prevention plan.
 - Quality and work standards of historic treatment work.
 - Change Orders for historic treatment work.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.

1.7 <u>INFORMATIONAL SUBMITTALS</u>

- A. Historic Treatment Schedule:
 - 1. Submit historic treatment schedule within Seven (7) days of date established for commencement of historic treatment work.
- B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by Contractor's historic treatment operations.
- C. Historic Treatment Program: Submit ten (10) days before work begins.
- D. Fire-Prevention Plan: Submit ten (10) before work begins.

1.8 <u>HISTORIC PRESERVATION</u>

A. All work to be carried out in accordance with current industry practices for the repair and conservation of historic buildings. All contractors performing work are required to be prequalified in accordance with Pre -qualification requirements in section 1.9 below and requirements indicated in technical specifications.

1.9 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: An experienced firm regularly engaged in historic treatments similar in nature, materials, design, and extent to the work as specified in each Section and that has completed a minimum of 5 recent projects within the past 5 years with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.
- B. Historic Treatment Specialist Pre-Qualification Requirements:
 - 1. Project Examples: Provide written narrative of the work undertaken to accompany example projects demonstrating ability to perform the work. Include photographs of work that demonstrate the scale of the project and specific work.
 - 2. Project Examples: Provide list of supervisors and historic treatment specialists that worked on example projects.

- 3. Historic Treatment Specialist Trades: Provide qualifications for trades prosed to perform the work. Provide a list of a minimum of 5 projects with successful delivery.
- 4. Provide a minimum of three (3) references for past projects shown as project examples.
- 5. Field Supervisor Qualifications: Full-time supervisors experienced in historic treatment work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on site when historic treatment work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of the specialist firm.
 - a. Construct new mockups of required work whenever a supervisor is replaced.
- C. Historic Treatment Program: Prepare a written plan for historic treatment for whole Project, including each phase or process and protection of surrounding materials during operations. Describe in detail the materials, methods, and equipment to be used for each phase of work. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project historic treatment program with specific requirements of programs required in other historic treatment Sections.
 - 1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
 - 2. Protection Plan: Include detailed plan of protection of surfaces affected by demolition, dismantling and general access and work throughout the space and the adjoining spaces, McFaddin Hall and Lyon Hall.
 - 3. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- D. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.
- E. Safety and Health Standard: ANSI/ASSE A10.6.

1.10 STORAGE AND HANDLING OF HISTORIC MATERIALS

- A. Salvaged Historic Materials:
 - 1. Clean loose dirt and debris from salvaged historic items unless more extensive cleaning is indicated.
 - 2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.

- 5. Protect items from damage during transport and storage.
- B. Historic Materials for Reinstallation:
 - 1. Repair and clean historic items for reuse as indicated.
 - 2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.
- C. Existing Historic Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Engineer, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after historic treatment and construction work in the vicinity is complete.
- D. Storage: Catalog and store historic items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
 - 1. Identify each item with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
 - 2. Secure stored materials to protect from theft.
 - 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F (3 deg C) or more above the dew point.

E. Storage Space:

1. Arrange for off-site locations for storage and protection of historic material that cannot be stored and protected on-site.

1.11 FIELD CONDITIONS

A. Size Limitations in Historic Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by twelve (12) inches or more.

2.0 PRODUCTS - NOT USED

3.0 EXECUTION

3.1 **PROTECTION**

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from historic treatment procedures.
 - 1. Use only proven protection methods, appropriate to each area and surface being protected.
 - 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where historic treatment work is being performed.
 - 3. Erect temporary barriers to form and maintain fire-egress routes.
 - 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during historic treatment work.
 - 5. Contain dust and debris generated by historic treatment work, and prevent it from reaching the public or adjacent surfaces.
 - 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
 - 7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
 - 8. Provide supplemental sound-control treatment to isolate removal and dismantling work from other areas of the building.
- B. Temporary Protection of Historic Materials:
 - 1. Protect existing historic materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
 - 2. Do not attach temporary protection to historic surfaces except as indicated as part of the historic treatment program and approved by Engineer.
- C. 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.
- D. Utility and Communications Services:
 - 1. Notify Owner, Engineer, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by historic treatment work before commencing operations.
 - 2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for historic treatment work.
 - 3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Engineer immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
 - 1. Prevent solids such as stone or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from historic treatment work.
 - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

3.2 **PROTECTION FROM FIRE**

- A. Follow fire-prevention plan and the following:
 - 1. Comply with NFPA 241 requirements unless otherwise indicated. Perform duties titled "Owner's Responsibility for Fire Protection."
 - 2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
 - 3. Prohibit smoking by all persons within Project work and staging areas except where specifically designated for smoking.
- B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
 - 1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
 - 2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
 - 3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that area is safe.
 - 4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
 - 5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
 - 6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:

- g. Train each fire watch in proper operation of fire-control equipment and alarms.
- h. Prohibit fire-watch personnel from other work that would distract from fire-watch duties.
- i. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
- j. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 15 minutes after conclusion of work to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
- k. Maintain fire-watch personnel at Project site until two (2) hours after conclusion of daily work.
- C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for type of fire risk in each work area. Ensure that nearby personnel and fire-watch personnel are trained in fire-extinguisher and blanket use.
- D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
 - 1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in historic treatment program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL HISTORIC TREATMENT

- A. Have historic treatment work performed only by qualified historic treatment specialists.
- B. Ensure that supervisory personnel are present when historic treatment work begins and during its progress.
- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photos or video.
- D. Perform daily inspections of Project site as the Work progresses to detect hazards resulting from historic treatment procedures.
- E. Follow the procedures in subparagraphs below and procedures approved in historic treatment program unless otherwise indicated:
 - 1. Retain as much existing material as possible; repair and consolidate rather than replace.
 - 2. Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.
 - 3. Use reversible processes wherever possible.
 - 4. Use historically accurate repair and replacement materials and techniques unless otherwise indicated.
 - 5. Record existing work before each procedure (preconstruction) and progress during the work with digital preconstruction documentation photographs or video recordings.
- F. Notify Engineer of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
 - 1. Do not proceed with the work in question until directed by Engineer.
- G. Where missing features are indicated to be repaired or replaced, provide work with appearance based on accurate duplications rather than on conjecture, subject to approval of Engineer.
- H. Where work requires existing features to be removed or dismantled and reinstalled, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.
- I. Identify new and replacement materials and features with permanent marks hidden in the completed Work to distinguish them from original materials. Record a legend of identification marks and the locations of the items on record Drawings.

HISTORIC TREATMENT PROCEDURES

3.5 HISTORIC TREATMENT SCHEDULE

- A. Spaces, areas, rooms, and surfaces requiring special care and treatment to ensure successful preservation:
- B. Restoration Zones:
 - 1. War Memorial Cloister exterior and Interior
 - 2. Entrance to Lyon Hall from Cloister
 - 3. Entrance to McFaddin Hall from Cloister
- C. Alteration Zone:
 - 1. Utility Tunnel
 - 2. Mechanical spaces within McFaddin Hall and Lyon Hall.

END OF SECTION 01 35 91

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 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).
- 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, pavement cuts and repairs.

1.3 COMPLIANCE

A. The Contractor shall give all notices, pay all fees and comply with all laws, rules and regulations applicable to the Work.

1.4 OWNER'S REQUIREMENTS

- A. The Contractor, Subcontractors, and employees of the Contractor and Subcontractors shall comply with all regulations governing conduct, access to the premises, operation of equipment and systems, and conduct while in or near the premises and shall perform the Work in such a manner as not to unreasonably interrupt or interfere with the conduct of business of the Owner.
- B. Upon completion of the project, the Contractor agrees to provide the Owner with a summary of municipal permit fees paid. This shall include the name of the permits secured, the permit fees paid by the Contractor and a copy of the permit. If no permit fees were required, the Contractor shall so state, in writing, upon completion of the project.

2.0 PRODUCTS – NOT USED

3.0 <u>EXECUTION - NOT USED</u>

END OF SECTION 01 41 00

SECTION 01 42 00 REFERENCES

1.0 GENERAL

1.1 <u>INTENT OF CONTRACT DOCUMENTS</u>

- A. Notes or instructions shown on any one Drawing, apply where applicable, to all other Drawings.
- B. All references to codes, specifications and standards referred to in the Specification Sections and on the Drawings shall mean, and are intended to be, the latest edition, amendment and/or revision of such reference standard in effect as of the date of these Contract Documents.
- C. Install All Work in Compliance with:
 - 1. NYS Uniform Code
 - a. International Building Code
 - b. International Residential Code
 - c. International Existing Building Code
 - d. International Fire Code
 - e. International Plumbing Code
 - f. International Mechanical Code
 - g. International Fuel Gas Code
 - h. International Property Maintenance Code
 - i. Uniform Code Supplement
 - 2. NYS Energy Code
 - a. International Energy Conservation Code
 - b. ASHRAE 90.1
 - c. Energy Code Supplement
 - 3. National Electric Code
 - 4. Occupational Safety and Health Administration (OSHA).
 - 5. Life Safety Code NFPA 101.
 - 6. All local ordinances
 - 7. Plans and Specifications in excess of code requirements and not contrary to same.

1.2 RELATED DOCUMENTS

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

1.3 **DEFINITIONS**

- A. "General": Basic Contract definitions are included in the Conditions of the Contract.
- B. "Contract Documents": The Contract Documents consist of the Agreement between Owner and Contractor, General Conditions, General Requirements, Drawings, Specifications, addenda issued before execution of the Agreement, other documents listed in the Agreement, and modifications issued after execution of the Agreement.
- C. "The Contract": The Contract Documents form the Contract for construction and represent the entire integrated Agreement between the Owner and Contractor.
- D. "The Work": The work comprises the completed construction required by the Contract Documents and includes all labor necessary to produce such construction and all materials and equipment incorporated in such construction.
- E. "Owner": Cornell University a New York corporation.
- F. "Architect/Engineer": The Architect or Engineer is the person lawfully licensed to practice architecture and/or engineering in the state of New York, identified as such in the Owner Contractor Agreement, and is referred to throughout the Contract Documents as if singular in number. The terms Architect and/or Engineer mean the Architect and/or his authorized representative.
- G. "Contractor": The Contractor, person, firm, or corporation with whom the Construction Agreement contract is made by Owner.
- H. "Subcontractor": A person, firm, or corporation, supplying labor and/or materials for work at site of the project for and under separate contract or agreement with Contractor.
- I. "Delegated Design" describes a collaboration between a design professional and contractor (or subcontractor) where the contractor assumes allocated responsibility for an element or portion of the Project's design. Delegated design allocation and assignment may occur in any project delivery method and will involve a licensed professional to perform the design. The Contractor or Subcontractor allocated an element or portion of the Project's design, will submit its engineered, stamped plans to the primary design team, who will check for any conflicts with any other aspect of the Work and make new documents to be included in the Project's design record. Contractor or Subcontractor allocated a delegated design element of the Project shall provide professional liability insurance for the design work in such amounts and as is required by Owner.
- J. "As Approved" or "Approved": Architect's or Owner's approval.
- K. "As Directed": Owner's direction or instruction. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

L. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

- M. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- N. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- O. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- P. "Reinstall". To place back into a former position.
- Q. "Replace". Provide a substitute for.
- R. "Provide": Furnish and install, complete and ready for the intended use.
- S. "Concealed': Work installed in pipe shafts, chases or recesses, behind furred walls, above ceilings, either permanent or removable.
- T. "Exposed": All capital Work not identified as concealed.
- U. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- V. "As-Built Documents": Drawings and other records that are maintained by the Contractor to record all conditions which exist when the building construction is completed. This includes both the elements of the project itself and existing elements that are encountered during the course of project construction.
- W. "Record Drawings": Shows construction changes in the project and the final location of all services, lines, outlets, and connections including underground and concealed items. The "record" drawings shall be compiled by the Architect based on the working as-built drawings and revised in accordance with the marked up drawings submitted by the Contractor.
- X. "Shop Drawings": Drawings, diagrams, illustrations, charts, brochures, and other data that are prepared by Contractor or any Subcontractor, manufacturer, supplier or distributor, for some portion of the work.
- Y. "Samples": Physical examples furnished to illustrate materials, equipment or workmanship, and to establish standards by which the work will be judged.
- Z. "General Conditions": The standardized contractual provisions describing the responsibilities, rights and relationships of the Owner and Contractor under the construction contract.

AA. "Contract Limit Lines": A limit line or perimeter line established on the drawings or elsewhere in the contract documents defining the boundaries of the site available to the contractor for construction purposes.

BB. "to do", "provide", "furnish", "install", etc., in these Specifications or on Drawings are directions given to the Contractor.

1.4 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.

REFERENCES

D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the organizations responsible for the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-6257
	Available from Defense Standardization Program www.dps.dla.mil	
	Available from General Services Administration www.gsa.gov	(202) 619-8925
	Available from National Institute of Building Sciences www.nibs.org	(202) 289-7800
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080

1.6 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(703) 358-2960
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202

CORNELL UNIVERSITY Ithaca, New York		SECTION 01 42 00 REFERENCES	
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664	
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800	
AATCC	American Association of Textile Chemists and Colorists (The) www.aatcc.org	(919) 549-8141	
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888	
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155	
ACI	ACI International (American Concrete Institute) www.aci-int.org	(248) 848-3700	
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216	
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530	
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700	
AGA	American Gas Association www.aga.org	(202) 824-7000	
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118	
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955	
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960	
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300	
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400	
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100	
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559	
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CORNELL UNIVERSITY Ithaca, New York		SECTION 01 42 0 REFERENCE	
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)		
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700	
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150	
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020	
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(505) 522-1437	
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600	
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989	
API	American Petroleum Institute www.api.org	(202) 682-8000	
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800	
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917	
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400	
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170	
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040	
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585	
AWI	Architectural Woodwork Institute www.awinet.org	(800) 449-8811 (703) 733-0600	

CORNELL UNIVERSITY		SECTION 01 42 00	
Ithaca, New Y	York	REFERENCES	
AWPA	American Wood-Preservers' Association www.awpa.com	(334) 874-9800	
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353	
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711	
ВНМА	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122	
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010	
BICSI	BICSI www.bicsi.org	(800) 242-7405 (813) 979-1991	
BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772	
CCC	Carpet Cushion Council www.carpetcushion.org	(203) 637-1312	
CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200	
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700	
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462	
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919	
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137	
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583	
CPA	Composite Panel Association www.pbmdf.com	(301) 670-0604	
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607	
CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176	
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CORNELL UNIVERSITY Ithaca, New York		SECTION 01 42 00 REFERENCES	
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CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200	
CSI	Cast Stone Institute www.caststone.org	(770) 972-3011	
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300	
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700	
CTI	Cooling Technology Institute www.cti.org	(281) 583-4087	
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010	
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500	
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945	
EJCDC	Engineers Joint Contract Documents Committee www.ejdc.org	(703) 295-5000	
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040	
ESD	ESD Association www.esda.org	(315) 339-6937	
FMG	FM Global www.fmglobal.com	(401) 275-3000	
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850	
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0	
GA	Gypsum Association www.gypsum.org	(202) 289-5440	
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208	
GS	Green Seal www.greenseal.org	(202) 872-6400	
WAR MFM	ODIAI DEFEDENCES	01 42 00-9	

CORNELL UNIVERSITY Ithaca, New York		SECTION 01 42 00 REFERENCES
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
НІ	Hydraulic Institute www.pumps.org	(888) 786-7744 (973) 267-9700
НІ	Hydronics Institute www.gamanet.org	(908) 464-8200
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IBR	Institute of Boiler & Radiation Manufacturers	
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
	Available from ANSI www.ansi.org	(202) 293-8020

CORNELL UNIVERSITY Ithaca, New York		SECTION 01 42 00 REFERENCES	
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (702) 567-8150	
ITS	Intertek www.intertek.com	(800) 345-3851 (713) 407-3500	
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11	
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690	
LMA	Laminating Materials Association (Now part of CPA)		
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864 (804) 314-8955	
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333	
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(847) 480-9138	
MFMA	Metal Framing Manufacturers Association www.metalframingmfg.org	(312) 644-6610	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190	
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222	
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937	
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613	
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405	
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6623 (281) 228-6200	
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926	

CORNELL UNIVERSITY Ithaca, New York		SECTION 01 42 00 REFERENCES	
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084	
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848	
NCAA	National Collegiate Athletic Association (The) www.ncaa.org	(317) 917-6222	
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900	
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094	
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-3550	
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698	
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110	
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901	
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200	
NETA	International Electrical Testing Association	(888) 300-6382	
	www.netaworld.org	(303) 697-8441	
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900	
NFPA	NFPA	(800) 344-3555	
	(National Fire Protection Association) www.nfpa.org	(617) 770-3000	
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776	
NGA	National Glass Association	(866) 342-5642	
	www.glass.org	(703) 442-4890	
NHLA	National Hardwood Lumber Association	(800) 933-0318	
	www.natlhardwood.org	(901) 377-1818	
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393	
WAR MEMO	ORIAL REFERENCES	01 42 00-12	

CORNELL UNIVERSITY		SECTION 01 42 00	
Ithaca, New Y	'ork	REFERENCE	
NOFMA	NOFMA: The Wood Flooring Manufacturers Association www.nofma.org	(901) 526-5016	
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070	
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400	
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010	
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788	
NTMA	National Terrazzo & Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930	
NYBFU	New York Board of Fire Underwriters www.nybfu.org	(212) 227-3700	
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300	
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322	
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720	
PGI	PVC Geomembrane Institute http://pgi-tp.ce.uiuc.edu	(217) 333-3929	
PLANET	Professional Landcare Network www.landcarenetwork.org	(800) 395-2522	
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540	
RCSC	Research Council on Structural Connections www.boltcouncil.org	(800) 644-2400 (312) 670-2400	
RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580	
RIS	Redwood Inspection Service www.calredwood.org	(888) 225-7339 (415) 382-0662	

CORNELL UNIVERSITY Ithaca, New York		SECTION 01 42 00 REFERENCES
SAE	SAE International www.sae.org	(877) 606-7323 (724) 776-4841
SBI	Steel Boiler Institute	
SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(516) 294-5424
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(703) 683-2075
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpte.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265

CORNELL UNIVERSITY		SECTION 01 42 00
Ithaca, New Y	ork	REFERENCES
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing, & Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrasssod.org	(847) 649-5555
TRI	Tile Roofing Institute www.tileroofing.org	(312) 670-4177
UFPO	Underground Facilities Protective Organization www.ufpo.org	(800) 962-7962 (800) 962-7811
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USGBC	U.S. Green Building Council www.usgbc.org	(202) 828-7422
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCSC	Window Covering Safety Council www.windowcoverings.org	(800) 506-4636
WDMA	Window & Door Manufacturers Association www.wdma.com	(800) 223-2301
WI	Woodwork Institute www.wicnet.org	(916) 372-9943
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WAR MEMO	RIAL REFERENCES	01 42 00-15

CORNELL	UNIVERSITY	SECTION 01 42 00
Ithaca, New	York	REFERENCES
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930
В.	Code Agencies: Where abbreviations and acronyms are used Contract Documents, they shall mean the recognized name of the list. Names, telephone numbers, and Web sites are subject to chaccurate and up-to-date as of the date of the Contract Documents.	the entities in the following lange and are believed to be
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233 (703) 931-4533
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543
NEC	National Electric Code	
C.	Federal Government Agencies: Where abbreviations and acronyr or other Contract Documents, they shall mean the recognized following list. Names, telephone numbers, and Web sites are believed to be accurate and up-to-date as of the date of the Contract of	name of the entities in the subject to change and are
CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://.dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322

CORNELL UNIVERSITY Ithaca, New York		SECTION 01 42 00 REFERENCES	
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332	
GSA	General Services Administration www.gsa.gov	(800) 488-3111	
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112	
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000	
NCHRP	National Cooperative Highway Research Program (See TRB)		
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478	
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999	
PBS	Public Building Service (See GSA)		
PHS	Office of Public Health and Science www.osophs.dhhs.gov/ophs	(202) 690-7694	
RUS	Rural Utilities Service (See USDA)	(202) 720-9540	
SD	State Department www.state.gov	(202) 647-4000	
TRB	Transportation Research Board www.nas.edu/trb	(202) 334-2934	
USDA	Department of Agriculture www.usda.gov	(202) 720-2791	
USPS	Postal Service www.usps.com	(202) 268-2000	
2.0 <u>PRC</u>	DDUCTS - NOT USED		

2.

EXECUTION - NOT USED 3.0

END OF SECTION 01 42 00

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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 <u>CONTROL OF ON-SITE CONSTRUCTION</u>

- A. Include a control system for the following phases of inspection:
 - 1. <u>Pre-Installation Meeting</u>. 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 01500.
 - 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 01410.
- 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. <u>Preparatory Inspection</u>. 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. <u>Initial Inspection</u>. 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. <u>Follow-up Inspections</u>. 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 e-Builder 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

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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. Concrete Reinforcement: Section 03 20 22.
 - 2. Cast-in-place Concrete: Section 03 30 00.

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**

- Cooperate with laboratory personnel. Provide access to Work, and Manufacturer's A. operations.
- В. 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.
- Furnish copies of Products test reports as required. D.
- 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.
 - When tests or inspections cannot be performed after such notice, reimburse laboratory 1. for personnel and travel expenses incurred due to Contractor's responsibility.
- Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.
- Employ and pay for the services of a separate, equally qualified independent testing H. 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

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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 local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

CORNELL UNIVERSITY

TEMPORARY FACILITIES AND CONTROLS

- 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 in most cases.
 - 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 to local Authority Having Jurisdiction, FM Global, Ithaca Fire Department Officers, Building Manager, Maintenance Manager, and Customer Service.
 - Fire Watch will be required and will need the Fire Watch Person's name and contact information. Cornell EH&S does not perform the fire watch, it is the responsibility of the Contractor.

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, siamese connections, standpipes, temporary fire-protection facilities, stairways, and other access routes for firefighting.
- 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 placed into operation and use.

TEMPORARY FACILITIES AND CONTROLS

8. At earliest feasible date in each area of Project, complete installation of permanent fireprotection 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 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 Environmental Health & Safety.
- F. Advise Cornell University Environmental Health & Safety of any items affecting Life Safety, e.g., 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.

TEMPORARY FACILITIES AND CONTROLS

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

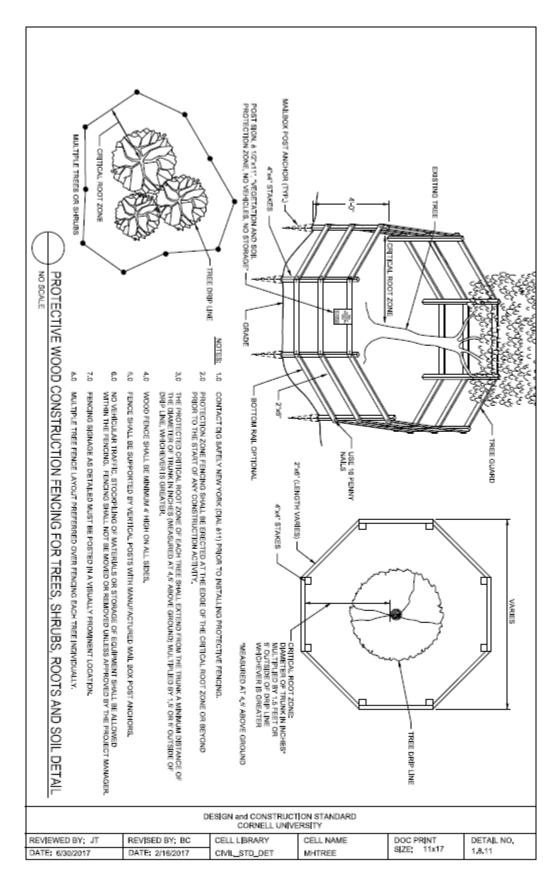
- A. Provide temporary weather-tight enclosure for building exterior, maintain in-place until installation of permanent enclosures. Provide temporary weather-tight enclosure of exterior walls as work progresses for protection of construction, in progress and completed, from exposure, foul weather, other 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.

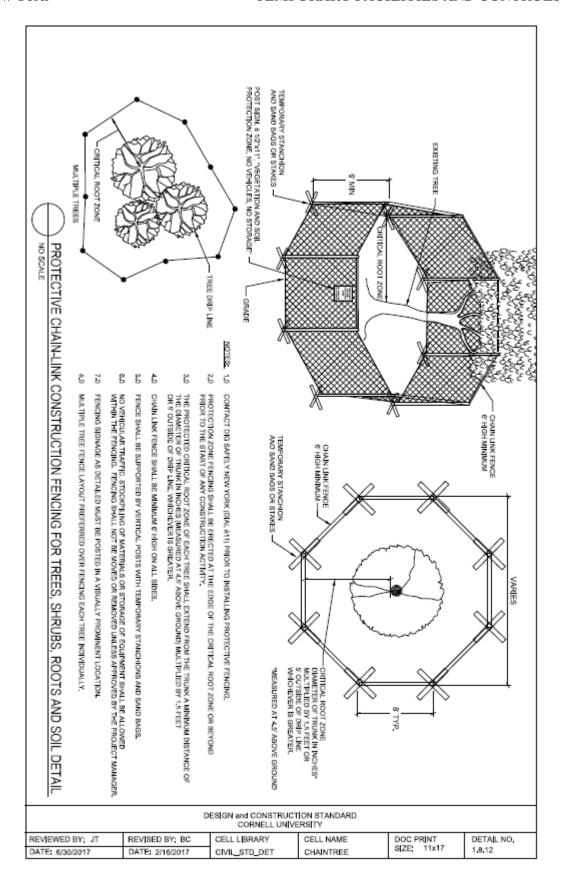
2.7 <u>TEMPORARY WATER CONTROL</u>

- 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.
 - Closed sidewalks need to be indicated with OSHA-approved signs, as well as, proper 2. barricades.
 - 3. Provide flag personnel as necessary to guide vehicles, protect personnel, public and employees.

2.10 **PROJECT IDENTIFICATION AND SIGNS**

- No Contractor signs to be displayed at the project site, unless authorized by the Owner. A.
- Owner Construction Project Sign. The Contractor shall install Owner provided project B. identification signage.

2.11 **SECURITY**

The Contractor shall provide security services as required to protect the interests of the A. Owner.

2.12 **FIELD OFFICES**

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

3.0 **EXECUTION**

3.1 **PREPARATION**

- 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.
 - Designate the locations and extent of temporary construction, storage, and other 1. temporary facilities and controls required for the expeditious accomplishment of the Work.
 - 2. Allow space for use of the site by Owner and by other contractors, as required by Contract Documents.

3.2 **GENERAL**

- A. Comply with applicable requirements specified in sections of Division 02 through 40.
- В. 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.
- Keep the site, at all times during the progress of the Work, free from accumulation of waste F. 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.
- 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**

- Completely remove temporary structures, materials, equipment and services: A.
 - When construction needs can be met by use of permanent construction. 1.
 - 2. At completion of the Project.
- В. 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.
 - Remove foundations and underground installations for temporary construction and 1.
 - Grade the areas of the site affected by temporary installations to required elevations and 2. slopes, and clean the area.

END OF SECTION 01 50 00

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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 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 <u>MATERIALS, GENERAL</u>

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 four (4) 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 HEAT AND VENTILATION

- A. The Contractor shall furnish temporary heat as may be necessary for constructing the Work.
- B. The Contractor will be permitted to use the building's permanent heating system for temporary heat. Permission to use the building's permanent heating system shall in no way constitute the Owner's acceptance of that portion of the Work.

TEMPORARY UTILITIES

- C. When using the permanent building systems for space conditioning, provide a written maintenance plan for acceptance by the Owner's Representative, prior to utilizing the equipment. Plan to address temporary filtering of air and water, sealing of open ducts, lubrication, operation outside of normal ranges, and controls/safeties. Return all equipment to its newly installed condition prior to acceptance testing.
 - 1. If the Contractor elects to use the building's permanent heating system for temporary heat, the Contractor shall provide filters with a minimum MERV of 8 at each returnair grille in system, maintain to keep them free of dust and debris, replace if necessary and remove at end of construction and clean HVAC system as required in Section 01 77 00 Project Closeout.
- D. Any temporary system shall be removed when no longer required.
- E. During heating cycles the enclosures separating the interior building areas from outside shall be maintained closed to conserve heat energy.
- F. The Contractor shall provide for ventilation of all structures until Physical Completion of the Work and shall control such ventilation to avoid excessive moisture levels and rates of drying of construction materials, including but not limited to concrete and to plaster, and to prevent condensation on sensitive surfaces. The Contractor shall be responsible for any moisture intrusion that is detrimental to the Project.

2.4 <u>TEMPORARY CONTRACTOR TELEPHONE SERVICE</u>

- 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. Provide adequate toilet and washing facilities for the use of personnel and employees; locate convenient to work stations.
- B. Existing plumbing facilities shall not be used by construction personnel.
- C. Facilities may be portable chemical-type toilets or temporary flush toilets connected to sanitary sewer, screened for privacy.
- D. Service, clean and maintain facilities and enclosures in a neat, clean and sanitary condition.

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

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SECTION 01 51 23 HEAT DURING CONSTRUCTION

1.0 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall maintain existing or temporary building heating systems to accomplish the following:
 - 1. Protect the existing facility and facility plumbing systems against damage due to cold temperatures.
 - 2. Provide sufficient heat so that the Work can be accomplished in accordance with the Contract Documents.
 - 3. Maintain construction schedules as required by the Contract.
- B. Include in the bid price an amount necessary to provide Construction Heat as required.
- C. Existing central steam systems may be used to the extent that they do not interfere with the safe and effective completion of Work. However, any modifications to existing systems shall be corrected prior to the conclusion of work.
- D. No natural gas is available to the facility for temporary heat.
- E. At the conclusion of the project the facility heating systems shall be returned to functional order as necessary to protect the building and facility plumbing systems.

1.2 **RESPONSIBILITY**

- A. The Contractor shall include in the bid the cost of the temporary heat.
- B. The Contractor shall be responsible for repairs to the facility necessitated by the failure to provide heat during any portion of the Work.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

END OF SECTION 01 51 23

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SECTION 01 57 13 SOIL EROSION AND SEDIMENT CONTROL

1.0 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall be responsible for preparing and implementing an Erosion and Sediment Control Plan.
- B. This Section describes minimum standards for the prevention and control of erosion during the construction process and may not be sufficient for all sites. The Contractor shall remain responsible for the means and methods of preventing erosion and may be required to employ additional means and methods as required to prevent violations of local, state, or federal standards.

1.2 **SUBMITTALS**

- A. Submit an Erosion and Sediment Control Plan, as specified herein.
- B. Refer to Section 01 33 00 Submittal Procedures.

1.3 PLAN AND IMPLEMENTATION GENERAL REQUIREMENTS

- A. Plan shall comply with design specifications in the New York Guidelines for Urban Erosion and Sediment Control, NYS Stormwater Management Design Manual, NYSDEC Technical and Operational Guidance Series, good engineering practices, and this Section.
- B. Erosion and Sediment Control Plan shall be reviewed and approved by the Environmental Health and Safety Office, and implemented prior to any site work.
- C. Maintain Erosion and Sediment Control measures throughout the course of site construction activities until vegetative growth is established to the Owner's satisfaction.
- D. At conclusion of the Project, remove all remaining temporary erosion control structures and properly dispose of accumulated sediment on-site in areas approved by the Owner.

1.4 PERFORMANCE STANDARDS

- A. At no time shall construction operations or any related disturbance of the site result in the impairment of local waterways. "Impairment" is defined by regulations as including, but not limited to, the following:
 - 1. The release of water into receiving waters that causes a substantial visible contrast to natural conditions; or
 - 2. The deposition of significant sediment into such waters.

SOIL EROSION AND SEDIMENT CONTROL

- B. Such deficiencies shall be corrected immediately by the Contractor to prevent further impairment.
- C. In addition, and without notice to the Contractor, the Owner shall also have the right, based on the Owner's independent assessment, to stop work or engage other contractor(s) to construct or correct such work as may be necessary to prevent the impairment of waterways, and to charge all costs related to such corrective or additional actions against the Contract.
- D. Acceptance of an Erosion and Sediment Control plan shall not in any way imply that the plan will be adequate in preventing impairment of waters, or that maintenance and modification will not be necessary. Rather, acceptance of the plan authorizes the Contractor to begin installation of the control measures under the assumption the appropriate maintenance and modification will be required throughout the life of the project to meet the project requirements.
- E. The Contractor's responsibilities under this Section shall end upon final completion and payment of the Work of the entire Contract.

1.5 EROSION AND SEDIMENT CONTROL PLAN COMPONENTS

- A. The Erosion and Sediment Control Plan submitted shall specifically address project measures, features, and areas critical to proper site erosion and sediment control. The Plan shall specifically include, but are not limited to, the following:
 - 1. Site Map, to scale;
 - 2. Measures to prevent stormwater from running onto the disturbed areas of the site;
 - 3. Inlet protection for storm sewers and catch basins;
 - 4. Measures to be used for dewatering; and
 - 5. Measures to be used for soil stabilization, runoff control, and sediment control, including specific measures for the following:
 - a. Site entrance stabilization
 - b. Staging areas
 - c. Material and soil stock piles
 - d. Concrete curing operations
 - e. Disturbed areas of the site

In addition to the requirements included in these specifications, specific erosion control measures shown on the Contract Drawings, if any, shall also be required.

B. All features shall be designed and installed in accordance with the references included in Paragraph 1.3 – Plan and Implementation General Requirements of this Section.

SOIL EROSION AND SEDIMENT CONTROL

C. Keep access roads and public roads clear of mud and construction debris at all times. Maintain dust control measures throughout construction.

1.6 <u>INSPECTIONS</u>

- A. At the sole discretion of the Owner, inspections may be performed by a third party or on-staff representative of the Owner.
 - 1. The Owner may inspect the site at any time, without prior notification, for compliance with the Erosion and Sediment Control Plan and applicable local, state and federal regulations. Any instances of non-compliances or failure to meet the performance standards found must be resolved within 24 hours, with more immediate responses as required to mitigate active erosion during storm events or similar instances.
 - 2. Modify the Erosion and Sediment Control Plan as necessary, to provide full compliance with the performance standards.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

END OF SECTION 01 57 13

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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 insure 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 <u>CAMPUS SITE / PALM ROAD STORAGE</u>

- A. All property including construction materials and equipment stored at the Palm Road 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 Palm Road 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 Palm Road 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 Palm Road 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 Palm Road 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.

STORAGE AND PROTECTION

H. Unoccupied storage containers not within the project fence shall be labeled in the Cornell standard. Signs customized for the project shall be ordered from Ithaca Plastics, Inc., 305 West Green Street, Ithaca, New York 14850, Phone - 607.272.8232, Fax - 607.277.2579, Email – db@ithacaplastics.com.

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 window sills 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.

STORAGE AND PROTECTION

- 2. HVAC ductwork shall be protected by the Contractor as follows to prevent introduction of contaminants:
 - a. Ductwork with interior lining 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 <u>EXECUTION NOT USED</u>

END OF SECTION 01 66 00

SECTION 01 71 23 FIELD ENGINEERING

1.0 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall provide and pay for field engineering services required for the Project.
 - 1. Survey work required in execution of the Project.
 - 2. Verify grades, lines, levels and dimensions shown on Drawings.
 - 3. Lay out Work from established control points and bench marks.
 - 4. Coordinate the Work of all trades.
 - 5. It may be necessary at times to discontinue portions of Contractor's work in order that the Owner's Representative may check measurements or surveys without interruptions or other interferences that might impair the accuracy of the results. At any time, on request of the Owner's Representative, Contractor shall discontinue its work to such extent as may be necessary for this purpose and shall cooperate in all reasonable means to the extent of providing labor, tools, or materials to assist the Owner's Representative in making measurements and surveys.
 - 6. Notwithstanding anything set forth above, it shall be the sole responsibility of the Contractor to complete the works within the tolerances of lines and grades as given on the drawings. No direct payment or claim for additional compensation will be allowed the Contractor for any work or delay occasioned by the Owner's Representative establishing or checking lines or grades or making other measurements, and no extension of time will be allowed for such delays.
- B. Owner's Representative will identify existing control points and property line corner stakes indicated on the drawings, as required.

1.2 QUALIFICATION OF SURVEYOR

A. The Surveyor shall be a registered civil engineer or registered land surveyor, licensed in the state in which the Project is located and acceptable to the Owner.

1.3 SURVEY REFERENCE POINTS

- A. Basic horizontal and vertical control points for the Project are those designated on drawings.
- B. Locate and protect control points prior to occupation of the site, and preserve all reference points during construction.
 - 1. Make no changes or relocations without prior written approval of the Architect and Owner.

- 2. Report to Owner when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- 3. Require surveyor to replace reference points which may be lost or destroyed.
 - a. Establish replacements based on original survey control.
- C. The Contractor shall provide and shall maintain axis lines on each floor and shall establish and shall maintain grade marks 4' 0" above the finished floor on each floor level.
- D. The Contractor shall furnish such stakes and other required equipment, tools and materials, and all labor as may be required in laying out any part of the Work.

1.4 **PROJECT SURVEY REQUIREMENTS**

- A. Prior to start of construction operations, review and verify figures shown on Drawings and on surveys furnished by Owner.
- B. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means for site improvements, stakes for grading, fill and topsoil replacement, utility slopes and invert elevations, batter boards for structures, foundations, column locations and floor levels, and controlling lines and levels required for the mechanical and electrical trades.
- C. From time to time, verify layouts by the same methods.

1.5 RECORDS

- A. Maintain a complete, accurate log of all control and survey work as it progresses.
 - 1. Make available to Architect and Owner on request: field books, notes, logs and other data developed in performing survey and control work.
 - 2. Maintain a record plan at field office for the information and use of all parties, recording reference points, control points and bench marks.
- B. On completion of foundations and major site improvements, prepare a certified survey showing all dimensions, locations, angles and elevations of construction and turn over to Owner. Submit copies of certified survey in accordance with Section 01 78 39 Record Documents
- C. When all enclosing walls are complete, certify the location and plumb of the walls.

1.6 SUBMITTALS

- A. Submit written qualifications of surveyor to Architect and Owner prior to starting survey work.
- B. Submit name and address of Professional Engineer to the Architect.
- C. Submit documentation to verify accuracy of field engineering work.

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FIELD ENGINEERING

- D. Submit certificate signed by registered engineer or registered surveyor certifying that elevations and improvements are in conformance, or nonconformance, with Contract Documents.
 - 1. Indicate on record drawings all variations from Contract Drawings.
 - 2. Indicate horizontal locations and elevations of all existing underground utilities encountered during excavation and construction.
- 2.0 PRODUCTS NOT USED
- 3.0 <u>EXECUTION NOT USED</u>

END OF SECTION 01 71 23

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SECTION 01 73 29 CUTTING, PATCHING AND REPAIRING

1.0 **GENERAL**

1.1 **DESCRIPTION**

- The Contractor shall be responsible for all cutting, fitting and patching, including excavation and backfill, required to complete the Work or to:
 - 1. Make its 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.
- В. 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.
- Do not cut or otherwise alter the work of the Owner except with the written consent of the D. 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
 - Build openings, including but not limited to channels, chases and flues as required to 1. complete the Work as set forth in the Contract.
 - After installation and completion of any work for which openings have been provided, 2. build in, over, and around and finish all such openings as required to complete the Work.
 - Furnish and install all sleeves, inserts, hangers and supports required for the execution 3. 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

CUTTING, PATCHING AND REPAIRING

- 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 in 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.

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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 <u>MATERIALS</u>

- 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 <u>INSPECTION</u>

- 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.

CUTTING, PATCHING AND REPAIRING

- 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 evenplane 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.

CUTTING, PATCHING AND REPAIRING

- 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 <u>CLEANING</u>

- 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

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SECTION 01 77 00 PROJECT CLOSEOUT

1.0 GENERAL

1.1 <u>INSPECTIONS</u>

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. The Architect shall prepare a Certificate of Substantial Completion, on the basis of an inspection, when the Architect has determined that the work is substantially complete.
- 3. 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.
- 4. 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.
 - 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.
- 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.
 - Organize list of spaces in sequential order, starting with exterior areas first and
 proceeding from lowest floor to highest floor, listing by room or space number.
 Organize items applying to each space by major element, including categories for
 individual exterior face elevations, ceilings, individual walls, floors, doors, roof levels,
 casework, equipment, and building systems.
- B. Contractor's Certified List of Completed Items: Final signed punch list submittal at Final Completion.
- C. Certificates of Release: Occupancy permits from authorities having jurisdiction.

1.3 FINAL CLEAN UP

- A. Upon completion of the work covered by the Contract the Contractor shall leave the completed Project ready for use and occupancy without the need of further cleaning of any kind and with all Work in new condition and in perfect order. In addition, upon completion of all Work the Contractor shall remove from the vicinity of the Work all plant, buildings, rubbish, unused materials, concrete forms and other materials belonging to him or used under its direction during construction or impairing the use or appearance of the property and shall restore such areas affected by the work to their original condition, and, in the event of its failure to do so, the same shall be removed by the Owner at the expense of the Contractor, and the Contractor and/or its surety shall be liable therefore. Final clean-up shall include but not be limited to the following:
 - 1. All finished surfaces shall be swept, dusted, washed and polished. This includes cleaning of the Work of all finishing trades where needed, whether or not cleaning by such trades is included in their respective sections of the specifications.
 - 2. Roofs, utility tunnels, manholes and pipe trenches and spaces between the new and existing Work shall be left thoroughly cleaned.
 - 3. Finished flooring shall be thoroughly cleaned in accordance with the manufacturer's recommendations.
 - 4. Where the finish of floors has been marred or damaged in any space or area, the entire floor of that space or area shall be refinished as recommended by the manufacturers of the flooring.
 - 5. All equipment shall be in an undamaged, bright, clean, polished and new appearing condition.
 - 6. All new glass shall be washed and polished, both sides. The Contractor shall be responsible for all breakage of glass in the area of the Work from the commencement of its activities until the building is turned over to Owner. The Contractor shall replace all broken glass and deliver the entire building with all glazing intact and clean.
 - 7. Provide new filters for all fan convectors after final cleaning.
 - 8. Refer to exterior clean up. Remove paint and glazing compound from surfaces.
- B. Clean adjacent structures and improvements of dust, dirt, and debris caused by construction operations. Return adjacent areas to condition existing before construction operations began.
- C. Cleaning of Renovated Duct Systems and Existing Duct Systems in Renovated Areas:
 - 1. Cleaning work shall be performed by firm which has minimum three (3) years' experience in mechanical cleaning of air systems. Work shall be done by skilled mechanics, technicians and experienced supervisors.
 - 2. Clean dirt, dust and debris from air units, associated equipment air ducts; sanitize same. Cleaning shall include:
 - a. Cleaning of air unit's supply, return and exhaust sections including coils, fans, filter racks, outdoor air intake shaft, and interior surfaces.

- b. Cleaning of dampers, heating coils, humidifiers, and similar devices in ductwork.
- c. Marking of duct-mounted damper settings, prior to cleaning, and returning dampers to marked positions after cleaning. This includes fire dampers, zone dampers, balancing dampers and volume dampers.
- d. Cleaning of terminal supply, return and exhaust grilles, registers and diffusers.
- e. Cutting of access holes in ductwork for cleaning process, as well as sealing and patching of same.
- f. Removal of portions of duct system which cannot otherwise be thoroughly cleaned, and replacement thereof.
- g. Sealing of lined duct systems, upon completion.
- h. Removal and reinstallation of ceiling panels, tiles, ceiling support tracks, and other ceiling construction, as required to facilitate cleaning.
- i. Providing access doors required to facilitate cleaning.
- 3. Cleaning shall meet National Air Duct Cleaners Association (NADCA) Standards, capable of verification by NADCA Vacuum Test. Cleanliness shall be subject to Architect's visual review; provide re-cleaning as necessary to satisfy Architect
 - a. Cleaning methods may include vacuuming, brushing, mechanical brushing, scraping, or air washing. Use method best suited for locations involved.
 - b. Do NOT use methods which could damage the system or the building.
 - c. Remove dirt, dust, lint and other accumulations by HEPA filtered air machine capable of minimum 6000 cfm. Air machine shall operate to obtain 1250 fpm across the work space. Use brushes, mechanical agitators or air whips to dislodge contaminants to be collected by the air machine.
 - d. Cleaning shall begin at the furthest point of the return system and at the outdoor air intake. Cleaning shall proceed toward the air handling equipment. Cleaning shall finish at the furthest point of the supply ductwork.

1.4 MAINTENANCE STOCK

A. Turn over to Owner's Representative the maintenance stock specified. Contractor shall obtain signed receipt from Owner's Representative for all maintenance stock.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

END OF SECTION 01 77 00

SECTION 01 78 22 FIXED EQUIPMENT INVENTORY

1.0 **GENERAL**

1.1 **FIXED EQUIPMENT INVENTORY**

- The Owner shall provide the Contractor with a list of Equipment Types to be inventoried and A. an Excel template.
- The Contractor shall populate the template (see Example Equipment List to be inventoried in В. Section 1.2). Once populated, the Contractor shall electronically return to the list to the Owner's Representative. The initial data to be captured on each piece of equipment shall include:
 - 1. Name of Product
 - 2. **Equipment Classification**
 - 3. Manufacturer
 - 4. Model Number
 - 5. Serial Number
 - 6. Cost
 - 7. Location (including Building and Room Number)
 - 8. Acquisition Date (Date of Installation)
- The Owner shall from the Contractor provided data create a follow-up equipment Excel C. template that contains the MAXIMO ID for the equipment with all the name plate and specification fields for each type of equipment. This template shall then be returned to the Contractor.
- D. The Contractor shall be responsible for the initial labeling of the equipment and its' disconnects with the MAXIMO ID using an electronic label maker. ID labels shall be in close proximity to Equipment Identification information, visually locatable from the access point to the equipment and on the face of disconnects.
- The Contractor shall then populate the MAXIMO Equipment Specification Template with the equipment nameplate, specification information, and warranty information. Contractor shall electronically submit the equipment data and any related documentation (i.e. - O&M manuals) to the Owner's Representative.

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FIXED EQUIPMENT INVENTORY

F. EXAMPLE EQUIPMENT LIST

- Building Equipment
- AC Drive/VSD
- Air Dryer
- Backflow Preventor
- Air Compressor
 - Building
 - Sprinkler
 - Control
 - Vacuum
- Pump
 - Condensate
 - Glycol
 - CWC
 - HWC
 - Potable
 - Sanitary Sewer
 - Storm Sewer
 - Sump
 - Quality Water
 - Fuel
- Fan
 - Exhaust
 - Supply
 - Return
- Fume Hood
- Furnace
- Generator
- Hot Water Heater
- Heat Exchangers
- Boiler
- Tank
- Unit Heater
- Fan Coil
- VAV Box
- Transfer Switch
- Motor
 - Pump
 - Fan
- Lift/Levelers
- Water Softener
- Reverse Osmosis

1.2 ROOF SYSTEM INVENTORY

- A. The Owner shall provide the Contractor with a list of Roof System Attributes to be inventoried in an Excel template.
- B. The Contractor shall provide a dimensioned roof plan of the facility drawn to scale, Auto CAD or Microstation format. Each roof panel of the roof system is to be labeled with a unique ROOF ID number that will reference the Excel template to properly inventory Roof System Attributes of each panel. Once populated, the Contractor shall electronically return to the drawings to the Owner's Representative for review and approval.
 - 1. Entire Roof Replacement Projects for a Facility: The Contractor is to assign a ROOF ID to each panel of the newly installed roofing system. The ROOF ID will be comprised of the unique Cornell Facility Code number followed by an underscore and a three digit number. (i.e. Day Hall (Facility Code: 2026) ROOF ID: 2006 001).
 - 2. Partial Roof Replacement Projects for a Facility: The Owner will provide a graphically representation of the facility's roof plan with the ROOF ID numbers already assigned to each panel of the roof. The Contractor is responsible to transfer the assigned ROOF ID numbers to their new drawings to be returned to the Owner's representatives.
- C. The Contractor shall populate the template. Once populated, the Contractor shall electronically return the list to the Owner's Representative. The initial data to be captured on each panel of the newly installed roof system shall include:
 - 1. Roof Classification
 - 2. Manufacturer (If applicable)
 - 3. Description of System
 - 4. Roof Material
 - 5. Installation Type
 - 6. Slope of Roof (Low or Steep)
 - 7. Roof ID (See Section 1.1.B) for additional information
 - 8. Area of Roof Panel (SF)
 - 9. Contractor (Installer of Roof System)
 - 10. Warranty Number (If applicable)
 - 11. Warranty Expiration Date (If applicable)
 - 12. Material Warranty Number (If applicable)
 - 13. Material Warranty Expiration Date (If applicable)
 - 14. Asbestos Present (If any material remained in place during the reroofing project)

FIXED EQUIPMENT INVENTORY

- 15. Insulation (Yes or No), Fastening type, Thickness
- 16. Flashing Material
- 17. Gutter Type (If applicable)
- 18. Downspout Type (If applicable)
- 19. Roof Drain Type (If Applicable)
- 20. Roofing Substrate
- 21. Facility (State or Endowed)
- 22. Vapor Barrier Type
- 23. Installation Date
- 24. Cost per Square Foot
- 25. Remaining Useful Life (RUL)
- 26. Type of Heat Trace Element (If applicable)
- 27. Type Snow Guard Systems (If applicable)
- 28. Additional Comments as Applicable
- D. The Contractor shall electronically submit the Roof System data as specified above and any related documentation (i.e. O&M manuals and Warranty data) to the Owner's Representative.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION – NOT USED

END OF SECTION 01 78 22

SECTION 01 78 23 OPERATING AND MAINTENANCE DATA

1.0 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract.
 - 1. Prepare operating and maintenance data as specified in this Section, as referenced in other pertinent sections of Specifications and as necessary to operate the completed work.
 - 2. Operations and maintenance data, in final format, shall be available to the Owner prior to substantial completion.
- B. Instruct Owner's personnel in the maintenance of products and in the operation of equipment and systems.

1.2 FORM OF SUBMITTALS

- A. Prepare data in the form of an instructional manual for use by Owner's personnel.
- B. Submit a CD with electronic .pdf files, 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 fly-leaf 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. Submit electronic .pdf files, 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. Submit electronic .pdf files, 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 thirty (30) calendar days after approved submittals.
- B. Submit completed data in final form twenty (20) calendar days prior the Acceptance Phase of the Project.
- C. Submit specified number of copies of approved data in final form prior to final acceptance.

1.7 INSTRUCTIONS OF OWNER'S PERSONNEL

- A. Prior to final inspections or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and systems:
 - 1. Instruction time shall be sufficient to fully instruct all shifts of the Owner's operating and maintenance personnel.
- B. Operations and maintenance shall constitute the basis of instruction:
 - 1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.
- C. Submit typewritten statement, signed by each of Owner's Representatives who have been instructed, describing:
 - 1. Method of Instruction.
 - 2. Equipment and Systems Operated.
 - 3. Length of Instruction Period.

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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. List under clear plastic (1/8" thick) 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 <u>EXECUTION - NOT USED</u>

END OF SECTION 01 78 23

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SECTION 01 78 36 WARRANTIES AND BONDS

1.0 GENERAL

1.1 DESCRIPTION

The Contractor shall:

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Co-execute submittals when so specified.
- D. Review submittals to verify compliance with Contract Documents.
- E. Submit to Architect for transmittal to Owner.

1.2 SUMMARY

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.
 - 2. General closeout requirements are included in Section 01 77 00 "Project Closeout."
 - 3. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Divisions 2 through 40.
 - 4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 **DEFINITIONS**

A. Standard Product Warranties are pre-printed written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner

1.4 QUALITY ASSURANCE

- A. Use adequate care and diligence to review Contract Documents to identify detailed requirements relating to warranties and bonds.
- B. Verify that each item required for this submittal conforms with specified requirements.

1.5 WARRANTY REQUIREMENTS

- A. In addition to standard and special warranties described in Divisions 2 through 40, Contractor shall warrant Work included in this project, for a minimum period of one (1) year following acceptance of a Certificate of Substantial Completion by Owner, to cover performance, materials, workmanship and compliance with Contract Documents.
- B. Corrective Work: Provide service within thirty (30) calendar days when requested by Owner. Perform services during normal working hours, unless specifically directed otherwise by Owner. Coordinate with Owner's representative to schedule performance of corrective work. Where designated service providers cannot perform corrective work within the Owner's required time frame, engage another qualified service provider. Submit a written statement to Owner upon completion of corrective work; document work performed and list outstanding items, if any.
 - 1. When a completed breakdown of a piece of equipment occurs of the malfunction of a system affects the environment or program involving 50 or more persons at a time (employees and students combined), or creates a safety or security risk to the Owner, an EMERGENCY may be declared by the Owner. The Owner may declare an emergency as defined above at which time the service response must be within 4 hours and may require action during non-normal working hours.
 - 2. When an emergency condition occurs, the Owner may take immediate corrective action to relieve the problem by making, a minimum as possible, temporary adjustments and/or repairs when necessary to decrease the problem until the designated Contractor's representative can respond. These temporary adjustments and repairs will in no way jeopardize the existing warranty.
 - 3. The Owner's service staff will advise the Contractor's Representative of all temporary adjustments and repairs done in relation to the malfunctioning equipment or facility.
 - 4. If the Contractor fails to respond with actual service within four (4) hours, and/or the necessary repairs or adjustments are not satisfactorily complete twenty-four (24) hours, the Owner will have the authority to make the necessary repairs or adjustments and charge the Contractor for parts and labor.
 - 5. If all adjustments and repairs done by the Owner in relation to the above conditions are done by authorized district personnel, there will be no negative effect of future warranty claims.

- C. Related Damages and Losses: When correcting failed or damaged warranted Work, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- D. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- E. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- F. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- G. Contractor's Procurement Obligations: Do not purchase, subcontract for, or allow others to purchase or subcontract for materials or units of Work for Project where a special project guaranty, specified product warranty, certification, or similar commitment is required until it has been determined that entities required to sign or countersign such commitments are willing to do so.
- H. Specific Warranty. Where a special warranty, certification, or similar commitment is required on such Work or part of the Work, the Owner reserves the right to refuse to accept the Work until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.6 <u>SUBMITTAL REQUIREMENTS</u>

- 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 <u>SUBMITTALS REQUIRED</u>

A. Submit warranties, bonds, and service and maintenance contracts as specified in the respective sections of Specifications. Submit a schedule listing all required warranties.

2.0 PRODUCTS – NOT USED

3.0 <u>EXECUTION</u>

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 <u>TIME OF SUBMITTALS</u>

- A. Make final submittals within ten (10) days after Date of Substantial Completion, prior to final request for payment.
- B. For items of work when acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within ten (10) days after acceptance, listing the date of acceptance as the start of the warranty period.

3.3 ROOF WARRANTY PACKAGE

- A. Roof warranties shall explicitly denote the specific roof panel identification number (ROOF ID) for which the warranty applies to.
- B. Roof panel identification numbers shall be generated in accordance with 01 78 22, FIXED EQUIPMENT INVENTORY.
- C. Roof warranties shall include a dimensioned roof plan with roof panel identification numbers generated in accordance with 01 78 22, FIXED EQUIPMENT INVENTORY.

END OF SECTION 01 78 36

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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 Data Filing Format of the Uniform Construction Index.
- 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 <u>RECORDING</u>

- A. Label each document "AS BUILT" in neat large printed letters.
- B. Record information concurrently with construction progress.
 - 1. Do not conceal any work until required information is recorded.

C. Drawings

As built drawings shall consist of making any changes neatly and clearly on the Contract Drawings using colored ink or pencil, shall be kept current by the contractor on a day-to-day basis in concert with the progress of the work. Where applicable, the change marked on a drawing is to carry the notation "per Change Order No. X", or similar reference which cites the reason for the change. As an alternative approach the Contractor can submit a plan for producing the "As-Built" drawings via electronic mark-up in Bluebeam, Adobe Professional, or other similar program as an alternative to colored pencil or ink mark-ups. Such plan shall be subject to approval of the Owner.

The day-to-day construction as built drawings shall be made available to the Architect or Owner's Representative for review upon request. The "As built" drawings shall show all changes to the following areas of construction:

1. Architectural:

- a. Modifications to components dictated by the building code
- b. Wall, door, window locations
- c. Built in casework locations
- d. New rated door and wall schedules/ locations
- e. Material and products where submittals are requested

2. Civil and Structural

- a. Dimensions for load carrying elements, both horizontal and vertical
- b. Materials and products where submittals are requested
- c. Load carrying elements and foundation systems
- d. Site related elements including:
 - Building outlines, entranceways, areaways, roof overhangs, downspouts, significant architectural projections and other pertinent data.
- e. All significant changes in foundations, columns, beams, openings, concrete reinforcing, lintels, concealed anchorages and "knock-out" panels made during construction.
- f. Building envelope systems including roofing systems and building shell systems
- g. Geotechnical subsurface information
- h. Items that will require future maintenance.
- i. Life safety critical items

3. Mechanical (HVAC, Plumbing and Fire Protection)

- a. Products where submittals are requested.
- b. Final locations of all equipment.
- c. Final sizes and materials of piping and ductwork.
- d. Final locations of inaccessible piping and ductwork.
- e. Final locations of all controls equipment, including all sensors and actuators.
- f. Final locations of all valves and dampers, including all shutoff valves, balance dampers and fire dampers.
- g. Location of access doors for all equipment in concealed locations.
- h. Final location and arrangement of all mechanical equipment and concealed gas, sprinkler, domestic, sanitary and drainage systems piping and other plumbing, including, but not limited to, supply and circulating mains, principal valves, meters, clean-outs, drains, pumps and controls, vent stacks, sanitary and storm water drainage.

4. Electrical

- a. Products where submittals were requested.
- b. Circuit (wire and raceway) size, number, and type.
- c. Main circuit pathways for Fire Alarm, Emergency Power, and Access Control/Security systems.
- d. Final locations of equipment and devices, interior and exterior luminaires, and power supplies.
- e. Final location of electric signal system panels, final arrangement of all circuits and any significant changes made in electrical signal system design as a result of Change Order or job conditions.

5. Environmental

- a. Utility related elements and supporting infrastructure
- b. Location of unusual excavation findings / contaminated soil (i.e. mercury uncovered during excavation, also on-site spills during construction), including quantity excavated/disposed.

D. Specifications and Addenda

Legibly mark each section to record:

1. Manufacturer, trade name, catalog number, and Supplier of each product and item of equipment actually installed.

2. Changes made by Field Order or by Change Order.

1.4 **SUBMITTAL**

- A. At Contract close-out, deliver copies of all record documents to the Owner's Representative.
- B. Accompany submittal with transmittal letter in duplicate, containing:
 - 1. Date
 - 2. Project title and number
 - 3. Contractor's name and address
 - 4. Title and number of each record document
 - 5. Certification that each document is complete and accurate
 - 6. Signature of Contractor or its authorized representative.

2.0 PRODUCTS – NOT USED

3.0 <u>EXECUTION - NOT USED</u>

END OF SECTION 01 78 39

TECHNICAL SPECIFICATIONS

FOR

WAR MEMORIAL PHASE 2 - RESTORATION

CORNELL UNIVERSITY ITHACA, NEW YORK

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SECTION 024119 - SELECTIVE DEMOLITION

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. Demolition and removal of selected portions of building or structure.
- 2. Demolition and removal of selected site elements.

B. Related Requirements:

- 1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
- 2. Section 013591 "Historic Treatment Procedures" for specific requirements for work within historic structures.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

- B. Historic items, objects including, but not limited to, commemorative plaques and tablets, and other items of interest or value to Owner that are dismantled or may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review procedure and sequence for selective demolition of concrete service tunnel ceiling/floor.
 - 4. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 5. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 6. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Engineering Survey: Submit engineering survey of condition of building.
- C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property for dust and noise control. Indicate proposed locations and construction of barriers.
- D. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - 2. Interruption of utility services. Provide written narrative of shut off dates and duration of outages for each service impacted by the project.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of stairs within McFaddin Hall and Lyon Hall.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- E. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces that might be misconstrued as damage caused by demolition operations.
- F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD 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.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Before selective demolition, Owner will remove the following items:
 - a. Miscellaneous items stored in utility tunnel.
- C. Notify Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is expected that hazardous materials will be encountered in the Work at the low slope roof area.
 - 1. Hazardous materials other than roofing flashing and patching will be removed by Owner before start of the Work.
 - 2. If suspected hazardous materials are encountered in other locations, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.
- F. Storage or sale of removed items or materials on-site is not permitted.
- G. 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.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

- 1. Establish existing warranties with Cornell University at preconstruction.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.11 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations. Perform selective demolition and dismantling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
 - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - c. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - d. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - e. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

3.4 PROTECTION

- A. Temporary Protection: 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. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Protect historic doors and frames.

- 5. Cover and protect furniture, furnishings, and equipment that have not been removed.
- 6. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 013591 "Historic Treatment Procedures".
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

- 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. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 5. Maintain fire watch during and for at least 4 hours after flame-cutting operations.
 - 6. Maintain adequate ventilation when using cutting torches.
 - 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 10. Dispose of demolished items and materials promptly.
- B. 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.
- C. Work in Historic Areas: Selective demolition may be performed only in areas of Project that are not designated as historic. In historic spaces, areas, and rooms, or on historic surfaces, the terms "demolish" or "remove" shall mean historic "removal" or "dismantling" as specified in Section 013591 "Historic Treatment Procedures."
- D. Removed and Salvaged Items:

- 1. Clean salvaged items.
- 2. Pack or crate items after cleaning. Identify contents of containers.
- 3. Store items in a secure area until delivery to Owner.
- 4. Transport items to Owner's storage area designated by Owner.
- 5. Protect items from damage during transport and storage.

E. Removed and Reinstalled Items:

- 1. Clean and repair items to functional condition adequate for intended reuse.
- 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
- 3. Protect items from damage during transport and storage.
- 4. Reinstall items in 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.
- F. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections as indicated. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- C. Reinforced Concrete Slab: Saw-cut small sections of concrete and control drop onto demolition shield located in ceiling below as not to damage shield or impact service tunnel below. Remove concrete slab from top. Removal through service tunnel is not permitted.
- D. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 075600 "Fluid Applied Roofing Gutter" and Section 073126 "Slate Shingles" for new roofing requirements.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and recycle and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

- 4. Comply with requirements of agencies having jurisdiction and Cornell University's requirements for disposal.
- B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. 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 024119

SECTION 024296 - HISTORIC REMOVAL AND DISMANTLING

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 historic treatment procedures in the form of special types of selective demolition work for designated historic spaces, areas, rooms, and surfaces and the following specific work:
 - 1. Removal and dismantling of indicated portions of building or structure and debris hauling.
 - 2. Removal and dismantling of indicated site elements and debris hauling.
 - 3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

- 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.
- 2. Section 024119 "Selective Demolition" for general selective demolition requirements.

1.3 DEFINITIONS

- A. Dismantle: To disassemble or detach a historic item from a surface, or a non-historic item from a historic surface, using gentle methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- B. Existing to Remain: Existing items that are not to be removed or dismantled, except to the degree indicated for performing required Work.
- C. Remove: To take down or detach a non-historic item located within a historic space, area, or room, using methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- D. Retain: To keep existing items that are not to be removed or dismantled.
- E. Salvage: To protect removed or dismantled items and deliver them to Owner or store ready for reuse.

1.4 PRECONSTRUCTION MEETINGS

A. Preconstruction Conference(s): Conduct conference(s) at Project site.

- 1. Review minutes of Preliminary Historic Treatment Conference that pertain to removal and dismantling procedures and protection of historic areas and surfaces.
- 2. Review list of items indicated to be salvaged.
- 3. Verify qualifications of personnel assigned to perform removal and dismantling.
- 4. Inspect and discuss condition of each construction type to be removed or dismantled.
- 5. Review requirements of other work that depends on condition of substrates exposed by removal and dismantling work.
- 6. Review methods and procedures related to removal and dismantling work, including, but not limited to, the following:
 - a. Historic removal and dismantling specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Fire prevention.
 - d. Coordination with building occupants.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic removal and dismantling specialist.
 - 1. For slate dismantling, slate construction firm qualifications are sufficient, and no additional qualifications are required.
- B. Preconstruction Documentation: Show pre-existing conditions of adjoining construction and site improvements including finish surfaces that might be misconstrued as damage caused by Contractor's removal and dismantling operations.
- C. Removal and Dismantling Historic Treatment Program: Submit 15 days before work begins.
- D. List of Items Indicated to Be Salvaged: Prepare a list of items indicated on Drawings to be salvaged for Owner's use or for reinstallation. Submit 15 days before preconstruction conference.
- E. Inventory of Salvaged Items: After removal or dismantling work is complete, submit a list of items that have been salvaged.
 - 1. Include item description, item condition, number of items if more than one of a type, and tag number. Include photo of item in original location.
 - 2. As work proceeds, include on the inventory items that were indicated to be salvaged and items of historic importance discovered during the work. Document reasons, if any, why an item indicated to be salvaged was not salvaged.

1.6 QUALITY ASSURANCE

- A. Historic Removal and Dismantling Specialist Qualifications: A qualified historic treatment specialist. General selective demolition experience is insufficient experience for historic removal and dismantling work.
- B. Removal and Dismantling Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of removal and dismantling work, including protection of surrounding and substrate materials and Project site.

- 1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
- 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- C. Mockups: Prepare mockups of specific historic removal and dismantling procedures specified in this Section to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Typical Dismantling Work Mockups. Dismantle:
 - a. One (1) exterior historic light fixture.
 - b. One (1) staircase granite tread.
 - c. One (1) inscribed stone floor unit.
 - d. One (1) stair tread adjacent to either McFaddin or Lyon Hall entrances.
 - e. One (1) dedication plaque.
 - f. One (1) item of stone within the wall assembly scheduled for replacement.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
- D. Regulatory Requirements: Comply with notification regulations of authorities having jurisdiction before beginning removal and dismantling work. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.7 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Engineer of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials are not anticipated.
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Owner will remove hazardous materials under a separate contract.
 - a. In the case of asbestos, stop work in the area of potential hazard, shut off fans and other air handlers ventilating the area, and rope off area until the questionable material is identified. Reassign workers to continue work in unaffected areas. Resume work in the area of concern after safe working conditions are verified.
- D. Storage or sale of removed or dismantled items on-site is not permitted unless otherwise indicated.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT SPECIALISTS

A. Historic Removal and Dismantling Specialist Firms: Subject to compliance with requirements, perform dismantling of historic fabric by specialist firm with proven track record of successful completion of similar work in compliance with requirements of section 013591 "Historic Treatment Procedures".

3.2 HISTORIC REMOVAL AND DISMANTLING EQUIPMENT

- A. Removal Equipment: Use only hand-held tools, except as follows or unless otherwise approved by Engineer on a case-by-case basis:
 - 1. Light jackhammers are allowed subject to Engineer's approval.
 - 2. Large air hammers are not permitted.
- B. Dismantling Equipment: Use manual, hand-held tools, except as follows or otherwise approved by Engineer on a case-by-case basis:
 - 1. Hand-held power tools and cutting torches are permitted only as submitted in the historic treatment program. They must be adjustable so as to penetrate or cut only the thickness of material being removed.
 - 2. Pry bars more than 18 inches long and hammers weighing more than 2 lb are not permitted for dismantling work.

3.3 EXAMINATION

- A. Preparation for Removal and Dismantling: Examine construction to be removed or dismantled to determine best methods to safely and effectively perform removal and dismantling work. Examine adjacent work to determine what protective measures are necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed or dismantled and location of utilities and services to remain that may be hidden by construction that is to be removed or dismantled.
 - 1. Verify that affected utilities are disconnected and capped.
 - 2. Inventory and record the condition of items to be removed and dismantled for reinstallation or salvage. Enter this information on the submittal of inventory of salvaged items.
 - 3. Before removal or dismantling of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- B. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or preconstruction video recordings.

C. Perform surveys as the Work progresses to detect hazards resulting from historic removal and dismantling procedures.

3.4 HISTORIC REMOVAL AND DISMANTLING

- A. General: Have removal and dismantling work performed by a qualified historic removal and dismantling specialist. Ensure that historic removal and dismantling specialist's field supervisors are present when removal and dismantling work begins and during its progress.
- B. Perform work according to the historic treatment program and approved mockup(s).
 - 1. Perform removal and dismantling to the limits indicated.
 - 2. Provide supports or reinforcement for existing construction that becomes temporarily weakened by removal and dismantling work, until the Project Work is completed unless otherwise indicated.
 - 3. Perform cutting by hand or with small power tools wherever possible. Cut holes and slots neatly to size required, with minimum disturbance of adjacent work.
 - 4. Do not operate air compressors inside building unless approved by Engineer in each case.
 - 5. Do not drill or cut columns, beams, joints, girders, structural slabs, or other structural supporting elements, without having Contractor's professional engineer's written approval for each location before such work is begun.
 - 6. Dispose of removed and dismantled items off-site unless indicated to be salvaged or reinstalled.
- C. Water-Mist Sprinkling: Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment according to the historic treatment program to ensure that such water does not create a hazard or adversely affect other building areas or materials.
- D. Unacceptable Equipment: Keep equipment that is not permitted for historic removal or dismantling work away from the vicinity where such work is being performed.
- E. Removing and Dismantling Items on or Near Historic Surfaces:
 - 1. Unfasten items in the opposite order from which they were installed.
 - 2. Support each item as it becomes loosened to prevent stress and damage to the historic surface.
 - 3. Dismantle anchorages.

F. Masonry Walls:

- 1. Remove masonry carefully, and erect temporary bracing and supports as needed to prevent collapse of materials being removed.
- 2. Dismantle top edge and sides before removing wall. Stop removal work and immediately inform Engineer if any structural elements above or adjacent to the work show signs of distress or dislocation during any phase of removal work.
- 3. Remove wall in easily managed pieces.
- 4. During removal, maintain the stability of the partially remaining wall. Notify Engineer of the condition of temporary bracing for wall if work is temporarily stopped during the wall's removal.
- G. Anchorages:

- 1. Remove anchorages associated with removed items.
- 2. Dismantle anchorages associated with dismantled items.
- 3. In non-historic surfaces, patch holes created by anchorage removal or dismantling according to the requirements for new work.
- 4. In historic surfaces, patch or repair holes created by anchorage removal or dismantling according to Section that is specific to the historic surface being patched.

3.5 HISTORIC REMOVAL AND DISMANTLING SCHEDULE

- A. Existing Items to Be Removed: all materials, assemblies, and systems as designated in Contract Drawings.
- B. Existing Items to Be Dismantled and Reinstalled:
 - 1. Historic lighting.
 - 2. Designated carved and inscribed masonry units.
 - 3. Decorative inscribed stone floor panels/treads within stone flooring.
 - 4. Granite staircase treads:
 - a. Central staircase
 - b. McFaddin entrance stair tread
 - c. Lyon entrance stair tread.
 - 5. Limestone/Fieldstone central staircase walls and stone pilasters and piers.
 - 6. If Alternate No. 5 accepted, acceptable quality slates.
- C. Existing Items to Remain: all materials, assemblies, and systems as designated in Contract Drawings.

END OF SECTION 024296

SPECIFICATION SECTION 028213

For the
Abatement of Asbestos Containing Materials
at
Cornell University War Memorial (3013)
336 West Avenue, Ithaca, New York
For the
Cornell War Memorial - Phase 2 - Restoration Project

Prepared for: Cornell University SCL Facilities Management 223 Thurston Ave. Ithaca, NY 14853

Prepared by:



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Delta Project No. 2019.003.201 Cornell Task Authorization No. TA-205, Work Order No. 12247557

Dated: February 15, 2023

Construction Documents - 100% Submission



SECTION 028213 - ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections apply to the Work of this Section.

1.2 SCOPE OF WORK

- A. The asbestos abatement work will consist of the removal/disposal of Non-Friable Organically Bound (NOB) asbestos containing roofing materials (ACRM's) and "assumed" NOB asbestos containing cloth wire wrap at the Cornell University War Memorial, located at 336 West Avenue on the Cornell Ithaca, New York Campus, as a part of the War Memorial Phase 2 Restoration Project.
- B. Reference Abatement Drawings SK-AR1 and SK-AR2 in Attachment A of this Specification Section for asbestos abatement locations and details. Reference the Division 00 Procurement Requirements section for the project's Pre-Renovation Asbestos Survey Report.
- C. Asbestos containing materials to be removed include the following:
 - Asbestos containing perimeter wall flashing and associated asbestos containing repair tar
 present on the center sloped asphalt roof section. Total quantity of wall flashing / repair tar
 to be removed is approximately 56 square feet, based on 56 linear feet at an average 12"
 flashing width. Reference the Attachment A Drawing SK-AR1 for roofing abatement
 location.
 - 2. The removal of "assumed" asbestos contain cloth wire wrap. Two types of cloth wire wraps associated with the light fixtures to be removed / restored were identified on 5 of the affected fixtures. Less than 1 square foot of wire wrap is anticipated to be removed at each fixture. If non-vinyl wire wrap is encountered at any other fixture to be removed/impacted by the project, all removal / restoration operations with the potential to impact the assumed NOB ACM cloth wire wraps shall be performed by the abatement contractor. Reference the Attachment A Drawing SK-AR2 for the location of the 5 fixtures where the presence of cloth wire wrap was confirmed and is to be removed for fixture removal/restoration work.
- D. Asbestos roofing and wire wrap removal operations shall be performed as per the requirements of 12 NYCRR Part 56-11.1 for In-Plant Operations.
- E. The "active" area from which ACM's are being removed shall be deemed to be the work area. Only the Contractors personnel, testing laboratory personnel, State/Federal inspectors, and other certified personnel shall have access thereto.
- F. All generated roofing waste shall either be double-bagged or placed directly in a dumpster lined with two layers of 6 mil fire-retardant poly and sealed air-tight prior to transport. All asbestos-containing and "asbestos-contaminated" roof waste must be Manifested, whether it is disposed of as "C&D" or asbestos waste. At a minimum, this shall include landfill disposal tickets for each waste load.
- G. 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. Any discrepancies noted shall be forwarded in writing to the Owner's Representative prior to removal activities. Failure to do

- so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work.
- H. 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. 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.
- B. Contractor to submit man power and work schedule with bid.
- C. Owner will provide a tie-in location for electric and water source.
- D. Any air sampling necessary to meet OSHA requirements will be the responsibility of the Asbestos Contractor.
- E. If utilized, Remote Decontamination Unit Location shall be approved by the Facility Representative.
- F. Waste Dumpster locations shall be approved by the Facility Representative.
- G. Continual water-tightness of the roof is the responsibility of the Contractor.

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, and 29 CFR 1926, 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. The Contractor shall comply fully with any variances secured from regulatory agencies by the Owner's Representative in the performance of the Work. Should the Contractor choose to apply for any variance, approval of the Contractor's petition package by the Owner's representative is required prior to submission to the NYS DOL.
- 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 requirements/procedures.
- B. Pre-Work Submittals: The Contractor shall submit electronic pdf files of the documents listed below to the Owner's Representative for review and approval a minimum 10 days prior to the commencement of asbestos abatement activities:
 - 1. Contractor license issued by New York State Department of Labor.
 - 2. Name proposed onsite supervisor(s).
 - 3. Progress Schedule:
 - a. Show the complete sequence of abatement activities and the sequencing of Work.
 - b. Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area or phase.
 - 4. Project Notifications: As required by Federal and State regulatory agencies together with proof of transmittal (i.e. certified mail return receipt).
 - 5. Building Occupant Notification: As required by regulatory agencies.
 - 6. Abatement Work Plan.
 - 7. Disposal Site/Landfill Permit from applicable regulatory agency.
 - 8. Proposed Waste Manifest.
 - 9. NYS Department of Environmental Conservation Waste Transporter Permit.
 - 10. City and/or State Building Permit.
- C. On-Site Submittals: Refer to Part 3.01.C for all submittals, documentation, and postings required to be maintained on-site during abatement activities.
- D. Project Close-out Submittals: Within 10 days of project completion, the Contractor shall submit electronic pdf files 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 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.).
- E. Fully executed/signed <u>Originals</u> of all waste disposal manifests shall be submitted as per applicable State and Federal Regulations and time frame requirements.
- F. 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 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:
 - 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."

1.7 NOTICES

A. 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.

1.8 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:
 - 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 for random inspections and daily Final Visual Inspections.
 - 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.
 - 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.
 - c. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner's Representative.
 - d. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.

- 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. Final Visual Inspections: 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.

1.9 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.

1.10 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.

1.11 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.

1.12 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.

1.13 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.

1.14 DELIVERY AND STORAGE

- 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.
 - 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.

1.15 TEMPORARY UTILITIES

- A. The Owner shall be responsible for shut down and lock out all of electrical power and HVAC systems within the asbestos Work Areas. If electrical circuits, machinery and other electrical systems in or passing through the 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 contractor shall be responsible for providing GFCI electric panel(s) and connecting them to the building system for project power. All power to the Work Area shall be brought in from outside the area.
- 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 APM 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.

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.
- B. Approved Manufacturer:
 - 1. International Protective Coatings Corp.: Serpiflex Shield
 - 2. American Coatings Corp.: FNE High Temperature Sealant
 - 3. Certified Technologies: CerTane 1000 Post Removal Encapsulant

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.
- C. Approved Manufacturers:
 - 1. Hako Minuteman
 - 2. Micro-Trap Inc.
 - 3. Control Resource Systems, Inc.

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 floor

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. Daily Project Log and Work Area Entry Log.

3.2 REMOVALS OF EXTERIOR NON-FRIABLE ORGANICALLY BOUND (NOB) ASBESTOS CONTAINING MATERIALS (ACM'S)

- A. Except as modified by this section, removal of exterior non-friable organically bound (NOB) ACM roofing and NOB ACM wire wrap 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 Subpart 56-11.1 for In-Plant Operations.
- C. The immediate work area shall be considered to be the area from which the ACM's are actively being removed. The asbestos project regulated abatement work area shall extend twenty-five (25') feet from the perimeter of the immediate work area and shall have signage in accordance with Section 56-7.4.

- D. Non-certified Workers are not allowed in the Work Area until the Work Area is cleared by the Asbestos Project Monitor.
- E. The Contractor is required to provide temporary protection of the building (i.e. roof, window openings, construction joints, etc.) at the end of each Work shift so as to maintain the building in a watertight condition.
- F. Dumpsters used for waste storage shall be lined with two layers of six mil polyethylene. The top shall be closed with polyethylene flaps that are sealed at the end of each work shift.
- G. 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.
- H. 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).
- 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 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, the isolation and critical barriers shall be removed.

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 securable.
- 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 secured at all times, except during loading. The waste container shall not be used for storage of equipment or contractor supplies.
- D. 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.

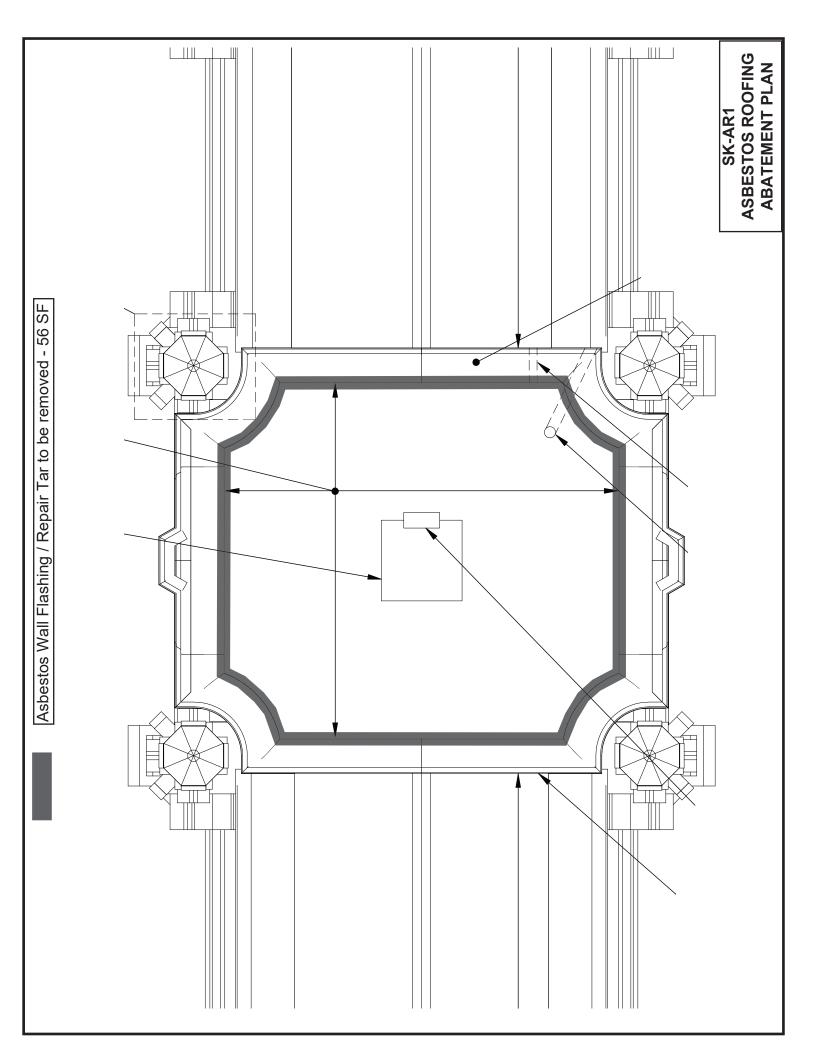
4.3 WASTE MANIFESTS

- 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 waste covered by the manifest.
- F. The Disposal Facility operator shall return the original Manifest to the Contractor.
- G. 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.
- H. Originals of all waste disposal manifests and/or Landfill Disposal Tickets shall be submitted by the Contractor to the Owner's Representative with the final close-out documentation.

END OF SECTION 028213

Attachment A

Drawings



SECTION 030130 - CONCRETE REPAIR

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 the following:
 - 1. Overhead, partial-width concrete repairs.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. All Division 1 Sections.
 - 2. Division 3 Section "Concrete"
 - 3. Division 3 Section "Galvanic Anodes"
 - 4. Division 7 Section "Joint Sealants"

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, unless otherwise indicated.
- B. Product Data and SDS: For each type of product indicated.
- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Repair materials
 - 2. Steel reinforcement, protective coatings and accessories.
 - 3. Adhesives.
- D. For cementitious concrete repair materials submit manufacturer's data sheet consistent the requirements of ACI 364.3R-09. Provide a manufacturer's data sheet for the following types of materials and as-required:
 - 1. Form and pour concrete repairs repair depth greater than 1"
 - 2. Overhead or vertical partial depth repairs
- E. Submit mix designs for concrete, associated laboratory test reports and product data for admixtures. Include additional mix proportion tests for characteristics of materials that may be varied for special project conditions, weather, or other circumstances. As a performance-based system, mix design responsibility rests with the concrete supplier.
- F. Sample of materials to be used for concrete formwork for approval of repair surface finish and texture.
- G. Submit any plans or other documents, needed to complete the work, such as documents prepared by specialty engineer for shoring or formwork.

1.4 QUALITY ASSURANCE

A. Concrete Standards: Comply with provisions of the following standards and industry practice guidelines, except where more stringent requirements are indicated.

- 1. ACI Manual of Concrete Practice, including the following standards:
 - a. ACI 301, "Specifications for Structural Concrete for Buildings".
 - b. ACI 318, "Building Code Requirements for Structural Concrete."
 - c. ACI 562, "Code Requirements for Assessment, Repair, and Rehabilitation of Concrete Buildings".
 - d. ACI 563 "Specifications for Repair of Concrete in Buildings."
- 2. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice".
- 3. International Concrete Repair Institute (ICRI): Technical Guidelines
- B. Manufacturing qualifications: The manufacturer of the specified product shall be ISO 9001 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.
- C. Construction manager qualifications: Construction manager shall utilize personnel experienced in concrete repair and rehabilitation. Construction manager's superintendents shall have the following minimum qualifications:
 - 1. Minimum of 5 years of experience with repair of existing concrete structures.
 - 2. Supervising persons shall have ICRI Concrete Surface Repair Technician (Level 1) accreditation or equivalent.
- D. Concrete repair contractor qualifications: Concrete repair contractor shall be qualified in the field of concrete repair and protection with a successful track record of 5 years of more.
 - 1. Selective removal work shall be performed only by technicians with demonstrated experience working on concrete removal.
 - 2. Supervising persons shall have ICRI Concrete Surface Repair Technician (Level 1) accreditation or equivalent.
 - 3. Supervising person having control over the work shall be present during all operations.
 - 4. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative for installation of proprietary systems when required by manufacturer.
- E. Pre-installation Conference: Conduct pre-installation meeting on site prior to installations:
 - 1. Require representatives of each entity directly concerned with concrete repair to attend, including the following:
 - a. Construction manager's superintendent.
 - b. Concrete repair contractor's superintendent and foremen.
 - c. Ready mixed concrete supplier (if applicable).
 - d. Concrete subcontractor (if applicable).
 - e. Concrete repair material manufacturer's representative.
 - f. Corrosion protection system installer (if applicable).
 - g. Other parties whose work is impacted by concrete repair.
- F. Testing Agency Qualifications: An independent agency to be retained by Owner or the Owner's designated agent, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- G. Concrete Repair Mockups
 - 1. In-place mockups to be prepared for the following types of concrete repairs:
 - a. Partial-width slab repair: minimum 2 foot by 2 foot area.

- 2. The mockups shall include all details of the concrete repair including surface preparation, reinforcing steel cleaning, anode placement, addition of supplemental reinforcing steel and materials placement.
- 3. Exposed concrete surfaces including formed surfaces will be reviewed by the Engineer and representatives of Cornell University.

1.5 DELIVERY, STORAGE AND HANDLING

- A. All material must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.
- B. Store all materials off the ground and protect from rain, freezing, or excessive heat until ready for use.

1.6 PROJECT CONDITIONS

- A. Do not install material if weather conditions will adversely impact installation, except where approved protective measures are in place. Maintain minimum application temperature 45°F (5°C) and rising or provide temporary climate control measures in accordance with manufacturer requirements.
- B. Take precautions to avoid damage to any surface near the work zone due to operations, mixing, handling and/or placing of materials.

1.7 WARRANTY

- A. Provide written contractor warranties in compliance with contract requirements.
- B. Provide written manufacturers warranties for all materials for maximum manufacturer warranty period available.

PART 2 - PRODUCTS

2.1 REPAIR MATERIAL MANUFACTURERS

- A. Repair Materials
 - BASF Corporation, Shakopee, MN 55379
 - 2. Sika Corporation, Lyndhurst, NJ 07071
 - 3. Mapei Corporation, Deerfield Beach, FL 33442
 - 4. Vector Corrosion Technologies, Tampa, FL 33610
 - 5. Or Engineer approved alternate manufacturer.
- B. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- D. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.3 STEEL REINFORCEMENT

- A. Galvanized Reinforcing Steel Bars: ASTM A676, Grade 60, deformed
- B. Galvanized Steel Welded Wire Reinforcement: ASTM A1060, galvanized, fabricated from asdrawn steel wire into flat sheets.
- C. Galvanized Steel (where specified): ASTM A123, Hot-Dipped Galvanized Steel
- D. Stainless Steel (where specified): ASTM A304 or A316.

2.4 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
- B. Tie wires to be plastic coated.

2.5 CONCRETE MATERIALS

- A. ACI 318-19 Exposure Category C2, F3
- B. Material Properties:
 - 1. Compressive Strength: ASTM C39
 - a. 5,000 psi at 28 days
 - 2. Entrained air content: 6% +/- 1% measured at point of discharge from mixer.
 - 3. Shrinkage: ASTM C157 (modified as below)
 - a. Demold specimen at 24 hours
 - b. 7 Days of wet curing (100% RH)
 - c. Air storage after 7 days
 - d. Maximum shrinkage 600 microstrain at 28 days
 - 4. Chloride Ion Permeability shall be 1,000 coulombs or less at 56 days when tested in accordance ASTM C1202.

- C. Cementitious materials: Use the following cementitious materials, of the same type, brand, and source, throughout Project.
- D. Portland Cement: ASTM C 150, Type I, low-alkali, gray. Supplement with the following:
 - 1. Fly Ash: ASTM C 618, Class F, or
 - 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120, or
 - 3. Silica Fume: ASTM C 1240, amorphous silica.
 - 4. Supplementary cementitious materials to be added in accordance with requirements of ACI 318.
- E. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source. Free of materials with deleterious reactivity to alkali in cement.
 - 1. Coarse and fine aggregates to shall be obtained from sources on the New York State DOT list of approved potential aggregate sources and shall not be designated as having ASR potential.
 - 2. Minimum bulk SSD specific gravity of the coarse aggregate on the New York State DOT posted test results shall be 2.67.
 - 3. Maximum absorption of the coarse aggregate on the New York State DOT posted test results shall be 1.2%.
 - 4. Maximum Coarse-Aggregate Size: 3/8" to No. 8, except where larger diameter aggregates can be accommodated in forms.
 - 5. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- F. Water: ASTM C 94.

2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494, Type A.
 - 2. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 - 3. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.
 - 4. Corrosion Inhibitor Calcium Nitrite Based Admixtures shall not be permitted.

2.7 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.8 CONCRETE REPAIR MATERIALS

- A. Concrete Patching and Repairs:
 - 1. BASF LA40 PMAC Repair Mortar
 - 2. US Concrete Products Deck Mix AE
 - 3. Contractor to verify that any corrosion inhibiting admixtures are not calcium nitrite based.
 - 4. Contractor to submit a non-shrink grout material for approval by Engineer. Non-shrink grout shall be non-chloride containing.
 - 5. Other materials shall be pre-approved by Engineer see section 1.3D.
- B. Anti-Corrosion Reinforcing Steel Coating where specified

- 1. Mapei Mapefer 1k
- 2. Alternate materials shall be approved by Engineer. Materials shall be cementitious in nature, high pH, or shall provide a sacrificial galvanic material.

2.9 CONCRETE REPAIR MATERIAL PROPERTIES

- A. Minimum requirements for concrete repair materials are listed below. Provide test results in accordance with requirements of ACI 364.3R-09.
- B. Compressive strength ASTM C 39
 - 1. Minimum 4,000 psi at 28 days
- C. Modulus of elasticity ASTM C469
 - 1. Minimum 3.5 x 10⁶ psi at 28 days
- D. Coefficient of thermal expansion CRD-C 39
 - 1. Maximum value 6.5 millionths / deg. F
- E. Freeze-thaw resistance ASTM C666
 - 1. Procedure A Durability factor greater > 97% at 300 cycles
- F. Unrestrained drying shrinkage ASTM C157 modified per procedure ASTM C928
 - 1. Maximum expansion 1,000 microstrain storage in air or water
 - 2. Maximum shrinkage 600 microstrain storage in air or water
- G. Restrained drying shrinkage ASTM C1581
 - 1. No cracking within 14 days storage in air.
 - 2. Average stress rate (s) < 20 psi/day

PART 3 - EXECUTION

3.1 REPAIR LAYOUT AND EVALUATION OF EXPOSED SURFACES AND REINFORCEMENT

- A. The initial layout of concrete repair areas will be completed by the Engineer or designated representative.
- B. After initial removals are complete, but prior to final cleaning, all exposed concrete surfaces and all reinforcement designated to remain in place will be reviewed by the Engineer or designated representative.
- C. Contractor shall provide minimum of 48 hours notice to Engineer to schedule adequate time for review of extent of concrete removals, concrete surface preparation and reinforcing steel cleaning.
- D. Contractor shall provide minimum of 48 hours notice to Construction Manager to allow for scheduling of anode installation by corrosion protection installer.
- E. When unsatisfactory surface preparation is observed, Engineer or designated representative will indicate any additional removals that may be necessary. Contractor to perform additional removals and surface preparation until satisfactory conditions are achieved and approved by Engineer or designated representative.
- F. Material placement can be completed after Engineer or designated representative has approved the extent of removal, and preparation of reinforcing steel and concrete surfaces.

3.2 REMOVALS

- A. Demolish and remove existing concrete only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:
 - 1. Proceed with removals systematically as detailed in the project schedule.
 - 2. Areas to be removed shall be designated by licensed Engineer or designated representative.
 - 3. Mechanically prepare the concrete substrate of existing structural slab to remain to obtain a surface profile of +/- 1/4" or greater.

- 4. Provide straight, even sawcut edges around all removal areas being sure to not disturb post-tensioning reinforcing or damage any embedded steel reinforcing that is to remain.
- 5. Perform concrete removal in areas to be repaired using saw cutting equipment, suitable chipping hammers (15 lb limit), scabblers and other equipment, that minimizes bruising of the finish substrate layer.
 - a. Perform abrasive blasting with sand, water or other media as a final preparation step to remove layers with bruising damage.
- 6. Do not cut, damage or remove existing embedded reinforcing steel, electrical conduits, etc., unless directed by the Engineer.
- 7. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report in writing to Engineer with accurate detail of conflict. Pending receipt of directive from Engineer, rearrange selective removals schedule as necessary to continue overall job progress without undue delay.

B. EMBEDDED REINFORCING STEEL

- 1. Reinforcing steel with more than 50% of surface area exposed, or has been bond degradation due to cracking or corrosion shall be undercut to provide ¾ inch of clear space around reinforcing steel.
- 2. Reinforcing steel in columns or structural elements in compression shall only be undercut when directed by Engineer.
- 3. Exposed reinforcing steel that is adhered to substrate with no evidence of bond degradation can remain in place without being undercut.
- 4. Where mild reinforcing steel with corrosion is encountered, sandblast or mechanically clean the steel to remove all contaminants and rust. Where existing reinforcing is epoxy coated, mechanically remove the coating in areas where corrosion is present, as well as in areas where the coating is damages or de-bonded. Extend removal to sound coating region.
- 5. Undercutting of reinforcing steel shall extend until reinforcing steel with no corrosion product is found.
- 6. When specified, apply approved reinforcing steel coating to completely encapsulate areas of exposed reinforcing steel.
- 7. When specified, attach galvanic anodes to reinforcing to provide sufficient electrical connection and mechanical bond. Alternately, provide full access for anode installation by corrosion protection installer.
- 8. All repair areas shall have undercut reinforcing steel present or embedded pins shall be installed in the repair area. Embedded pins to be a minimum of 3 inches long, embedded in epoxy to a minimum depth of 1.5 inches. Bend exposed pins where topping concrete is less than 1.5 inches thick. Pins to have a minimum diameter of 3/8 inch. Pins to be constructed from stainless steel. Maximum pin spacing to be 18 inches on center, with a minimum of one pin per repair area and one pin per SF of repair area.

C. LOSS OF SECTION DUE TO CORROSION

- 1. Reinforcing steel with greater than 25% loss of cross-section area due to corrosion shall be supplemented with new reinforcing steel.
- 2. Engineer may waive requirement to supplement reinforcing steel.
- 3. Supplemental reinforcing steel shall be installed with sufficient lap length to allow sufficient for development of the new reinforcing steel to replace the cross-section lost to corrosion.
- 4. Supplemental reinforcing steel to have similar mechanism for corrosion mitigation as existing reinforcing steel.

5. When required by the Engineer, contractor to provide calculations prepared by a specialty engineer showing adequate development of supplemental reinforcing steel based upon inplace cross-section of existing reinforcing steel.

3.3 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces.
- F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- G. Chamfer exterior corners and edges of permanently exposed concrete.
- H. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- I. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- J. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- K. Finished concrete repair surfaces will reviewed and approved by a representative of Cornell University.

3.4 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.5 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.6 SHORES AND RESHORES

- A. Comply with ACI 562 and ACI 301 for design, installation, and removal of shoring and reshoring.
- B. When required by Engineer, contractor shall retain a specialty engineer to design required shoring members. Shoring plans developed by specialty engineer shall be signed and sealed.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.7 STEEL REINFORCEMENT

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

3.8 MIXING AND APPLICATION

A. Concrete & repair materials:

- 1. Deposit concrete material continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. Deposit concrete to avoid segregation.
 - a. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - b. Consolidate placed concrete with mechanical vibrating equipment
- 2. Mix and place pre-packaged concrete material in accordance with manufacturer directions.
 - a. For vertical and overhead applications, trowel apply in lifts in accordance with manufacturer instructions.

B. Finishing

- 1. Broom or trowel finish to match existing conditions, or as approved by representative of Cornell University.
- 2. Repair and patch tie holes and defects in formed surfaces, removing fins and other projections or irregularities.
- 3. Cure repair areas per manufacturers written instructions. Contractor shall be required to submit curing plan procedures for Engineer approval prior to placement of repair material.
- 4. Remove all form work when the concrete repair has reached a minimum of 3,000 psi. Repair all bug holes and fastener holes upon removal of form.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete materials from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hotweather protection during curing.
- B. Formed Surfaces: If removing forms before end of curing period, continue curing for the remainder of the curing period.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 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.

3.10 CLEAN UP

- A. Clean all work areas of all wet and/or dried concrete material and sealant on a daily basis.
- B. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

PART 4 - EXECUTION

4.1 FIELD QUALITY CONTROL

- A. Testing and Inspecting: The Engineer and Owner's Testing Agency will perform quality assurance observations and materials testing unless otherwise indicated. Where discrepancies arise, contractor shall engage a qualified testing agency to perform tests and to submit reports.
- B. The Engineer reserves the right to waive the requirements of any of the required inspections/testing.
- C. Quality Assurance Observations:
 - 1. Removals and surface preparations
 - 2. Steel reinforcement repairs & protections; placement.
 - 3. Concrete placement & finishing
 - 4. Curing procedures and maintenance of curing temperature.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's placement of each concrete mixture. Less frequent testing must be approved by the Engineer.
 - 2. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 3. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 - 4. Compression Test Specimens: ASTM C 31.
 - 5. For traditionally reinforced concrete structures: Cast & cure four or six inch diameter cylinder specimens:
 - a. 1 set, field cured, test at 7 days (form removal)
 - b. 1 set, laboratory cured, test at 7 days
 - c. 1 set, laboratory cured, test at 28 days
 - d. A compressive-strength test shall be the average compressive strength from a set of three specimens 4×8 inch cylinders, or two specimens 6×12 inch cylinders, obtained from same composite sample and tested at age indicated.

4.2 PERFORMANCE OF SURFACE REPAIRS

A. Failure of concrete repairs to bond to substrate (as evidenced by a hollow sound when tapped), excessive shrinkage, or disintegration or other failure of patches to perform, will be considered failure of materials and workmanship. Repair or replace all defective areas of such failures as directed by Engineer.

END OF SECTION

SECTION 030190 - GALVANIC ANODE INSTALLATION

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 the following:
 - 1. Location of existing reinforcing steel for anode connections.
 - 2. Removal of concrete to allow for installation of anodes and anode connectors.
 - 3. Preparation of substrates and material interfaces to receive repair anodes.
 - 4. Installation of anodes.
 - 5. Placement of specialty anode embedding mortar.
 - 6. Curing and protection of materials.
 - 7. Installation of monitoring stations at selected locations.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Special Conditions" and all other Division 1 Sections.
 - 2. Division 3 Section "Concrete Repair"
 - 3. Division 7 Section "Joint Sealants"

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, unless otherwise indicated.
- B. Product Data and MSDS: For each type of product indicated.

C. ANODE LAYOUT AND CALCULATIONS

- 1. Anode manufacturer shall submit a shop drawing showing layout of anodes.
- 2. Anode layout drawing shall indicated maximum spacing between anodes in both concrete repair areas and outside of concrete repair areas.
- 3. Anode shop drawings shall include anode type(s) to be installed, and accessories to be used for installation.
- 4. Anode manufacturer shall submit calculations demonstrating the anodes will satisfy the performance requirements in Section 1.7.

1.4 QUALITY ASSURANCE

- A. Concrete Standards: Comply with provisions of the following standards and industry practice guidelines, except where more stringent requirements are indicated.
 - 1. ACI Manual of Concrete Practice, including the following standards:
 - a. ACI 301, "Specifications for Structural Concrete for Buildings".
 - b. ACI 318, "Building Code Requirements for Structural Concrete."

- c. ACI 562, "Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures."
- d. ACI 563, "Specifications for Repair of Concrete in Buildings."
- 2. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice".
- 3. International Concrete Repair Institute (ICRI): Technical Guidelines
- B. Manufacturing qualifications: The manufacturer of the specified product shall be ISO 9001 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.
- C. Anode Installer qualifications: Installer shall be qualified in the field of concrete repair and protection with a successful track record of 5 years of more.
 - 1. Selective removal work shall be performed only by technicians with demonstrated experience working on concrete removal.
 - 2. Supervising person shall have ICRI Concrete Surface Repair Technician (Level 1) accreditation or equivalent.
 - 3. Supervising person shall be a NACE-qualified corrosion technician (Cathodic Protection Technician-CP2 or higher).
 - 4. Supervising person having control over the work shall be present during all operations.
 - 5. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative.
- D. Pre-installation Conference: Conduct pre-installation meeting on site prior to installations:
 - 1. Require representatives of each entity directly concerned with concrete to attend, including the following:
 - a. Anode manufacturer.
 - b. Anode installer's superintendent.
 - c. Concrete repair contractor.
 - d. Construction manager's representative.

1.5 DELIVERY, STORAGE AND HANDLING

- A. All material must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.
- B. Store all materials off the ground and protect from rain, freezing, or excessive heat until ready for use.

1.6 PROJECT CONDITIONS

- A. Do not install material if weather conditions will adversely impact installation, except where approved protective measures are in place. Maintain minimum application temperature 45°F (5°C) and rising or provide temporary climate control measures in accordance with manufacturer requirements.
- B. Take precautions to avoid damage to any surface near the work zone due to operations, mixing, handling and/or placing of materials.

1.7 ANODE PERFORMANCE REQUIREMENT

A. The intended design service life of the anode system is 25 years.

1.8 MANUFACTURER EXTENDED LIMITED WARRANTY

- A. Anode manufacturer shall provide a Limited Warranty with a notarized signature from a corporate officer.
- B. The Limited Warranty shall state the following:
 - 1. The galvanic anodes will remain electrochemically active and produce galvanic current in relation to the environment in which they are installed for a minimum of 5 years from the date of anode installation.
 - 2. The anode unit, including its constituents, does not include substances that may cause adverse effects to concrete or reinforcing steel and will not contribute to reinforcing steel corrosion damage over the life of the structure.
 - 3. The galvanic anodes meet requirements of ACI 318 and 562.

PART 2 - PRODUCTS

2.1 ANODE MANUFACTURERS

- A. Anodes, Anode Installation Mortar and Anode Connectors
 - 1. Vector Corrosion Technologies, Winnipeg, MB R3Y 1G4
 - 2. Or Engineer approved alternate manufacturer.
- B. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 GALVANIC ANODES AND ANODE CONNECTORS

- A. Embedded galvanic anodes shall be Anode Type 2A Class C. The anode units shall be premanufactured with zinc in compliance with ASTM B418 Type II cast around an uncoated, non-galvanized steel lead wire and encased in a highly alkaline cementitious shell with a pH of 14 or greater.
- B. Anode shall contain an internal power source to all for dual phase impressed current cathodic protection and sacrificial anode behavior.
- C. The anode unit shall contain no intentionally added chloride, bromide, sulfate or other constituents that are detrimental to concrete or corrosive to reinforcing steel as per ACI 222R.
- D. Basis of Design Anodes: Embedded galvanic anodes shall be Galvashield Fusion T2-100 available from Vector Corrosion Technologies (www.vector-corrosion.com) USA (813) 830-7566, Canada (204) 489-9611 or approved equal.
- E. Anode connectors and installation tools shall be from same manufacturer as embedded anodes and shall be designed to be compatible with the embedded anodes.
- F. Minimum wire size for connections between anodes shall be 20 gauge. Wires for connection between anodes shall be resistant to alkali materials. Use of PVC wire covering is prohibited.

2.3 EMBEDDING MORTAR

- A. Anode embedding mortar shall be a Portland cement-based mortar.
- B. Resistivity of embedding mortar shall be controlled to ensure performance of embedded anodes. Maximum resistivity shall be 5,000 ohm-cm, measured in accordance with AASHTO Provisional Standard TP 95.
- C. Embedding mortar shall be chemically formulated to limit the potential for acid generation at the anodes.
- D. Galvashield Embedding Mortar by Vector Corrosion Technologies is an acceptable material.

2.4 ASSOCIATED MATERIALS FOR ANODE INSTALLATION

- A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- B. Water: Potable.
- C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.5 ANODE MONITORING SYSTEM

- A. Provide monitoring systems to allow for performance monitoring of anodes at two locations in the War Memorial.
- B. Monitoring system shall be provided by anode manufacturer. System shall include all components including reference electrode needed for measurement.
- C. Monitoring system to include sensors for monitoring of the internal relative humidity of the concrete adjacent to the anode locations.
- D. Monitoring systems to include on-site logging of data using a data logger system. Data loggers to be installed in protected locations along the concourses or other designated locations.
- E. All wiring for the monitoring system to be installed securely to existing structure. Any exposed connectors or wiring to be installed with UV resistant connection materials.
- F. Monitoring system components shall be installed in a weather tight boxes, with a lockable closures.
- G. Installation shall document number of anodes connected to the monitoring station.
- H. Initial installation shall include taking initial measurements of anode activity.

PART 3 - EXECUTION

3.1 ANODE LAYOUT

- A. Use an appropriate technology to locate the existing reinforcing steel for reinforcing steel connections on slab soffit. Pachometers and surface penetrating radar are appropriate technologies for locating reinforcing steel.
- B. Mark out locations for anode installation and for reinforcing steel connections. Anode installation spacing shall be as shown on drawings. When possible, anodes shall be installed on a grid pattern with a minimum of 4 inches between the reinforcing steel and anode.

3.2 CONCRETE REMOVAL FOR ANODE INSTALLATION

- A. At anode locations, drill or core existing concrete to provide a minimum hole size of 2 inch diameter by 5.5 inches deep.
- B. At reinforcing steel connectors locations, drill a 0.5 inch diameter hole to the depth of the reinforcing steel. Minimum hole depth to be 1 inch. Use drill bit to contact reinforcing steel bar to establish a clean contact area.
- C. Sawcut slot to be provided between anode location and connection hole. Slot to be a minimum of 0.25 inches wide by 0.5 inches deep.
- D. All holes and sawcuts shall be cleaned of dust and concrete debris.

3.3 REINFORCING STEEL CONNECTOR INSTALLATION

- A. Install reinforcing steel connectors at reinforcing steel consistent with manufacturer's recommendations.
- B. A maximum of five anodes may be connected per reinforcing steel connector.
- C. Verify electrical continuity of adjacent reinforcing steel connectors using a multi-meter. Maximum resistance between adjacent reinforcing steel connectors shall be 1 ohm or less than 1 mV using the DC mV method.

3.4 ANODE INSTALLATION

- A. Holes shall be in a saturated-surface dry condition prior to anode placement.
- B. Pre-wet anodes in a small volume of water.
- C. Complete wiring between the anodes and the rebar connections.
- D. Anode embedding mortar shall be mixed in accordance with manufacturer's recommendations. After removing excess water from the presoaked holes, fill each anode installation hole approximately 2/3 full with prepared embedding mortar.
- E. Insert an anode into each hole, forcing the embedding mortar to fill the annular space from the bottom up. Top off the hole with embedding mortar or other approved mortar and strike off excess flush with the concrete surface. Minimum cover on top of the anode shall be 0.5 inch.
- F. Bury connection wires into the saw cuts and drilled holes with embedding mortar or other material and strike off flush with the concrete surface.
- G. Wet cure cement-based mortar or cure with two coats of a membrane-forming concrete curing compound meeting the requirements of ASTM C309.
- H. Protect area from foot traffic for 24 hours.

3.5 CLEAN UP

- A. Clean all work areas of all wet and/or dried concrete material and sealant on a daily basis.
- B. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

PART 4 - QUALITY CONTROL

4.1 FIELD QUALITY CONTROL

A. Testing and Inspecting: The Engineer and Owner's Testing Agency will perform quality assurance observations and materials testing unless otherwise indicated. Where discrepancies arise, contractor shall engage a qualified testing agency to perform tests and to submit reports.

4.2 MANUFACTURER CORROSION TECHNICIAN

- A. The corrosion protection contractor will enlist and pay for a technical representative employed by the galvanic anode manufacturer (designated corrosion technician) to provide training and on-site technical assistance during the initial installation of the galvanic anodes. The designate corrosion technician shall be a NACE-qualified corrosion technician (Cathodic Protection Technician-CP2 or higher).
- B. The qualified corrosion technician shall have verifiable experience in the installation and testing of embedded galvanic protection systems for reinforced concrete structures.
- C. The corrosion protection contractor shall coordinate its work with the designated corrosion technician to allow for site support during project startup and initial anode installation. The corrosion technician shall provide contractor training and support for development of application procedures, verification of electrical continuity, and project documentation.

4.3 MONITORING STATIONS

- A. At specified locations, a monitoring station shall be installed on. Monitoring station location to be selected by Engineer.
- B. Monitoring stations to be installed as shown on approved anode shop drawings.
- C. Initial readings at monitoring stations shall be taken at time of initial installation.

END OF SECTION

SECTION 033000 - CONCRETE

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. Structural slab replacement.
- 2. Sloped topping slab installation.
- 3. Sidewalk replacement (Alternate No. 1 Scope)
- 4. Footing for new site wall (Alternate No. 4 Scope)
- 5. Miscellaneous concrete where indicated on Contract Drawings.

B. Related Requirements:

- 1. Section 030130 "Concrete Repair" for repair of existing concrete.
- 2. Section 030190 "Galvanic Anodes" for galvanic anodes to be installed in existing War Memorial.
- 3. Section 079200 "Joint Sealants".

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site.
 - 1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - e. Special concrete finish Subcontractor.
 - 2. Review the following:

- Special inspection and testing and inspecting agency procedures for field quality control.
- b. Construction joints, control joints, isolation joints, and joint-filler strips.
- c. Semirigid joint fillers.
- d. Vapor-retarder installation.
- e. Anchor rod and anchorage device installation tolerances.
- f. Cold and hot weather concreting procedures.
- g. Concrete finishes and finishing.
- h. Curing procedures.
- i. Forms and form-removal limitations.
- j. Shoring and reshoring procedures.
- k. Methods for achieving specified floor and slab flatness and levelness.
- I. Floor and slab flatness and levelness measurements.
- m. Concrete repair procedures.
- n. Concrete protection.
- o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
- p. Protection of field cured field test cylinders.

1.5 ACTION SUBMITTALS

- A. Product Data: For each of the following (if used).
 - 1. Portland cement.
 - 2. Fly ash.
 - 3. Slag cement.
 - 4. Blended hydraulic cement.
 - 5. Silica fume.
 - 6. Performance-based hydraulic cement
 - 7. Aggregates.
 - 8. Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
 - 9. Fiber reinforcement.
 - 10. Vapor retarders.
 - 11. Floor and slab treatments.
 - 12. Liquid floor treatments.
 - 13. Curing materials.
 - 14. Joint fillers.
- B. Design Mixtures: For each concrete mixture, include the following:
 - 1. Mixture identification.
 - 2. Minimum 28-day compressive strength.
 - 3. Durability exposure class.
 - 4. Maximum w/cm.
 - 5. Slump limit.
 - 6. Air content.
 - 7. Nominal maximum aggregate size.
 - 8. Synthetic micro-fiber content.

- 9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
- 10. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
- 11. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
- 12. Intended placement method.
- 13. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

- 1. Concrete Slab Replacement and Slope Plan Shop Drawings, indicating:
 - a. Plans and sections showing proposed elevations of sloped topping or sloped structural slab based on field conditions
 - b. Location/extents of snow melt system (if approved)
 - c. Reinforcement details and their locations
 - d. Construction joint layout
- D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:
 - 1. Concrete Class designation.
 - 2. Location within Project.
 - 3. Exposure Class designation.
 - 4. Formed Surface Finish designation and final finish.
 - 5. Final finish for floors.
 - 6. Curing process.
 - 7. Floor treatment if any.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
 - 1. Installer: Include copies of applicable ACI certificates.
 - 2. Ready-mixed concrete manufacturer.
 - 3. Testing agency: Include copies of applicable ACI certificates.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Fiber reinforcement.
 - 4. Curing compounds.
 - 5. Floor and slab treatments.
 - 6. Bonding agents.
 - 7. Adhesives.
 - 8. Vapor retarders.
 - 9. Semirigid joint filler.
 - 10. Joint-filler strips.
 - 11. Repair materials.

- C. Material Test Reports: For the following (if used), from a qualified testing agency:
 - 1. Portland cement.
 - 2. Fly ash.
 - 3. Slag cement.
 - 4. Blended hydraulic cement.
 - 5. Silica fume.
 - 6. Performance-based hydraulic cement.
 - 7. Aggregates.
 - 8. Admixtures:
- D. Preconstruction Test Reports: For each mix design.
- E. Field quality-control reports.
- F. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Concrete Flatwork: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.
 - 2. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.
- B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
 - 1. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- D. Field Quality Control Testing Agency Qualifications: An independent agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
 - Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.
- E. Mockups: Cast concrete slab on ground (sidewalk) panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.

- 1. Slab-On-Ground: Build panel approximately 8 feet by 20 feet in the location indicated or, if not indicated, as directed by Engineer.
- 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
 - 1. Include the following information in each test report:
 - a. Admixture dosage rates.
 - b. Slump.
 - c. Air content.
 - d. Seven-day compressive strength.
 - e. 28-day compressive strength.
 - f. Chloride ion permeability at 56 days.
 - g. Concrete shrinkage.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301, and as follows.
 - 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 3. Do not use frozen materials or materials containing ice or snow.
 - 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
 - 5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
 - 1. Maintain concrete temperature at time of discharge to not exceed 90 deg F.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:

- 1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
- 2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
- 3. Obtain aggregate from single source.
- 4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

- 1. Portland Cement: ASTM C150/C150M, Type I, Type II, Type I/II, low alkali.
- 2. Fly Ash (if used): ASTM C618, Class C or F.
- 3. Slag Cement (if used): ASTM C989/C989M, Grade 100 or 120.
- 4. Silica Fume (if used): ASTM C1240 amorphous silica.
- C. Normal-Weight Aggregates: ASTM C33/C33M, coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1. Alkali-Silica Reaction: Comply with the following:
 - a. Use aggregate obtained from sources on the New York State DOT list of approved potential aggregate sources and shall not be designated as having ASR potential.
 - b. Use low alkali cement for all concrete mixtures.
 - c. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293 or,
 - d. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
 - 2. Maximum Coarse-Aggregate Size: 1 ½" nominal.
 - 3. Coarse-Aggregate Size: 3/8" to No. 8, except where larger diameter aggregates can be accommodated in forms.
 - 4. Minimum bulk SSD specific gravity of the coarse aggregate on the New York State DOT posted test results shall be 2.67.
 - 5. Maximum absorption of the coarse aggregate on the New York State DOT posted test results shall be 1.2%.
 - 6. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C260/C260M.
- E. Chemical Admixtures (if used): Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

- 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
- 2. Retarding Admixture: ASTM C494/C494M, Type B.
- 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
- 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
- 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
- 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- F. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.3 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
 - 1. Color:
 - a. Ambient Temperature Below 50 deg F: Black.
 - b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
 - c. Ambient Temperature Above 85 deg F: White.
- D. Water: Potable or complying with ASTM C1602/C1602M.
- E. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

2.4 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.
- B. Ramp mortar for sloping deck to cloister drains within slotted edge restraints: ERM (Exterior ramp mortar) as manufactured by Ardex (https://www.ardexamericas.com/).

2.5 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
 - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

- 1. Fly Ash or Other Pozzolans: 25 percent by mass.
- 2. Slag Cement: 50 percent by mass.
- 3. Silica Fume: 10 percent by mass.
- 4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
- 5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
 - 1. Use water-reducing, high-range water-reducing or plasticizing admixtures in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.6 CONCRETE MIXTURES

- A. Class A: Normal-weight concrete used for structural concrete and concrete flatwork.
 - 1. Exposure Class per ACI 318-19:
 - a. Exterior: F3 S0 W1 C2.
 - b. Interior: F1 S0 W0 C0.
 - 2. Minimum Compressive Strength: as indicated in Contract Drawings.
 - 3. Air Content:
 - a. Exposure Class F2 and F3: 6 percent, plus or minus 1.0 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size or larger.
 - 4. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
 - 5. Shrinkage: ASTM C157 (modified as below)
 - a. Demold specimen at 24 hours
 - b. 7 Days of wet curing (100% RH)
 - c. Air storage after 7 days
 - d. Maximum shrinkage 600 microstrain at 28 days

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94, and furnish batch ticket information.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

- 1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
- 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
 - 1. Daily access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
 - 4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
 - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
 - 3. Install reglets to receive waterproofing and to receive counterflashing at exterior walls.

3.4 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 - 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Engineer.

- 2. Place joints perpendicular to main reinforcement.
- a. Continue reinforcement across construction joints unless otherwise indicated.
- b. Do not continue reinforcement through sides of strip placements of floors and slabs.
- 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
- 4. Locate joints for slabs at third points of spans.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.

3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installations of formwork, reinforcement, and embedded items are complete and that required inspections are completed.
- B. Notify Engineer and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer in writing, but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

- Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
 - 1. If a section cannot be placed continuously, provide construction joints as indicated.
 - 2. Deposit concrete to avoid segregation.
 - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - 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 mixture constituents to segregate.
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Do not place concrete floors and slabs in a checkerboard sequence.
 - 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 3. Maintain reinforcement in position on chairs during concrete placement.
 - 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 5. Level concrete, cut high areas, and fill low areas.
 - 6. Slope surfaces uniformly to drains where required.
 - 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 - 8. Do not further disturb slab surfaces before starting finishing operations.

3.6 FINISHING FORMED SURFACES

- A. As-Cast Surface Finishes:
 - 1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1 inch wide or 1/2 inch (13 mm) deep.
 - b. Remove projections larger than ½ inch.
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 Class D.
 - e. Apply to concrete surfaces not exposed.

3.7 FINISHING FLOORS AND SLABS

- A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
 - 1. Finish to comply with Owner requirements for exposed flatwork as demonstrated in approved mockup.
 - 2. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
 - 3. Coordinate required final finish with Engineer before application.

3.8 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

- 1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
- 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
- 3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.9 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 - 1. Comply with ACI 301 for cold weather protection during curing.
 - 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
 - 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1,) before and during finishing operations.
- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
 - 1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 - 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 - 3. If forms remain during curing period, moist cure after loosening forms.
 - 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.

- e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
 - 1. Begin curing immediately after finishing concrete.
 - 2. Continue curing for a minimum of 7 days.

3.10 TOLERANCES

A. Conform to ACI 117.

3.11 JOINT FILLING

- A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month.
 - 2. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.
- D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete:
 - 1. Repair defective areas designated by Engineer.
 - 2. Remove and replace concrete that cannot be repaired to Engineer's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
 - a. Limit cut depth to 3/4 inch.
 - b. Make edges of cuts perpendicular to concrete surface.

- c. Clean, dampen with water, and brush-coat holes and voids.
- d. Fill and compact with patching mortar before surface has dried.
- e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
- 2. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Engineer.

D. Repairing Unformed Surfaces:

- 1. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
- 2. After concrete has cured at least 14 days, correct high areas by grinding.
- 3. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing.
- a. Finish repaired areas to blend into adjacent concrete.
- 4. Repair defective areas, except random cracks and single holes 1/4 inch or less in diameter, by cutting out and replacing with fresh concrete.
- a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
- b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
- c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
- d. Place, compact, and finish to blend with adjacent finished concrete.
- e. Cure in same manner as adjacent concrete.
- E. Perform structural repairs of concrete, subject to Engineer's approval.
- F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.13 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
 - 1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
 - 2. Testing agency shall immediately report to Engineer, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 - 3. Testing agency shall report results of tests and inspections, in writing, to Owner, Engineer, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

- a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
 - 1. Headed bolts and studs.
 - 2. Verification of use of required design mixture.
 - 3. Concrete placement, including conveying and depositing.
 - 4. Curing procedures and maintenance of curing temperature.
 - 5. Verification of concrete strength before removal of shores and forms from beams and slahs
 - 6. Batch Plant Inspections: On a random basis, as determined by Engineer.
- E. Concrete Tests: Testing of samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:
 - 1. Testing Frequency: Obtain one sample for each day's placement of each concrete mixture, plus one set for each additional 25 cu. yd. or fraction thereof.
 - a. When frequency of testing provides 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 C143/C143M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's placement of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete.

- a. One test for each composite sample, but not less than one test for each day's placement of each concrete mixture.
- 4. Concrete Temperature: ASTM C1064/C1064M:
- a. One test for each composite sample.
- 5. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and laboratory cure two sets of three or 4-inch by 8-inch cylinder specimens for each composite sample.
- b. Cast, initial cure, and field cure additional standard cylinder specimens for each composite sample as required to support confirmation of minimum strength for concrete formwork removal.
- 6. Compressive-Strength Tests: ASTM C39/C39M.
- a. Test one set of three laboratory-cured specimens at seven days and one set of two specimens at 28 days.
- b. Test field-cured specimens as required to support removal of concrete formwork..
- c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
- 7. Strength of each concrete mixture will be satisfactory if every 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 if specified compressive strength is 5000 psi or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
- 8. Additional Tests:
- a. 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 Engineer.
- b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Engineer.
 - 1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.
- 9. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 10. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.14 PROTECTION

- A. Protect concrete surfaces as follows:
 - 1. Protect from petroleum stains.

- 2. Diaper hydraulic equipment used over concrete surfaces.
- 3. Prohibit vehicle use on concrete slabs.
- 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
- 5. Prohibit placement of steel items on concrete surfaces.
- 6. Prohibit use of acids or acidic detergents over concrete surfaces.
- 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION

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SECTION 040120 - HISTORIC MASONRY RESTORATION

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. Repair/reconstruction of masonry elements:
 - a. Pointing and repointing of masonry
 - b. Localized repairs to stone elements including repair via injection, patching, pinning, and Dutchman repair
 - c. Localized stone replacement.
 - d. Localized stone rebuilding at new louver locations.
- 2. Replacement of inscribed and carved panels.
- 3. Cleaning:
 - a. General cleaning of masonry.
 - b. Localized salt removal at ground-level limestone.
- 4. Masonry related to roofing:
 - a. Preparation of reglets for roofing / flashing terminations
 - b. Removal of deteriorated parging from parapet masonry and installation of new cementitious parge to serve as substrate for fluid-applied roofing.
 - c. Removal and rebuilding of masonry to facilitate replacement of interior rainwater conductors.

B. Related Sections include the following:

- 1. Section 013591 "Historic Treatment Procedures" for work requirements on historic structures.
- 2. Section 076000 "Sheet Metal Flashing and Trim"
- 3. Section 079200 "Joint Sealants"

1.3 UNIT PRICES

A. See Section 012200 "Unit Prices" for description of unit prices affecting items specified under this Section.

1.4 ALTERNATES

A. See Section 012300 "Alternates" for description of alternates affecting items specified under this Section.

1.5 DEFINITIONS

- A. Very Low-Pressure Spray: Less than 100 psi.
- B. Low-Pressure Spray:
 - a. Pressure: 100 to 400 psi.
 - b. Flow Rate: 4 to 6 gpm.
- C. Medium-Pressure Spray:
 - a. Pressure: 400 to 800 psi.b. Flow Rate: 4 to 6 gpm.
- D. High-Pressure Spray:
 - a. Pressure: 800 to 1200 psi.b. Flow Rate: 4 to 6 gpm.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.
- B. Samples for Verification: Before erecting mockups, submit samples of the following. Resubmit additional samples as necessary to obtain Engineer and Owner approval.
 - 1. Limestone for stone unit replacement and Dutchmen repairs, 2 samples min, 6" x 6" each.
 - 2. Bluestone for stone unit replacement and repairs, 5 samples min.
 - 3. Custom color-matched cured samples of limestone repair mortar in prepared disks illustrating color and surface finish, 2 samples min.
 - a. Color shall be based on cleaned area of limestone.
 - 4. Each type of pointing mortar (limestone and bluestone) in the form of sample mortar strips, 6 inches long by ½ inch wide, set in aluminum or plastic channels, 5 samples for each type of mortar.
 - a. Include with each sample a list of ingredients with proportions of each, established through testing of samples of original materials taken from the buildings. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials.

C. Shop drawings:

- 1. Include plans, elevations, sections, and locations of inscribed and carved stone replacements.
 - a. Indicate complete dimensions for new stone units and their jointing, showing relation of existing to new units.
- 2. Show partial replacement stone units (dutchmen).

- 3. Indicate setting number of each new stone unit and its location on the structure in annotated plans and elevations.
- 4. Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of each point of contact or anchorage.
- D. Restoration Program: For each phase of restoration process, provide detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration and cleaning work including protection of surrounding materials on building and Project site.
 - 1. Include equipment for cutting mortar joints to sufficiently expose subsurface voids commonly encountered in brick head joints
 - 2. Include methods for keeping pointing mortar damp during curing period.
 - 3. If materials and methods other than those indicated are proposed for any phase of restoration work, provide a written description, including evidence of successful use on comparable projects, and a testing program to demonstrate their effectiveness for this Project.
 - 4. Include a masonry restoration schedule showing final conditions, locations and quantities for repair to be used in tracking allowance quantities.
- A. Cleaning Program: For each cleaning process and phase, provide detailed description of materials, methods, equipment, and sequence of operations to be used.
 - 1. Include methods for controlling water and runoff to minimize the risk of water infiltration and contamination of the site and building elements.
 - 2. If materials and methods other than those indicated are proposed for any phase of restoration work, provide a written description, including evidence of successful use on comparable projects, and a testing program to demonstrate their effectiveness for this Project.

1.7 QUALITY ASSURANCE

- A. Restoration Specialist Qualifications: Engage an experienced masonry restoration firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.
 - 1. Field Supervision: Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that masonry and concrete restoration and cleaning are in progress. Supervisors shall not be changed during Project except for causes beyond the control of restoration specialist firm.
 - 2. Restoration Worker Qualifications: Persons who are experienced in restoration work of types they will be performing per the Submittal specifications. Persons performing certain restoration activities shall be individually pre-qualified prior to commencing the Work per Section E.
- B. Source Limitations: Obtain each type of material for stone restoration (cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.

- C. Preconstruction Conference: Conduct conference at Project site to comply with requirements in Division 1. Review methods and procedures related to all facets of exterior masonry repair and rehabilitation including, but not limited to, the following:
 - 1. Coordination with work of others that precedes or relies on repair or rehabilitation construction.
 - 2. Locations, extent and sequencing of all mock-ups.
 - 3. General: Engineer and representatives of all related trades to be represented at conference.
- D. Mockups: Contractor shall provide mockups of each of the following for review / approval by Design Professional. Prepare mockups of restoration work as follows to demonstrate aesthetic effects and qualities of materials and execution. Prepare mockups on existing walls under same weather conditions to be expected during remainder of the Work.
 - 1. Limestone Cleaning (to facilitate aesthetic review of stone repair work): Prepare a small (2 SF) sample on inconspicuous areas for each specified/submitted product to assess effects and effectiveness on substrates. After cleaning approach has been selected from these samples, prepare the following cleaning mockups for review of appearance and workmanship. All mockup locations shall be decided in conjunction with Engineer.
 - a. One limestone window surround.
 - b. Twenty square feet (20 SF) of façade masonry to remain
 - c. Four linear feet (4 LF) limestone coping stone.
 - 2. Stone Panel Replacement (Dedication Plaques): Prepare installation mockup at (1) location illustrating stone anchor installation.
 - 3. Stone Repointing: Prepare installation pointing mortar mockups illustrating range of color using specified materials and joint profiles.
 - a. For limestone joints, assume (5) mortar mockups will be required (each approximately 3-4 LF)
 - b. For field masonry joints, assume (5) mortar mockups will be required (each approximately 3-4 LF)
 - 4. Limestone Crack Repair: In (2) areas designated by Engineer, repair stone unit via crack injection method. Permit Engineer review of both crack injection as well as finish patch along joint width in accordance with typical detail. Mock-up shall be min 1' long. Mockup will be evaluated for workmanship and aesthetic blending of the new mortar within the surrounding pointing to remain.
 - 5. Limestone Dutchman Repair: In (2) areas designated by Engineer, remove and replace damaged section of stone, and install new stone using approved materials; approx. 6" x 6" x 3" thick. Mockup will be evaluated for workmanship and aesthetic blending of the repair areas with the surrounding stone to remain.
 - 6. Limestone Spall Repair w/ Repair Mortar: In (2) areas designated by Engineer, prepare installation mockups for surface preparation and installation of new limestone patching material.

- 7. Limestone Spall Repair w/ Pins / Adhesive: In (2) areas designated by Engineer, prepare installation mockups. Mockup will be evaluated for workmanship and aesthetic blending of the repair areas with the surrounding stone to remain.
- 8. Stone Infill at Former Downspout Penetration: Prepare installation mockup at (1) location to illustrate blending of new stone with existing.
- 9. Stone Reconstruction: Prepare installation mockup illustrating stone anchor installation and coursing of new stone with existing to remain (2 SF min).
- 10. Cementitious Parge: Surface preparation and installation of new cementitious parge at masonry walls to serve as new substrate for roofing system (4 LF).
- E. Restoration mason mechanics test panels for workmanship:
 - 1. Contractor to ensure that mortar raking out process does not damage or overcut existing joints to remain and widen mortar joints, and that pointing/repointing workmanship replicates the existing mortar to remain as closely as possible in profile, texture, and color.
 - 2. All mason mechanics to be considered for work on this project shall individually prepare two test panels:
 - a. Mortar joint raking out test panels. Test panels that contain overcut or damaged masonry will be rejected. Mason mechanics that fail this test panel will not be permitted to perform any mortar removal work.
 - One test panel, approx. 10 LF (including a minimum of three "T" joints) of raked out limestone mortar.
 - b. Mortar pointing/repointing: Once mortar mix designs, profiles, and textures have been approved, every mason mechanic shall provide one 4 SF test panel per masonry type replicating the approved pointing/repointing process. Test panels will be judged on their conformance to the approved mortar sample. Approved samples shall be the standard for joints to be used in the completion of the Work. Work shall not begin until mortar pointing/repointing panels are approved. If rejected, mason mechanics are permitted to complete new samples for consideration. Masons whose workmanship remains rejected will not be permitted to undertake pointing/repointing work on this Project.

1.8 PRODUCT HANDLING

- A. Deliver masonry to Project site strapped together in suitable packs or pallets or in heavy-duty cartons.
- B. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

- D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.9 PROJECT CONDITIONS

- A. Repoint mortar joints and repair masonry only when air temperature is between and 40 and 90 deg F (4 and 32 deg C) and is predicted to remain so for at least 7 days after completion of work.
- B. Cold-Weather Requirements: Comply with the following procedures for masonry and stone repair and mortar-joint pointing:
 - 1. When air temperature is below 40 deg F (4 deg C), heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F (4 and 49 deg C).
 - 2. When mean daily air temperature is below 40 deg F (4 deg C), provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 7 days after repair and pointing.
- C. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 90 deg F (32 deg C) and above.
- D. Clean masonry surfaces only when air temperature is 40 deg F (4 deg C) and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.10 SEQUENCING AND SCHEDULING

- A. Order new masonry as not to delay completion of the Work.
- B. Order sand for mortar immediately after approval of mockups. Take delivery of and store at Project site a sufficient quantity of sand to complete Project.
- C. Masonry maintenance work will be performed concurrently with a roof replacement and window replacement/refurbishment program. Coordinate these scopes to minimize delays to the work.

PART 2 - PRODUCTS

2.1 INSCRIBED AND CARVED PANELS REPLACEMENT MATERIALS

- A. Limestone, ASTM C568: Provide limestone of variety, color, size, shape and finish to match existing to remain.
 - 1. Indiana limestone for stone plaque full unit replacements: Match existing surrounding limestone to remain. Approved suppliers include:
 - a. Old World Stone Ltd, 905-332-5547, www.oldworldstone.com
 - b. Approved substitute.

2.2 STONE REPLACEMENT AND DUTCHMAN REPAIR MATERIALS

- A. Limestone, ASTM C568: Provide limestone of variety, color, size, shape and finish to match existing to remain.
 - 1. Indiana limestone for Dutchmen repairs and full unit replacements: Match existing surrounding limestone to remain. Approved suppliers include:
 - a. Old World Stone Ltd, 905-332-5547, www.oldworldstone.com
 - b. Approved substitute.
- B. Bluestone, ASTM C616: Provide bluestone of variety and color as approved during submittal process.
 - 1. Provide bluestone with finish that matches existing stonework and suitable for exterior exposure. Suppliers, subject to approval by Owner, include:
 - a. Meshoppen Stone, Inc., (570) 833-2767, www.meshoppenstone.com.
 - b. Finger Lakes Stone Company, Inc., 607-273-4646. www.fingerlakesstone.com.
 - c. Approved substitute
- C. Dowels and Stone Setting Mortar: Type and size indicated or, if not indicated, to match existing anchors in size and type. Bases of Design:
 - 1. Fabricate anchors and dowels from Type 304 stainless steel, all-thread.
 - 2. Anchor adhesive and setting mortar shall be Jahn M80 Anchor Setting Mortar as manufactured by Cathedral Stone Products (www.cathedralstone.com)
- D. Bone Screws for Small Dutchmen Repairs: Type 316 Stainless steel, Cancellous Bone Screws, either 4 mm diameter, fully threaded, 26 mm long; or 6 mm diameter, fully threaded, 55 mm long. (Distributer: Diverse Surgical Supplies, www.diversesurgical.com, (866) 800-9414.)
- E. Stone anchors for stone unit replacement: Type 304 Stainless Steel Stone Anchors as manufactured by Hohmann and Barnard, or approved equal.
 - 1. #405 Stone Anchor
 - 2. #433 Stone Anchor
 - 3. #435 Stone Anchor
 - 4. #407 Stone Anchor
- F. Structural Adhesive: Provide as noted in drawings for use in anchor embedment and masonry repairs.
 - 1. Epoxy anchor adhesive, HILTI HIT-HY 270.
 - 2. Anchor mesh sleeve for hollow masonry or masonry with voids: HILTI HIT-SC.
- G. Shim Materials: Non-reactive, composed of slate, nylon or stainless steel.

2.3 MORTAR MATERIALS

- A. Field-mixed mortar for new and existing masonry:
 - 1. Regional Materials: Aggregate for mortar and grout shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
 - 2. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 - 3. Hydrated Lime: ASTM C 207, Type S.
 - 4. Aggregate for Mortar: ASTM C 144.

- a. Use aggregate obtained from sources on the NYSDOT list of approved potential aggregate sources. Aggregate shall not be designated as having ASR potential.
- b. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
- c. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
- d. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- 5. Water: Potable.
- B. Bag Mix mortar: Use specialty pre-mixed Type N mortar with custom sand and color blend to match existing mortars.
 - 1. Use Jahn M110 as manufactured by Cathedral Stone Products (www.cathedralstone.com)

2.4 MORTAR MIXES

- A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
- B. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.
- C. Do not use admixtures in mortar unless otherwise indicated.
- D. Mixes: Mix mortar materials in the following proportions:
 - 1. Pointing Mortar by Type: ASTM C 270, Proportion Specification, Type N (walls), or Type S (stairs, on-grade stone) unless otherwise indicated; with cementitious material limited to Portland cement and lime. Add mortar pigments to produce mortar colors required.
 - a. Variations in sand mixes may be required to achieve custom blended mortar to match existing including but not limited to various colors of sand and aggregate, as well as additional sieve passing required for mortars where joints are either larger or smaller than the standard 3/8" mortar joint. All mortars will shall match existing and will be subject to approval in field during a mock-up process.

2.5 STONE REPAIR MATERIALS

- A. Limestone Repair Mortar: Provide single-component, cementitious, mineral based, premixed patching mortar.
 - 1. Products: Subject to compliance with manufacturers requirements.
 - a. Jahn M70 Limestone Repair Mortar as manufactured by Cathedral Stone, Inc. or approved equal.
 - b. Color: To match existing. Subject to mock-up approval.
- B. Stone-To-Stone Adhesive: 1-part cementitious stone adhesive.
 - 1. Products: MasonrRE Adhesive as manufactured by Cathedral Stone Inc., or approved equal.

2.6 CRACK INJECTION MATERIALS

- A. Grout Injection: Use low viscosity repair mortar specifically formulated to penetrate and reseal joints and cracks of variable thickness (1/16 inch to 3/8 inch). Bases of design--
 - 1. Joints 1/16 to 3/16 in.: Jahn M30- #32 (Soft stone) Micro Injection Grout, as manufactured by Cathedral Stone Products, Inc. (www.cathedralstone.com)
 - 2. Joints 3/16 to 3/8 in.: Jahn M40 Crack Injection Grout, as manufactured by Cathedral Stone Products, Inc.
 - 3. Syringe Kit: Jahn Luer Lock Syringe with 10 or 12 gauge metal tip, as manufactured by Cathedral Stone Products.
 - 4. Cementitious Repair Mortar for finishing Stone Crack Injection Repairs: Jahn M70 Limestone Repair Mortar as manufactured by Cathedral Stone Products (www.cathedralstone.com)

2.7 MASONRY CLEANING PRODUCTS

- A. Water: Potable.
- B. Cold-Water Soak Cleaning of Limestone:
 - 1. Apply cold water by intermittent spraying to keep surface moist.
 - 2. Use perforated hoses or other means that will apply a fine water mist to entire surface being cleaned.
 - 3. Apply water in cycles of three hours on and 30 minutes off.
 - 4. Continue spraying until surface encrustation has softened enough to permit its removal by water wash, as indicated by cleaning tests.
 - 5. Remove soil and softened surface encrustation from surface with cold water applied by low-pressure spray.
- C. Chemical Cleaning Agents: Use the following products or approved alternate as determined by mockups.
 - 1. Biocides:
 - a. BioKlean, as manufactured by Prosoco (www.prosoco.com)
 - b. D/2, as manufactured by Cathedral Stone Products (www.cathedralstone.com)
 - 2. Final washdown
 - a. Sure Klean Vana Trol by Prosoco.
 - b. Potable water.

2.8 PARGE FOR PARAPET MASONRY

- A. SikaTop 122 Plus by Sika Corporation (www.sikausa.com)
- B. Primer: Scrub coat of SikaTop 122 Plus
 - c. Extend with 3/8" course aggregate for applications greater than 1". Aggregate must be non-reactive, clean, well graded, and comply with ASTM C33. Use aggregate obtained from sources on the NYSDOT list of approved potential aggregate sources. Aggregate shall not be designated as having ASR potential.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, statuary, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from repair and restoration work.
 - 1. Erect temporary protective covers over walkways and at points of pedestrian entrances and exits that must remain in service during course of restoration and cleaning work.
- B. Protect building and other surfaces against damage from exposure to its cleaning process.
 - 1. Cover adjacent surfaces with materials that are proven to resist cleaning effluent used unless process being used will not damage adjacent surfaces. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
 - 2. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
- C. Prevent mortar from staining face of surrounding roofing and other surfaces.
 - 1. Cover sills, ledges, and projections to protect from mortar droppings.
 - 2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
 - 3. Immediately remove mortar in contact with exposed masonry and other surfaces.
 - 4. Clean mortar splatters from scaffolding at end of each day.

3.2 INSTALLATION AND USE OF PROPRIETARY PRODUCTS

- A. For the purposes of this section, installation and use of proprietary products refers to:
 - 1. Pre-packaged mortar products.
 - 2. Epoxy adhesives.
 - 3. Injection materials.
 - 4. Masonry cleaning products.
- B. All proprietary products shall be installed according to manufacturer specifications and required installation instructions, including, but not limited to, the following:
 - 1. Delivery, storage and handling instructions.
 - 2. Protection and site conditions that must be met before application.
 - 3. Execution instructions including workmanship standards and application techniques.
 - 4. Curing and setting procedures.
 - 5. Final cleaning procedures.
- C. Any anticipated deviations from manufacturer specifications should be submitted to Engineer for approval.

3.3 STONE REPLACEMENT

A. Remove stones calling to be replaced on Contract Documents in sections.

- B. Provide temporary shoring as required to maintain structural integrity of wall above removed stone piece(s).
- C. Install stone anchors (4 per stone) into stone backup wall and adjacent stone pieces.
- D. Set new stone in mortar. Tool joints in compliance with tooling determined during mockup process.

3.4 POINTING AND REPOINTING MASONRY

- A. Rake out and repoint mortar joints at locations indicated.
- B. Rake out joints as follows:
 - 1. Remove mortar from joints to depths indicated on Drawings, but not less than ¾ in. or that required to expose sound, unweathered mortar. Where removal exposes voids or pockets in joints, extend removal to provide sufficient access to permit complete filling by repointing mortar. Where subsurface cracking is encountered in mortar, extend depth of removal beyond cracking depth.
 - 2. If removal of mortar risks cutting into stone or brick, consult with Engineer before proceeding. Use diamond-tipped drill / grinder bits or suitable hand-tools to remove corner and head joint mortar to achieve the required consistent depth.
 - 3. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
 - 4. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Engineer.
 - a. Cut out mortar in accordance with procedures documented in contract drawings. Personnel shall not perform joint preparation without Engineer's written approval. This approval will be based on submission by Contractor of a satisfactory quality-control program and demonstrated ability of operators to use tools without damaging masonry during individual mockups. Quality-control program shall include provisions for supervising performance and preventing damage due to worker fatigue.
- C. Notify Engineer of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, corroding metal, and other deteriorated items. For voids that are likely to not be consolidated with repointing, injection grouting shall be used.
- D. Point masonry joints as follows:
 - 1. Rinse masonry-joint surfaces with water to remove dust and mortar particles. Time rinsing applications so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen masonry-joint surfaces before pointing
 - 2. Mix only enough pointing mortar that can be installed within 1.5 hours.
 - 3. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch (9 mm) until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
 - 4. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 1/4 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Take care not to spread mortar over edges onto exposed masonry surfaces or to featheredge mortar.

- 5. When mortar is thumbprint hard, tool joints to match original appearance of joints. Remove excess mortar from edge of joint by brushing.
- 6. Washdown surfaces with potable water after at least 7 days of curing to minimize the risk of damaging final profile of pointing and pigment removal.
- 7. Where mortar joints occur at locations where new fluid-applied membrane waterproofing system turns up vertical masonry walls, joints shall be tooled flush with masonry substrate.
- E. Cure mortar by maintaining in thoroughly damp condition for at least 72 hours including weekends and holidays.
 - 1. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
 - 2. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.

3.5 CRACK INJECTION

- A. Rake out existing mortar and sealant materials from existing crack.
- B. Review exposed representative areas of injection with Engineer to confirm injection product selection, and any exposed special conditions.
- C. Wash the surface and interior of the crack using clean water to remove all dust, loose or deleterious material which could prevent proper flow and/or adhesion.
- D. Drill a series of injection ports in the center of the crack angled downward. Seal the crack with removable, non-staining clay, sealant or caulk.
- E. Mix the grout material per the manufacturer's written recommendations.
- F. Immediately before injection, moisten interior of the crack by flushing with water. If the crack is allowed to dry out before the grout is injected, this step shall be repeated.
- G. Inject grout into the lowest port and continue until it flows freely from this port and proceeding until crack is fully filled.
- H. Clean any grout spills or runs immediately with clean water to avoid additional chemical or mechanical cleaning methods after the product has set.
- I. Remove temporary injection port seals, route surface of the crack as noted on the drawings, and infill outer surface of crack with cementitious repair material.

3.6 STONE DUTCHMAN

- A. At locations identified by Engineer, make edges of stone at removals smooth and square to each other and to finished surface.
- B. For installation of Dutchman:
 - 1. For Dutchman greater than 3/4 inches: Install stainless steel dowel(s), if required, and repair mortar in accordance with product manufacturer's written instructions and guidelines. Cure as required by product manufacturer.

2. For Dutchman less than 3/4 inches: Assume min. 2 bone screws will be required per Dutchman. Reposition and affix the spall with masonry adhesive to the substrate and secure with non-marking, removable tape. Drill an undersized pilot hole (approx. 0.4 mm) for the diameter of the bone screw, perpendicular to the back plane of the spall, to embed the screw into the substrate min. 1 in. Redrill the top of the new hole with a larger diameter bit to permit the hex head of the bone screw to countersink. Clean the hole with compressed air, and confirm the depth of the hole. Install the bone screw by hand with a hex key. Cover the area over the hex head with repair mortar, and cure as required by product manufacturer. Clean cured spall and treat any remaining cracks greater than 1/16" with color-matched grout.

3.7 STONE PATCHING

- A. Remove all loose mortar and masonry prior to installation of the repair mortar. "Sound" masonry with a hammer to verify its integrity. Remove any sealant residue.
- B. Where cramp anchors, threaded rod anchors, or dowels have been cut and pieces remain embedded in the substrate: Anchors that are free of rust, solidly embedded, and do not project beyond the surface of the masonry unit may remain and exposed surfaces of such anchors shall be coated with a corrosion-inhibiting paint. All others should be removed.
- C. Cut the edges of the repair area to provide a minimum depth of 1/4". The edges of the repair should be square cut. Do not allow any feathered edges in the repair area.
- D. Install anchors in all repair areas if specified on the Contract Drawing.
- E. Clean all dust from surface and pores of the substrate, using clean water and a scrub brush.
- F. For very dry or porous surfaces, pre-wet the substrate ahead of time to prevent the substrate from drawing moisture out of the repair too quickly. Re-wet the surface immediately before applying the repair material.
- G. Apply the mortar mix using a trowel to place and compress the mortar into the repair ensuring not to leave any voids. For overhead repairs thicker than 2", apply mortar in layers, allowing the first layer to cure for a two to four hours before applying the second layer. If applied in layers, scrape off any cement skin that has formed and continue application. Dampen the surface and before applying the next layer. Work mortar firmly into the surface of the masonry, including the corners, and under and around all mechanical anchors.
- H. Build up repair material so that it is slightly above the adjacent masonry surface. Allow mortar 30 to 60 minutes to set slightly (wait time will vary with temperature and humidity-longer in cool weather), and then scrape off excess material using a straight edge (a plasterer's miter rod is good for this). Do not press down or "float" the repair. Where repairs occur at panel edges or corners, form mortar to match the profile of the surrounding masonry. In all cases, finish and texture repair so that it is as indistinguishable as possible from the adjacent masonry.

I. Clean any mortar residues from area surrounding the repair by sponging as many times as necessary with clean water. This should be done before repair material sets.

3.8 AESTHETIC BLENDING OF NEW AND EXISTING MASONRY TO REMAIN

- A. General: To the fullest extent possible, all reconstructed or locally replaced stone shall be installed to minimize the aesthetic mismatch of the new repointing and stone. Should an unacceptable visual mismatch occur as judged by the Engineer and Owner, the following penetrating stains and sealers remedies shall be considered:
 - 1. Confirm locations in field with Engineer prior to proceeding.
 - 2. Provide a minimum of three 2x2 ft mockup samples in an obscure area similar to the affected construction, or on similar, excess materials per affected condition to be corrected.
 - 3. Upon approval by Engineer and Owner, install proprietary products in conformance with approved mockups.

3.9 REGLETS

- A. All reglets shall be cut to a depth of 2-1/2" unless noted otherwise.
- B. Care shall be taken during cutting of reglets to not damage the edges of the reglet or spall the masonry substrate in the removal process.
- C. Clean all reglets of dirt, mortar, mastic, sealant, flashing tapes, and any other foreign materials.
- D. Location and extents of all reglets to be verified with the Engineer in the field prior to cutting.
- E. Pointing of Reglets: Where indicated, reglets shall be filled with mortar, tooled and cured per approved mockups.

3.10 PARGE FOR PARAPET MASONRY

- A. Prepare surface of parapet masonry where new fluid-applied roofing is to be installed. Surface must be clean and sound. Remove all dust, disintegrated, flaking, scaling, or loose material.
- B. Install new cementitious parge (SikaTop 122 Plus) to level masonry and infill minor divots or voids. Install in accordance with manufacturer's recommendations and per approved mockup.
- C. Curing: Cure parge in accordance with manufacturer's instructions.
- D. Surface Profile: After approximately 24 hours, grind surface of parge to provide surface to achieve a CSP-3 surface profile in preparation for fluid applied roofing. This is the required surface texture for the fluid-applied membrane.

3.10 CLEANING

A. General: Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 5 feet away by Engineer.

- B. Proceed with cleaning in an orderly manner; work from one end of each elevation to the other. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.
 - 1. For chemical cleaners, work from bottom to top.
 - 2. For water cleaning, work from top to bottom.
- C. Use only those cleaning methods indicated for each masonry material and location.
 - 1. Uniform masonry cleaning shall be performed either prior to repointing or once the repointed joints have cured a minimum of 28 days to minimize the risk of damage to the new work. Use only those cleaning methods and cleaning agents approved by Engineer and Owner.
 - 2. Perform cleaning indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces, or other adjacent materials and landscaping.
- D. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances crusts, dust accumulations, thick black atmospheric deposits, and salt deposits.
 - 1. Use non-metallic brushes to remove surface deposits.

E. General Cleaning Process:

- 1. Review water protection plan with Owner and Engineer prior to proceeding.
- 2. Proceed with cleaning in an orderly manner; work from top to bottom and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.
- 3. Use only those cleaning methods approved for various substrates during mockup review.
- 4. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners and interstices, and that produces an even effect without streaking or damaging stone surfaces.
- 5. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

F. Final washdown.

- 1. Evaluate which elevations of the building whose new mortar will have cured sufficiently to permit a final washdown. Confirm protection plan is in place prior to proceeding.
- 2. Use a combination of light pressure powerwashing (500 psi max, 30-40 fan tip nozzle, not closer than 12 inches from area to be cleaned) and proprietary chemical products to remove any lingering debris, dust, and excess mortar from the masonry.
- 3. Remove protections.

G. Schedule:

1. All building elevations and elements shall be generally cleaned to remove light atmospheric soiling, and new masonry assemblies or repointing shall be cleaned after all major construction activities have concluded.

3.11 QUALITY CONTROL

- A. Engineer will observe progress and quality of portions of the Work at critical stages and at intervals during the course of construction. Critical stages include but are not limited to the following:
 - 1. Dismantling of masonry for all classes of repair (repointing, base flashing preparation, partial removals to expose embedded steel and other framing)
 - 2. Permit observation by Engineer to confirm adequacy and extent of removals prior to commencing replacement construction.

- 3. Preparation of steel surfaces at embedded framing, prior to receiving protective measures / coverings.
- 4. Installation of embedded, concealed work (flashings, anchorages).
- B. Notify Engineer sufficiently in advance of times when Work will be ready for observation and prior to removal of access.

END OF SECTION 040120

SECTION 050372 - HISTORIC DECORATIVE METAL REPAIR

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. Historic treatment of decorative metal in the form of repair as follows:
 - a. Removing and dismantling metal for shop repair, repatination, sealing, and replacement of components; reinstalling repaired, repatinated, and sealed metal.

B. Related Requirements:

- 1. Section 024296 "Historic Removal and Dismantling" for general historic removal and dismantling requirements.
- 2. Section 265000 "Lighting" for associated electrical work at historic lighting.

1.3 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s)
- B. Medium-Pressure Spray: 400 to 800 psi (2750 to 5510 kPa); 4 to 6 gpm (0.25 to 0.4 L/s)
- C. High-Pressure Spray: 800 to 1200 psi (5510 to 8250 kPa); 4 to 6 gpm (0.25 to 0.4 L/s)

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site.
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of decorative metal.
 - 2. Review methods and procedures related to historic decorative metal repair including, but not limited to, the following:
 - a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Fire-protection plan.

- d. Decorative metal historic treatment program and procedure for selecting metal treatments established through mockup.
- e. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

- A. Perform decorative metal repair in the following sequence, which includes work specified in this and other Sections:
 - 1. Dismantle existing surface-mounted objects and hardware that overlie decorative metal surfaces except items indicated to remain in place. Tag items with location identification and protect.
 - 2. Verify that temporary protections have been installed.
 - 3. Examine condition of decorative metal.
 - 4. Clean decorative metal surface, and remove paint and other finishes to the extent required.
 - 5. Repair and replace existing decorative metal and supports to the degree required for a uniform and sound surface on which to paint or apply other finishes.
 - 6. Cure repaired surfaces and allow them to dry for proper finishing.
 - 7. Apply finishes and sealants.
 - 8. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for product application and use.
 - 2. Include test data substantiating that products comply with requirements.

B. Shop Drawings:

- 1. Include plans, elevations, and sections showing locations and extent of repair and replacement work, with enlarged details of replacement parts indicating materials, profiles, methods of attachment, accessory items, and finishes.
- 2. Include field-verified dimensions and the following:
 - a. Full-size patterns with complete dimensions for new decorative metal components and their jointing, showing relation of existing to new components.
 - b. Templates and directions for installing anchor bolts and other anchorages.
 - c. Identification of each new metal item and component and its location on the structure in annotated plans and elevations.
 - d. Provisions for expansion, weep holes, and conduits as required for each location and exposure.
 - e. Provisions for sealant between decorative metal components and for sealant-type joints if required.
- C. Samples for Initial Selection: For each type of decorative metal item and component with factory-applied finishes.
 - 1. Include samples of sealant materials, miscellaneous materials, and accessories involving size, color, or finish selection.

- D. Samples for Verification: For the following products in manufacturer's standard sizes unless otherwise indicated, finished as required for use in the Work:
 - 1. Each type of new material to be used for replacing existing or missing decorative metal; 6 inches (150 mm) long in least dimension or whole item.
 - a. Patterns for Casting: Before casting components, submit the actual patterns from which molds will be made for casting. Package and ship to prevent loss or damage, or make patterns available for inspection by Engineer at fabrication plant.
 - 2. Fittings and brackets.
 - 3. Glass for interior and exterior lights
 - 4. Each type of exposed connection between components. Show method of finishing components at connections.
 - 5. Each type of exposed finish prepared on metal of the same alloy to be used for the Work of this Section; 6 inches (150 mm) long in least dimension.
 - 6. Sealant materials.
 - 7. Accessories: Each type of anchor, accessory, and miscellaneous support in required finishes.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist.
- B. Historic treatment specialist conservation studio insurance for (insuring decorative historic light fixtures while housed at conservation studio)
- C. Decorative Metal Historic Treatment Program: For repairing historic decorative metalwork.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents, including material, finish, source, and location on or in building.
- B. Molds for Castings: On completion of manufacturing of cast components, deliver one unused mold of each shape and size of component to Project site. Deliver to a location and at a time determined by Owner, to become property of Owner.
 - 1. Deliver molds carefully packed, protected from dirt, moisture, and breakage so as to arrive in usable, undamaged condition and enable long-term storage and possible future use.

1.9 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic decorative metal repair specialist. Repair specialist shall be experienced in forge welding. Experience in torch- or arcwelding and installing and finishing new decorative metal work is insufficient experience for decorative metal historic treatment work.

- 1. Single Specialist: Have the work of Section 050372 "Historic Decorative Metal Repair" performed by the same historic treatment specialist firm, meeting the specialist qualifications of those Sections.
- B. Decorative Metal Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic decorative metal repair work, including each process or phase of repairing decorative metal, related work, and the protection of surrounding materials and Project site.
 - 1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- C. Decorative Metal Finish Samples: Provide initial finish samples using metal matching the item to be refinished.
- D. Mockups: Prepare mockups of historic treatment repair processes to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation. Prepare mockups so they are inconspicuous.
 - 1. Replacing Metal Component: Submit one full mockup of repair of similar metal to existing historic metal to be restored.
 - 2. Cast-Metal Components: Submit patterns, models, or plaster castings made from existing decorative metal for each replacement casting required.
 - 3. Refinishing: Submit sample of refinishing of historic metal by using initial sample of finish on same metal. Include sample of repatination and wax or acrylic finish.
 - 4. Refinishing; Perform one mockup of metal restoration refinishing on Cloister light in conservator's studio. Include, glass lenses and new lamping. Make available for review by restoration Engineer.
 - 5. Installation: Perform one complete installation of one interior Cloister and one exterior light fixture.
 - 6. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
 - 7. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 FIFLD CONDITIONS

A. Weather Limitations: Proceed with historic treatment of decorative metal only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

- A. Provide metal materials made of the alloys, forms, and types that match existing metals and have the ability to receive finishes matching existing finishes unless otherwise indicated. Exposed-to-view surfaces exhibiting imperfections inconsistent with existing materials are unacceptable.
- B. Source Limitation for Replacement Cast Materials: Obtain castings for historic treatment of decorative metal from single source from single manufacturer with resources to provide materials of consistent quality in appearance and physical properties.
- C. Copper Alloys, Bronze:
 - 1. Plate, Sheet, Strip, and Bars: ASTM B36/B36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper and 40 percent zinc).
 - 2. Composition Bronze Castings: ASTM B62, Alloy UNS No. C83600 ("85-5-5-5" is the common trade name; 85 percent copper and 5 percent each of tin, lead, and zinc).
 - 3. Sand Castings: ASTM B584, Alloy UNS No. C86500 (No. 1 manganese bronze; 58 percent copper, 39 percent zinc, 1 percent manganese, and small amounts of other metals).

2.2 PREPARATORY CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F (60 to 71 deg C).
- C. Detergent Solution: Vulpex
- D. Abrasive Materials:
 - 1. Abrasive Pads: Non-scratch, of the following type(s):
 - a. Abrasive Pad with Sponge: Combination plastic abrasive pad, consisting of a sponge enclosed with a woven urethane, polypropylene, or other plastic mesh or fabric, without other abrasive components that can scratch metal.
 - b. Abrasive Pad of Plant Fibers: Agave, loofa, or another tough plant fiber, without other abrasive components that can scratch metal.
 - 2. Medium Abrasives for Copper Alloys: Extra fine bronze wool or plastic abrasive pads.
 - 3. Blasting Abrasive: Pulverized walnut shells.
- E. Wash Cloths: Lint-free, absorbent, durable cloth without abrasives that can scratch metal.

2.3 FASTENERS

- A. Fasteners: Fasteners of the same basic metal as fastened metal unless otherwise indicated. Use metals that are noncorrosive and compatible with each metal joined.
 - 1. Match existing fasteners in material and in type of fastener unless otherwise indicated.

- 2. Use concealed fasteners for interconnecting decorative metal components and for attaching them to other work unless exposed fasteners are unavoidable or the existing fastening method.
- 3. For exposed fasteners, use Phillips-type machine screws of head profile flush with metal surface unless otherwise indicated.
- 4. Finish heads of exposed fasteners to match finish of metal fastened unless otherwise indicated.

2.4 ACCESSORIES

- A. Metal-Patching Compound: Two-part, epoxy- or polyester-resin, metal-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of metal repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be produced for filling metal that has deteriorated because of corrosion or deformation. Filler shall be capable of filling deep holes and spreading to feather edge.
- B. Brazing Rods for Copper Alloys: Type and alloy as recommended in writing by brazing-rod manufacturer and as required for color match, strength, and compatibility in fabricated items.
- C. Welding Electrodes and Filler Metal: Select according to AWS specifications for metal alloy welded; use metal type and alloy as required for color match, strength, and compatibility in fabricated items.
- D. Glass: Match Engineer's sample. Glass provided by McGrory Glass, Paulsboro, NJ
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended in writing by manufacturer for interior and exterior applications.

F. Sealant Materials:

- 1. Provide manufacturer's standard, elastomeric nonstaining, single-component, nonsag silicone sealant complying with applicable requirements in Section 079200 "Joint Sealants."
- 2. Colors: Provide colors of exposed sealants to match colors of metals in which sealant is placed unless otherwise indicated.
- G. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer according to MPI #23 (surface tolerant, anticorrosive metal primer) for concealed locations
 - 1. Surface Preparation: Use coating requiring no better than SSPC-SP 3, "Power Tool Cleaning" surface preparation according to manufacturer's literature or certified statement.
 - 2. VOC Limit: Use coating with a VOC content of 400 g/L (3.3 lb/gal.) or less.
- H. Masking Tape: Nonstaining, nonabsorbent material; compatible with chemical solutions being used and substrate surfaces, and that will easily come off entirely, including adhesive.
- I. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

- 1. Previous effectiveness in performing the work involved.
- 2. Little possibility of damaging exposed surfaces.
- 3. Consistency of each application.
- 4. Uniformity of the resulting overall appearance.
- 5. Do not use products or tools that could do the following:
 - a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in the Contract.
 - b. Leave an unintended residue on surfaces.
- J. Anchorage: Bronze alloy anchors as indicated.

2.5 METAL FABRICATION

- A. Custom fabricate repairs of decorative metal items and components in sizes and profiles to match existing decorative metal unless otherwise indicated, with accurate curves, lines, and angles. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
- B. Provide uniform, neat seams with minimum exposure of welds, brazing, solder, and sealant.
- C. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for fasteners. Use concealed fasteners where possible; use exposed fasteners to match existing work.
- D. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
 - 1. Use materials and methods that match color of base metal, minimize distortion, and develop maximum strength and corrosion resistance.
 - 2. Remove flux immediately.
 - 3. At exposed connections, match contours of adjoining surfaces, and finish exposed surfaces smooth and blended so no roughness shows after finishing.
- E. Castings: Fabricate castings free of warp, cracks, blowholes, or other defects that impair strength or appearance. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks.
 - 1. Finish castings to match existing decorative metal work.
 - 2. Replacement Casting for Light components: Duplicate existing finial on exterior light.
- F. Date Identification: Emboss on a concealed, interior surface of the metal body of each new component, in easily read characters, "MADE <Insert year>." Manufacturer's name may also be embossed.

2.6 FINISHES, GENERAL

A. Have decorative metal refinishing performed by a qualified decorative metal refinishing specialist.

- B. Refinish Appearance Standard: Refinish as established by mockup.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a temporary protective covering before shipping.
- D. 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.

2.7 COPPER-ALLOY FINISHES

- A. Finish designations for copper alloys comply with the system defined in NAAMM's "Metal Finishes Manual for Restoration Architectural and Metal Products (AMP 500-06)."
- B. Exterior and Interior Finish: Finish for all historic metal restoration to be developed and finalized through mock up.
- C. Exterior and Interior Finish: Repatinated metal with hot wax and lacquer finish:
 - 1. Patination and Finish as established by samples and mockup.
 - 2. Patination chemicals for base color:
 - a. Use chemicals for patination that achieve same color and finish for new cast bronze elements and existing cast bronze elements and existing plate elements.
 - b. Hot or cold immersion, or hot surface application as determined by mockup.
 - 3. Clear lacquer finish: Nikolas waterborne acrylic urethane and wax

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT SPECIALIST

- A. Historic Treatment Specialist Firms: Subject to compliance with requirements provide historic decorative metal repair by one of the following:
 - 1. Kreilick Conservation of Oreland, PA (http://www.kreilickconservation.com/).
 - 2. Approved conservator with proven history of completing restoration of historic metal in accordance with Section 013591 "Historic Treatment Procedures" and requirements of this section.

3.2 PROTECTION

A. Comply with dismantling requirements when removing decorative metal items for transferring to conservation studio.

3.3 HISTORIC DECORATIVE METAL REPAIR, GENERAL

A. Repair Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 10 feet away by Engineer.

- B. Execution of the Work: In repairing historic items, disturb remaining existing work as minimally as possible and as follows:
 - 1. Stabilize decorative metal to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
 - 2. Remove deteriorated coatings and corrosion.
 - 3. Sequence work to minimize time before protective coatings are reapplied.
 - 4. Repair items where stabilization is insufficient to stop progress of deterioration.
 - 5. Repair items in place unless otherwise indicated and retain as much original material as possible.
 - 6. Replace or reproduce historic items where indicated or scheduled.
 - 7. Make historic treatment of materials reversible whenever possible.
 - 8. Install temporary protective measures to stabilize decorative metal that is indicated to be repaired later.
- C. Mechanical Coating Removal: Use gentlest mechanical methods that do not abrade metal substrate. Do not use abrasive methods, such as sanding, or power tools except as indicated as part of the historic treatment program and approved by Engineer.
- D. Repairing Decorative Metal Items: Match existing materials and features, retaining as much original material as possible to complete the repair.
 - 1. Unless otherwise indicated, repair decorative metals by patching, filling, piecing-in, splicing, or otherwise reinforcing metals with new material matching existing.
 - 2. Where indicated, repair decorative metal by limited replacement to the extent indicated, matching existing material.
- E. Replacing Decorative Metal Components: Where indicated, duplicate and replace items with new metal matching existing metal.
 - 1. Replace heavily deteriorated or missing parts or features of decorative metal with compatible materials, using surviving prototypes to create patterns or molds for duplicate replacements.
 - 2. Do not use substitute materials unless otherwise indicated.
 - 3. Compatible substitute materials may be used.

3.4 PREPARATORY CLEANING

- A. Perform preparatory cleaning before performing repair work. Use only those methods indicated for each type of decorative metal and its location.
 - 1. Brushes: If using wire brushes, use brushes of same base metal composition as metal being treated. Use brushes that are resistant to chemicals being used.
 - 2. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that spray methods do not damage surfaces.
 - a. Equip units with pressure gages.
 - b. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
 - c. For high-pressure water-spray application, use fan-shaped spray that disperses water at an angle of at least 40 degrees.

- d. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F (60 and 71 deg C) at flow rates indicated.
- 3. Uniformity: Perform each cleaning method in a manner that results in uniform coverage of all surfaces, including corners, contours, and interstices, and that produces an even effect without streaks or damaging surfaces.
- 4. Protection: After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

B. Detergent Cleaning:

- 1. Wet surface with cold water applied with sponges or wash cloths.
- 2. Scrub surface with detergent solution and natural-fiber bristle brush until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet. Leave uniform patina intact.
- 3. Rinse with cold water applied with low pressure spray to remove detergent solution and soil.
- C. Cleaning by Abrasive Blasting: Clean surfaces to remove dirt by dry blasting with specified blasting abrasive at pressure and distance from surface indicated below.
 - 1. Pressure and Distance from Surface: Maximum pressure of 60 psi (415 kPa) with specified blasting abrasive propelled from a distance of 12 to 18 inches (305 to 457 mm) from surface.
 - 2. Pressure and Distance from Surface: As established by mockup.

D. Chemical Rust Removal: Lintels only:

- 1. Remove loose rust scale with approved, medium abrasives for ferrous metals.
- 2. Apply rust remover with brushes or as recommended in writing by manufacturer.
- 3. Allow rust remover to remain on surface for period recommended in writing by manufacturer or as determined by testing. Do not allow extended dwell time.
- 4. Wipe off residue with mineral spirits and either steel wool or soft rags, or clean with method recommended in writing by manufacturer to remove residue.
- 5. Dry immediately with clean, soft cloths. Follow direction of grain in metal.
- 6. Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.

3.5 HISTORIC DECORATIVE METAL REFINISHING, GENERAL.

- A. Refinishing Appearance Standard: Refinished surfaces are to have a uniform appearance as viewed from 5 feet away by Engineer.
- B. Execution of the Work: In refinishing historic items, disturb remaining existing work as minimally as possible and as follows:
 - 1. Remove dirt and corrosion.
 - 2. Sequence work to minimize time before protective coatings are reapplied.
 - 3. Refinish items in place unless otherwise indicated and retain as much original finish as possible and according to required appearance.
 - 4. Make historic treatment of materials reversible whenever possible.

C. Refinishing Decorative Metal Item: Do not remove existing finishes unless noted otherwise. Clean metal removing oxidization and reapply patination and hot wax finish and buff.

3.6 REPATINATION

A. Repatination: Apply chemicals or immerse objects in manner resulting in even finish.

3.7 PROTECTIVE COATING

- A. Protective Hot-Wax Coating: Apply wax coating to produce uniform appearance without runs or other surface imperfections.
 - 1. Clean and dry surface being waxed.
 - 2. Preheat surface to about 212 deg F (100 deg C); hot enough to melt the wax and remove water vapor and other gases within metal surface, but not hot enough to boil the wax or ignite solvents, if any.
 - 3. Apply uniform wax coating to surface, ensuring that wax coverage is complete, including recesses. Apply second wax coating following the same process.
 - 4. Inspect surface and repair holidays by reheating and applying more wax.
 - 5. Buff waxed surface to a slight shine with a lint-free cloth after wax has cooled to a hazy appearance.

3.8 DISMANTLING, REPAIR, AND INSTALLATION

A. Perform dismantling work as required in Section 024296 "Historic Removal and Dismantling."

B. Reinstalling:

- 1. Locate and place decorative metal iron items level and plumb and in alignment with adjacent construction.
 - a. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- 2. Use concealed anchorages where possible, unless otherwise indicated.
- 3. Form tight joints with exposed connections accurately fitted together.
- 4. Install concealed joint fillers, sealants, and flashings, as the Work progresses, to make exterior items weatherproof.
- 5. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.
- 6. Touch Up: At completion of installation, touch up and restore damaged or defaced finish surfaces and fastener heads.
- C. Sealant: Clean and prepare joint surfaces and apply and cure sealant according to Section 079200 "Joint Sealants."
 - 1. Keep joints to receive sealant dry and free of debris.

- 2. Do not allow primer to spill or migrate onto adjoining surfaces.
- 3. Apply sealant on joint surfaces between abutting cast-metal components in a continuous application immediately before joining the components together. Remove excess after components are joined and tightened.
- 4. Fill sealant-type joints with specified joint sealant as recommended in writing by sealant manufacturer and the following:
 - a. Install sealant using only proved installation methods that ensure sealant is deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding metal.
 - b. Do not allow sealant to overflow or spill onto adjoining surfaces or to migrate into the voids of adjoining surfaces, particularly rough or sculptural textures. Promptly remove excess and spillage of sealant as the work progresses. Clean adjoining surfaces by means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.

3.9 PRIMING

- A. Repair Primer: Apply immediately after completing a repair.
- B. Finish Primer: Apply as soon after cleaning as possible.

3.10 PAINTING STEEL UNCOVERED DURING THE WORK

- A. Notify Engineer if steel is exposed during metal removal. Where Engineer determines that the steel is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:
 - 1. Surface Preparation: Remove paint, rust, and other contaminants according to SSPC-SP 3, "Power Tool Cleaning," standard as applicable to comply with paint manufacturer's recommended preparation.
 - 2. Antirust Coating: Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).
- B. If on inspection and rust removal the thickness of a steel member is found to be reduced from rust by more than 1/16 inch (1.6 mm), notify Engineer before proceeding.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.
- B. Notify testing agency in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors have had reasonable opportunity to inspect work areas at locations of lift devices or scaffolding.

END OF SECTION 050372

SECTION 057300 - DECORATIVE METAL 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. Copper-alloy decorative railings.

1.3 DEFINITIONS

A. Railings: Handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.4 COORDINATION AND SCHEDULING

- A. Coordinate selection of metal finishes to match repatination of historic metal
- 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 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 meet structural performance requirements.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site

1.6 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of railings assembled from standard components.
 - 2. Grout, anchoring cement, and paint products.
 - 3. Finishing products
- B. Shop Drawings: Include plans, elevations, sections, and attachment details.

- 1. For illuminated railings, include wiring diagrams and roughing-in details.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
- D. Samples for Verification: 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. Welded connections.
 - 4. Brazed connections.
 - 5. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
- E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer
- B. Welding certificates.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.
- D. Preconstruction test reports.
- E. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.8 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.6/D1.6M, "Structural Welding Code Stainless Steel."
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mock up of anchorage assembly into stone paving and stone wall.
 - 2. Build mockups for each form and finish of railing consisting of one posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches (600 mm) in length.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Copper-Alloy Decorative Railings:
 - 1. Manufacture with proven record of successful fabrication of bronze alloy handrails.
- B. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. 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. Performance characteristics are indicated by criteria subject to verification by one or more methods, including structural analysis, preconstruction testing, field testing, and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by Engineer, except with Engineer's approval. If modifications are proposed, submit comprehensive explanatory data to Engineer for review.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, to design railings, including attachment to building construction.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Copper Alloys: 60 percent of minimum yield strength.
- C. 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. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings 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.

2.3 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: Same metal and finish as supported rails unless otherwise indicated.
 - 1. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.

2.4 COPPER ALLOYS

- A. Copper and Copper Alloys, General: Provide alloys indicated and with temper to suit application and forming methods, but with strength and stiffness not less than Temper H01 (quarter hard) for plate, sheet, strip, and bars and Temper H55 (light drawn) for tube and pipe.
- B. Castings, Bronze: Composition bronze castings complying with ASTM B62, Alloy UNS C83600 (85-5-5-5 or No. 1 composition commercial red brass) or sand castings complying with ASTM B584, Alloy UNS C86500 (No. 1 manganese bronze).
- C. Plate, Sheet, Strip, and Bars; Bronze: ASTM B36/B36M, Alloy UNS C28000 (muntz metal, 60 percent copper).

2.5 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Copper-Alloy (Bronze) Components: Silicon bronze (Alloy 651 or Alloy 655) fasteners where concealed; muntz metal (Alloy 280) fasteners where exposed.
 - 2. Stainless Steel Components: Type 316 stainless steel fasteners.
- B. Fasteners for Anchoring 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. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.
 - 1. Provide hex drive flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
 - 1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Group 2 (A4)] stainless steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

2.6 MISCELLANEOUS MATERIALS

- A. Brazing Rods: For copper-alloy railings, provide type and alloy as recommended by producer of metal to be brazed and as required for color match, strength, and compatibility in fabricated items.
- B. Lacquer for Copper Alloys: Clear acrylic lacquer specially developed for coating copper-alloy products.
- C. 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.
- D. 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.

2.7 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. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for 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 (1 mm) 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 will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded or nonwelded 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 welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.

- I. Brazed Connections: Connect copper-alloy railings by brazing. Cope components at connections to provide close fit, or use fittings designed for this purpose. Braze corners and seams continuously.
 - 1. Use materials and methods that match color of base metal, minimize distortion, and develop maximum strength and corrosion resistance.
 - 2. Remove flux immediately.
 - 3. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and brazed surface matches contours of adjoining surfaces.
- J. Mechanical 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.
- K. Form changes in direction as follows:
 - 1. As detailed.
 - 2. By bending to smallest radius that will not result in distortion of railing member.
- L. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- M. Close exposed ends of hollow railing members with prefabricated end fittings.
- N. 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.
- O. 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 to prevent bracket or fitting rotation and crushing of substrate.
- P. 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.
- Q. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.9 COPPER-ALLOY FINISHES

- A. Finish designations for copper alloys comply with the system for designating copper-alloy finish systems defined in NAAMM's "Metal Finishes Manual for Architectural and Metal Products."
- B. Patinate Bronze Finish: Coordinate finish with selected finish of historic metal lights established through mock up.
 - 1. Patination through hot or cold immersion, or hot chemical application as established through mockup.
- C. Fine-Matte Finish, Lacquered: M42-O6x (Mechanical Finish: nondirectional finish, fine matte; Coating: clear, organic, air dried, as specified below).
 - 1. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine stone and concrete surface (alternate only) are is sound condition and capable of receiving handrail anchorage systems prior to fabrication and prior to installation. Notify Engineer of any deficiency that will prevent anchorage.

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 have been 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 (2 mm in 1 m).

- 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 (5 mm in 3 m).
- 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 concealed surfaces of copper alloys that will be in contact with grout, concrete, masonry, or dissimilar metals, with a heavy coat of bituminous paint.
- 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. Use wood blocks and padding to prevent damage to railing members and fittings. 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 (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

- A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts for alternate scope only. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes in stone as indicated. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, set in sealant.
- D. Leave anchorage joint exposed with 1/8-inch (3-mm) buildup, sloped away from post and anchoring material flush with adjacent surface.
- E. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

- 1. For copper-alloy railings, attach posts as indicated using fittings designed and engineered for this purpose.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

- A. Attach handrails to walls with wall brackets. Provide brackets with a minimum 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
 - 1. Use type of bracket with predrilled hole for exposed hex fastener flush with bracket plate surface.
 - 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- B. Secure wall bracket to building construction as follows:
 - 1. For solid masonry anchorage, use drilled-in expansion shields and hex bolts.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made by Owner.
- B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings according to ASTM E894 and ASTM E935 for compliance with performance requirements.
- C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Engineer and comply with specified requirements.
- D. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.7 CLEANING

A. Clean copper alloys according to metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.

3.8 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.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300

SECTION 060312 - HISTORIC WOOD REPAIR

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 historic treatment of wood in the form of repairing wood features as follows:
 - 1. Repairing wood doors.
 - 2. Repairing, refinishing, and replacing missing elements of hardware.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site
 - 1. Review methods and procedures related to historic wood repair, including, but not limited to, the following:
 - a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Wood historic treatment program.
 - d. Coordination with building occupants.

1.4 SEQUENCING AND SCHEDULING

- A. Perform historic wood repair in the following sequence, which includes work specified in this and other Sections:
 - 1. Before dismantling wood components for on-site or off-site repair, tag each component with location-identification numbers. Indicate on tags and building plans the locations of each component.
 - 2. Dismantle hardware and tag with location-identification numbers.
 - 3. In the shop, label each repaired component and whole or partial replacement with permanent location-identification number in inconspicuous location and remove site-applied tags.
 - 4. Sort units by condition, separating those that need extensive repair.

- 5. Clean surfaces.
- 6. General Wood-Repair Sequence:
 - a. Remove transparent coating to bare wood.
 - b. Repair wood by consolidation, replacement, partial replacement, and patching.
 - c. Sand, prime, fill, sand again, and prime surfaces again for refinishing.
- 7. Repair, refinish, and replace hardware if required. Reinstall operating hardware.
- 8. Reinstall components.
- 9. Apply finish coats.
- 10. Install remaining hardware.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
 - 2. Weather stripping.
 - 3. Shop drawing indicating reassemble details of door jamb.
 - 4. Repair anchors.
- B. Samples for Initial Selection: For each type of exposed wood and finish.
 - 1. Identify wood species, cut, and other features.
 - 2. Include Samples of hardware and accessories involving color selection.
- C. Samples for Verification: For the following products in manufacturer's standard sizes unless otherwise indicated, finished as required for use in the Work:
 - 1. Repaired Wood: Prepare Samples using wood species the same as that of door wood at site, repaired, and prepared for refinishing.
 - 2. Hardware: Full-size elements with finish to match existing.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist and wood-repair-material manufacturer.
- B. Wood Historic Treatment Program: Submit before work begins.
- C. Preconstruction Test Reports: For historic wood repair.

1.7 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic wood-repair specialist, experienced in repairing, refinishing, and replacing wood in whole and in part. Experience only in fabricating and installing new woodwork is insufficient experience for wood historic treatment work.

- B. Wood-Repair-Material Manufacturer Qualifications: A firm regularly engaged in producing wood consolidant and wood-patching compound that have been used for similar historic wood-treatment applications with successful results, and with factory-authorized service representatives who are available for consultation, Project-site inspection, and on-site assistance.
- C. Wood Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site.
 - 1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- D. Mockups: Prepare mockups of historic treatment repair processes to demonstrate aesthetic effects and to set quality standards for materials and execution, and for fabrication and installation. Prepare mockups so they are as inconspicuous as practicable.
 - 1. Locate mockups on existing surfaces where directed by Engineer.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Pack, deliver, and store products in suitable packs, heavy-duty cartons, or wooden crates; surround with sufficient packing material to ensure that products will not be deformed, broken, or otherwise damaged.
- B. Until installed, store products inside a well-ventilated area and protect from weather, moisture, soiling, abrasion, extreme temperatures, and humidity, and where environmental conditions comply with manufacturer's requirements.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with historic wood repair only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

PART 2 - PRODUCTS

2.1 HISTORIC WOOD REPAIR, GENERAL

A. Quality Standard: Comply with applicable requirements in Section 12, "Historic Restoration Work," and related requirements in AWI/AWMAC/WI's "Architectural Woodwork Standards" for construction, finishes, grade rules, and other requirements unless otherwise indicated.

1. Exception: Industry practices cited in Section 12, Article 1.5, "Industry Practices," of the Architectural Woodwork Standards do not apply to the work of this Section.

2.2 WOOD-REPLACEMENT MATERIALS

- A. Wood, General: Clear fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch (0.8 mm) deep by 2 inches (51 mm) wide.
 - 1. Species: Match species of each existing type of wood component or assembly unless otherwise indicated.

2.3 WOOD-REPAIR MATERIALS

- A. Source Limitations: Obtain wood consolidant and wood-patching compound from single source from single manufacturer.
- B. Wood Consolidant: Ready-to-use product designed to penetrate, consolidate, and strengthen soft fibers of wood materials that have deteriorated due to weathering and decay and designed specifically to enhance the bond of wood-patching compound to existing wood.
 - 1. Manufacturer: Abatron
- C. Wood-Patching Compound: Two-part, epoxy-resin, wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to featheredge.
 - 1. Manufacturer: Abatron

2.4 HARDWARE

- A. Hardware, General: Provide hardware required for each type of replicated or repaired wood, including but not limited to, hinges, pulls, latches, fasteners, and accessories indicated or required for proper operation. Hardware shall smoothly operate, tightly close, and secure units appropriately for frequency of use, unit weight, and dimensions.
- B. Material and Design:
 - 1. Material: Solid bronze of alloy indicated unless otherwise indicated.
 - 2. Design: Match type and appearance of existing hardware.
 - 3. Replacement Hardware: Regardless of mechanisms within, match existing, exposed hardware of the following types:
 - a. Misc. screws, plates, weather stripping.
- C. Hardware Finishes: Comply with BHMA A156.18 for base material and finish requirements indicated by the following:
 - 1. BHMA 612: Satin bronze, clear-coated; bronze base metal.

2.5 MISCELLANEOUS MATERIALS

A. Cleaning Materials:

- 1. Detergent Solution: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 1/2 cup (125 mL) of laundry detergent that contains no ammonia, 5 quarts (5 L) of 5 percent sodium hypochlorite bleach, and 15 quarts (15 L) of warm water for each 5 gal. (20 L) of solution required.
- 2. Mildewcide: Commercial, proprietary mildewcide or a solution prepared by mixing 1/3 cup (80 mL) of household detergent that contains no ammonia, 1 quart (1 L) of 5 percent sodium hypochlorite bleach, and 3 quarts (3 L) of warm water.
- B. Adhesives: Wood adhesives with minimum 15- to 45-minute cure at 70 deg F in gunnable and liquid formulations as recommended in writing by adhesive manufacturer for each type of repair and exposure condition.
- C. Fasteners: Use fastener metals that are noncorrosive and compatible with each material joined.
 - 1. Match existing fasteners in material and type of fastener unless otherwise indicated.
 - 2. Use concealed fasteners for interconnecting wood components.
 - 3. For fastening metals, use fasteners of same basic metal as fastened metal unless otherwise indicated.
 - 4. For exposed fasteners, use Phillips-type machine screws of head profile flush with metal surface unless otherwise indicated.
 - 5. Finish exposed fasteners to match finish of metal fastened unless otherwise indicated.

2.6 WOOD FINISHES

- A. Unfinished Replacement Units: Provide wood surfaces of replacement units unfinished; smooth, filled, and suitably prepared for on-site finishing.
 - 1. Color and Gloss: Match finish of existing finish material, color and reflectivity, test existing finish to identify system. Establish new finish through mockups.

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT SPECIALIST

A. Historic Treatment Specialist Firms: Subject to compliance with requirements, provide a firm with proven record of successful restoration of historic wood.

3.2 PREPARATION

- A. Protect adjacent materials from damage by historic wood repair.
- B. Clean wood of mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. After cleaning, rinse thoroughly with fresh water. Allow to dry before repairing or painting.

C. Condition replacement wood members and replacement units to prevailing conditions at installation areas before installing.

3.3 HISTORIC WOOD REPAIR, GENERAL

- A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Engineer from 5 feet away for interior work and exterior work.
- B. General: In treating historic items, disturb them as minimally as possible and as follows:
 - 1. Remove coatings and apply borate preservative treatment before repair.
 - 2. Repair items in place where possible.
 - 3. Install temporary protective measures to protect wood-treatment work that is indicated to be completed later.
- C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and natural-fiber bristle brushing that will not abrade wood substrate, reducing clarity of detail. Do not use abrasive methods, such as sanding, wire brushing, or power tools, except as indicated as part of the historic treatment program and as approved by Engineer.
- D. Repair and Refinish Existing Hardware: Dismantle hardware; strip paint, repair, and refinish it to match finish samples; and lubricate moving parts just enough to function smoothly.
- E. Repair Wood: Match existing materials and features, retaining as much original material as possible to perform repairs.
 - 1. Unless otherwise indicated, repair wood by consolidating, patching, splicing, or otherwise reinforcing wood with new wood matching existing wood or with salvaged, sound, original wood.
 - 2. Where indicated, repair wood by limited replacement matching existing material.
- F. Replace Wood: Where indicated, duplicate and replace units with units made from salvaged, sound, original wood or with new wood matching existing wood. Use surviving prototypes to create patterns for duplicate replacements.
 - 1. Do not use substitute materials unless otherwise indicated.
 - 2. Compatible substitute materials may be used.
- G. Identify removed items with numbering system corresponding to item locations, to ensure reinstallation in same location. Key items to Drawings showing location of each removed unit. Permanently label units in a location that will be concealed after reinstallation.

3.4 WOOD PATCH-TYPE REPAIR

- A. General: Patch wood that exhibits depressions, holes, or similar voids, and that has limited amounts of rotted or decayed wood.
 - 1. Verify that surfaces are sufficiently clean and free of paint residue prior to patching.

- 2. Treat wood with wood consolidant prior to application of patching compound. Coat wood surfaces by brushing, applying multiple coats until wood is saturated and refuses to absorb more. Allow treatment to harden before filling void with patching compound.
- 3. Remove rotted or decayed wood down to sound wood.
- B. Apply borate preservative treatment to accessible surfaces either before applying wood consolidant or after removing rotted or decayed wood. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom. Allow treatment to dry.
- C. Apply wood-patching compound to fill depressions, nicks, cracks, and other voids created by removed or missing wood.
 - 1. Prime patch area with application of wood consolidant or manufacturer's recommended primer.
 - 2. Mix only as much patching compound as can be applied according to manufacturer's written instructions.
 - 3. Apply patching compound in layers as recommended in writing by manufacturer until the void is completely filled.
 - 4. Sand patch surface smooth and flush with adjacent wood, without voids in patch material, and matching contour of wood member.
 - 5. Clean spilled compound from adjacent materials immediately.

3.5 WOOD-REPLACEMENT REPAIR

- A. General: Replace parts of or entire wood items at locations where damage is too extensive to patch.
 - 1. Remove surface-attached items from wood surface before performing wood-replacement repairs unless otherwise indicated.
 - 2. Verify that surfaces are sufficiently clean and free of paint residue prior to repair.
 - 3. Remove broken, rotted, and decayed wood down to sound wood.
 - 4. Custom fabricate new wood to replace missing wood; either replace entire wood member or splice new wood part into existing member.
 - 5. Secure new wood using finger joints, multiple dowels, or splines with adhesive and nailing to ensure maximum structural integrity at each splice. Use only concealed fasteners. Fill nail holes and patch surface to match surrounding sound wood.
- B. Apply borate preservative treatment to accessible surfaces after replacements are made. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom.
- C. Repair remaining depressions, holes, or similar voids with patch-type repairs.
- D. Clean spilled materials from adjacent surfaces immediately.
- E. Reinstall items removed for repair into original locations.

3.6 DISMANTLING EXISTING WOOD ELEMENTS

- A. Dismantle Elements:
 - 1. Protect adjacent surfaces.

- 2. Do not apply excessive force to dismantle elements so that damage to adjacent surfaces occurs.
- 3. Drill out anchorage that is stripped and cannot be removed by screw driver/screw gun.
- 4. Salvage existing anchorage in good condition and reinstall following repair.
- 5. Do not substitute anchors, screws for letter quality hardware.

3.7 FIELD QUALITY CONTROL

A. Manufacturers Field Service: Engage wood-repair-material manufacturers' factory-authorized service representatives for consultation and Project-site inspection, and provide on-site assistance when requested by Engineer.

3.8 ADJUSTMENT

A. Adjust existing and replacement operating items, hardware, and accessories for a tight fit at contact points and for smooth operation and tight closure. Lubricate hardware and moving parts.

3.9 CLEANING AND PROTECTION

- A. Protect wood surfaces from contact with contaminating substances resulting from construction operations. Monitor wood surfaces adjacent to and below exterior concrete and masonry during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances contact wood surfaces, remove contaminants immediately.
- B. Clean exposed surfaces immediately after historic wood repair. Avoid damage to coatings and finishes. Remove excess sealants, patching materials, dirt, and other substances.

END OF SECTION 060312

SECTION 061000 - CARPENTRY

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. Framing with dimension lumber.
- 2. Plywood roof deck and gutter sheathing.
- 3. Wood blocking, cants, and nailers.
- 4. Joist hangers and fasteners.

B. Related Requirements:

- 1. Section 075600 "Fluid-Applied Roofing and Gutter Liners"
- 2. Section 076000 "Flashing and Sheet Metal"

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product, including fasteners. Indicate component materials and dimensions and include construction and application details.
 - 1. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 2. For plywood, include data on lumber, adhesives, and fabrication.

1.5 INFORMATIONAL SUBMITTALS

A. Certificates of Inspection: Issued by lumber grading agency for wood products not marked with grade stamp.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing. Contractor shall prepare mockups for each of the following for review by the Design Professional:
 - 1. Installation of new anchors at existing rafter plates illustrating installation and spacing, 2 locations.
 - 2. Installation of new rafter plates, 4 linear feet.
 - 3. Installation of rafter reinforcement and attachment to rafter plate, 1 location.
 - 4. Installation of gutter framing illustrating gutter slope and attachment to structure (prior to sheathing), 8 linear feet.
 - 5. Installation of plywood gutter sheathing at drain location illustrating slope and interface with drain. 8 linear feet.
 - 6. Installation of plywood roof sheathing, (1) 4x8 board, each roof area.
 - 7. Installation of new roof framing at low slope roof (prior to sheathing), 1 joist.
 - 8. Installation of joist reinforcement at low slope roof (prior to sheathing):
 - a. 1 full length sister
 - b. 1 partial length sister
 - 9. Installation of galvanized angles at ends of roof joist framing at low slope roof, 1 joist.
 - 10. Installation of blocking between ends of joist members, 1 location.
 - 11. Installation of framing at new roof hatch, 1 location
 - 12. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
 - 13. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- B. Schedule delivery of wood roof decking to avoid extended on-site storage and to avoid delaying the Work.
- C. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood

roof decking with surfaces that are to be exposed in the final Work protected from exposure to sunlight.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Roof Joists, Reinforcement, Gutter Framing, Rafter Plate, Curbs, Blocking: Southern Pine, No. 2 grade or better.
 - 1. Size: 2x framing; depth as indicated on Drawings.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Nailers for roof accessories. Use materials below to match thickness required.
 - a. Dimensional lumber, Southern Pine or Hem Fir, No. 2 grade or better

2.4 ROOF & GUTTER PLYWOOD SHEATHING

- A. Plywood Sheathing, roof and gutter: Exterior plywood, APA PS-1, Grade A-C or better, exposure durability rating of Exterior.
 - 1. Span Rating: 48/24
 - 2. Nominal Thickness: as indicated on Drawings.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Provide fasteners of Type 304 stainless steel.
- B. Fasteners for securing plywood roof sheathing to wood framing
 - 1. Deck-Drive DWP Wood Screw, Type 316 stainless steel, flat head, torx drive by Simpson Strong Tie
 - a. Size: #10 x 3"
- C. Nails, Brads, and Staples: ASTM F1667.
- D. Post-Installed Anchors for roof perimeter nailers: as indicated on Drawings.
- E. Joist Hangers and Angles as indicated on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Do not splice structural members between supports unless otherwise indicated.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- E. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

- F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. ICC-ES evaluation report for fastener.
- G. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

A. For plywood:

- 1. Arrange joints so that pieces do not span between fewer than three support members.
- 2. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- 3. Coordinate roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- 4. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Roof and Gutter Sheathing:
 - a. Screw to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
 - b. Space panels 1/8 inch apart at edges and ends.

3.3 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.4 PROTECTION

A. Protect roof carpentry from weather.

END OF SECTION 061000

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SECTION 070150 - PREPARATION FOR REROOFING

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. Full tear-off of entire roof.
 - a. Slate roofing, including flat-seam copper gutter system.
 - b. Built Up roof system.
- 2. Removal of all existing roofing attachments.
- 3. Re-cover preparation of entire roof.
- 4. Removal of indicated flashings.
- 5. Temporary roofing and daily tie in.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.
- B. Roof Re-Cover Preparation: Existing roofing system is to remain and be prepared for new roof installed over it.
- C. Full Roof Tear-Off: Removal of existing roofing system from deck.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, sections, and details.
- C. Temporary Roofing Submittal: Product data and description of temporary roofing system. If temporary roof remains in place, include surface preparation requirements needed to receive permanent roof, and submit a letter from roofing manufacturer, stating acceptance of the temporary roof and that its inclusion does not adversely affect the roofing system's resistance to fire and wind or its FM Global rating.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
 - 1. Include certificate that Installer is approved by warrantor of existing roofing system.
 - 2. Include certificate that Installer is licensed to perform asbestos abatement.
- B. Fastener pull-out test report.
- C. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.
- D. Landfill Records: Indicate receipt and acceptance of demolished roofing materials and hazardous wastes, such as asbestos-containing materials, by a landfill facility licensed to accept them.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: licensed to perform required removals and to perform asbestos abatement (if required) in the state or jurisdiction where Project is located.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Reroofing Conference: Conduct conference at Project site.
 - 1. Meet with Owner; Engineer; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; roofing Installer, including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing, including installers of roof deck, roof accessories, and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing system tear-off and replacement, including, but not limited to, the following:
 - a. Reroofing preparation, including roofing system manufacturer's written instructions.
 - b. Temporary protection requirements for existing roofing system components that are to remain.
 - c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
 - d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
 - e. Existing roof deck conditions requiring notification of Engineer.
 - f. Existing roof deck removal procedures and Owner notifications.

- g. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
- h. Structural loading limitations of roof deck during reroofing.
- i. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
- j. HVAC shutdown and sealing of air intakes.
- k. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
- I. Asbestos removal and discovery of asbestos-containing materials.
- m. Governing regulations and requirements for insurance and certificates if applicable.
- n. Existing conditions that may require notification of Engineer before proceeding.
- o. Contractor shall prepare and distribute meeting minutes to all attendees within 5 days of meeting.

1.7 FIELD CONDITIONS

- A. Existing Roofing System is assumed to be a combination of the following: Built-up asphalt, slate, copper metal gutter liner.
- B. Owner will occupy portions of building immediately adjacent to reroofing area. Conduct reroofing so Owner's operations are not disrupted. Provide Owner with not less than 72 hours notice of activities that may affect Owner's operations.
 - 1. Coordinate work activities daily with Owner so Owner can place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
 - 2. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.
- C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- E. Conditions existing at time of inspection for bidding are maintained by Owner as far as practical.
 - 1. The results of any analysis of existing test cores from existing roofing system by the Owner if existing are available for Contractor's reference.
 - 2. Construction Drawings and Project Manual, if existing, for existing roofing system are provided for Contractor's convenience and information, but are not a warranty of existing conditions. They are intended to supplement rather than serve in lieu of Contractor's own investigations. Contractor is responsible for conclusions derived from existing documents.

- F. Limit construction loads on roof to limit designated on the structural drawings for rooftop equipment wheel loads and limit designated on the structural drawings for uniformly distributed loads.
- G. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
 - 1. Remove only as much roofing in one day as can be made watertight in the same day.
- H. Hazardous Materials: It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work. Existing roof will be left no less watertight than before removal.
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.
- I. Hazardous Materials: Contractor shall confirm with the Owner if a report on the presence of hazardous materials is on file for review and use. If available, the Contractor shall examine the report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except according to procedures specified elsewhere in the Contract Documents.
 - 3. Coordinate reroofing preparation with hazardous material remediation to prevent water from entering existing roofing system or building.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during reroofing, by methods and with materials so as not to void existing roofing system warranty. Notify warrantor before proceeding.
 - 1. Notify warrantor of existing roofing system on completion of reroofing, and obtain documentation verifying that existing roofing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 TEMPORARY PROTECTION MATERIALS

- A. Provide one or more of the following products as required to protect the roof substrate and building interior from damage.
 - 1. Expanded Polystyrene (EPS) Insulation: ASTM C 578.

- 2. Plywood: DOC PS1, Grade CD Exposure 1.
- 3. OSB: DOC PS2, Exposure 1.

2.2 TEMPORARY ROOFING MATERIALS

- A. Design and selection of materials for temporary roofing are Contractor's responsibilities.
 - 1. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).
 - 2. Base Sheet: ASTM D 4601, Type II, nonperforated, asphalt-impregnated and coated, glass-fiber sheet.
 - 3. Glass-Fiber Felts: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt.
 - 4. Asphalt Primer: ASTM D 41/D 41M.
 - 5. Roofing Asphalt: ASTM D 312, Type III or IV.
 - 6. Base Sheet Fasteners: Capped head, factory-coated steel fasteners, listed in FM Global's "Approval Guide."

2.3 INFILL AND REPLACEMENT MATERIALS

- A. Use infill materials matching existing roofing system materials unless otherwise indicated.
 - 1. Infill materials shall be as approved by the new roofing membrane manufacturer, unless otherwise indicated.
- B. Wood blocking, curbs, and nailers are specified in Section 061000 "Carpentry."

2.4 AUXILIARY REROOFING MATERIALS

A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Shut off rooftop utilities and service piping before beginning the Work. Coordinate all shut downs with the Owner before proceeding.
- B. Test existing roof drains to verify that they are not blocked or restricted. Immediately notify Engineer and the Owner of any blockages or restrictions.
- C. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

- D. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- E. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
 - 1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

- A. Full Roof Tear-Off: Remove existing roofing and other roofing system components down to the wood roof deck.
 - 1. Remove all material atop existing wood roof substrate.
 - 2. Remove wood blocking, curbs, and nailers.
 - 3. Remove fasteners from deck.

3.3 DECK PREPARATION

- A. Inspect wood deck with the Engineer after tear-off of roofing system.
- B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Engineer. Do not proceed with installation until directed by Engineer.
- C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Engineer. Do not proceed with installation until directed by Engineer.
- D. Provide additional deck securement as indicated on Drawings or as directed by the Engineer after review of exposed wood roof deck.
- E. Replace wood roof deck boards as indicated on Drawings or as directed by the Engineer.
- F. Replace wood roof deck as indicated in Contract Documents. Roof sheathing replacement will be paid for by adjusting the Contract Sum according to Allowances and Unit Prices included in the Contract Documents.

3.4 INFILL MATERIALS INSTALLATION

- A. Immediately after roof tear-off, and inspection and repair, if needed, of deck, fill in tear-off areas to match existing roofing system construction.
 - 1. Installation of infill materials as approved by the new roofing membrane manufacturer.

- Installation of wood blocking, curbs, and nailers is specified in Section 061000 "Roof Carpentry.
- B. Install new roofing patch over roof infill area. If new roofing is installed the same day tear-off is made, roofing patch is not required.

3.5 TEMPORARY ROOFING

- A. Install approved temporary roofing over area to be reroofed.
- B. Install temporary roofing over area to be reroofed. Install two glass-fiber felts mechanically fasten base sheet and install a glass-fiber felt, lapping each sheet 19 inches (483 mm) over preceding sheet. Embed glass-fiber felt in a solid mopping of hot roofing asphalt applied within equiviscous temperature range. Glaze-coat completed surface with hot roofing asphalt.
- C. Remove temporary roofing before installing new roofing.
- D. Remove temporary roof before installation of new roofing system. Restore temporary roofing to watertight condition if required by weather conditions.

3.6 BASE FLASHING REMOVAL

- A. Remove existing base flashings. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.
- B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish.
- C. Inspect parapet sheathing, wood blocking, curbs, and nailers for deterioration and damage. If parapet sheathing, wood blocking, curbs, or nailers have deteriorated, immediately notify Engineer.
- D. Replace parapet framing, wood blocking, curbs, and nailers to comply with Section 061000 "Roof Carpentry."

3.7 FASTENER PULL-OUT TESTING

- A. Perform fastener pull-out tests according to SPRI FX-1, and submit test report to the Engineer before installing new roofing system.
 - 1. Obtain the Engineer and roofing manufacturer's approval to proceed with specified fastening pattern. Roofing manufacturer may furnish revised fastening pattern commensurate with pull-out test results.

3.8 DISPOSAL

- A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
 - 1. Storage or sale of demolished items or materials on-site is not permitted.

- B. Transport and legally dispose of demolished materials off Owner's property.
- C. Provide required records to document material disposal.

END OF SECTION 070150

SECTION 071300 - SHEET MEMBRANE WATERPROOFING

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. Sheet membrane waterproofing.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, protection of installed system, and repairs.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
 - 2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.
- B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, seaming, and other similarly detail information necessary to fully describe application. Include the following:
 - 1. Locations, sizes, and details for penetrations
 - 2. Perimeter and penetration details, including location of preformed special shapes.
 - 3. Sheet layout and size.
 - 1) Number of flashing rolls by width
 - 4. Show adjacent or related portions of Work in a complete manner.
 - 5. Coordinate submittal with submittals of related portions of Work
- C. Samples: For each specified product, including the following products:

- 1. Two (2) 8-by-8-inch squares of waterproofing membrane, one for each specified membrane thickness.
- 2. 8-by-8-inch square of protection board.
- 3. 4-by-4-inch square of drainage panel.
- 4. One (1) preformed interior corner shape.
- D. Closeout Submittals: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Provide a letter of certification from membrane manufacturer that installer firm utilized for application of sheet membrane waterproofing system is an approved installer in good standing.
 - 1. Submit listing of not less than 5 of Installer's most recent applications representing similar scope and complexity to Project requirements. List shall include information as follows:
 - a. Project name and address
 - b. Name of Owner
 - c. Name of Contractor
 - d. Name of Engineer
 - e. Date of completion
 - 2. Provide manufacturer's certification that products to be used comply with specified requirements are suitable for intended application.

B. Pre-Application Conference:

- Schedule a conference to be held on-site in advance of ordering materials and beginning application of waterproofing, but in no case less than 30 days before application of waterproofing. Provide not less than 72 hours advance notification to attendees, Owner, and Design Professional.
- 2. Conference attendees shall include Owner, Design Professional, Contractor, waterproofing installer, a representative of waterproofing manufacturer, and representatives of other trades whose work may interface with or affect waterproofing application.
- 3. Topics to be discussed at conference shall include:
 - a. A review of Contract documents and accepted shop drawings shall be made. If conflicts exist between manufacturer's specifications and Contract Documents, these differences shall be defined and resolved. Consult waterproofing manufacturer's representative to assist in resolving issues.
 - b. Establish trade-related work schedules and appropriate trade sequencing, including timely installation of equipment and penetrations to avoid or limit traffic on membrane waterproofing.
 - c. Review areas to receive the waterproofing system and termination details.
 - d. Construction schedules and work methods shall be reviewed to prevent damage to waterproofing, including provisions for installation of temporary traffic paths or walkways for protection of finished waterproofing system.
 - e. Weather conditions and working temperature criteria shall be reviewed.
 - f. Establish and review provisions for on-site monitoring after waterproofing application is complete to assure that finished waterproofing application is not damaged by other trades. Establish provisions for payment for repairs in event that damage does occur.
- 4. Pre-construction conference and inspection shall serve to clarify Contract Documents, application requirements and what work shall be completed before application can begin.

- a. If waterproofing installer or representative of waterproofing manufacturer discovers problems during inspection of substrates, a second pre-application shall be held to verify that corrective measures have been taken.
- 5. Prepare and submit to parties in attendance, Design Professional, and Owner a written report of preinstallation conference. Report shall be submitted within 3 days following conference.
- C. Manufacturer's Field Service: Membrane manufacturer shall provide the services of a competent field representative on-site to accept substrate surface before application of waterproofing materials and to provide on-site technical assistance and application guidance for application of waterproofing system.
- D. Mockups: Build *in-situ* mockups to verify selections made under Sample submittals and to set quality standards for installation. Approval of mockups does not constituted approval of deviations from the Contract Documents contained in mockups unless Design Professional specifically approves such deviations in writing. Subject to compliance with requirements, approved mockups may become part of the completed work if undisturbed at time of Substantial Completion. Provide the following mockups:
 - a. A minimum 4-foot-by-4-foot area stepped mockup illustrating field and termination details of new waterproofing system. This may be combined with the unit paver mockup (see specification section 321400).

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver prepackaged materials in manufacturer's original unopened packaging with labels intact. Packaging or containers shall fully identify brand, type, grade, class and other qualifying information used to describe contents.

B. Storage:

- 1. Materials that are susceptible to retaining moisture or that may be damaged by moisture shall be stored in a dry location before application. Moisture-sensitive materials shall be stored in enclosed areas protected from moisture or elevated humidity.
- 2. Store membrane rolls lying down.
- 3. Stack materials on pallets or platforms that are raised off ground or substrate.
- 4. Cover materials in a manner to provide air circulation and to prevent damage to surfaces.
- 5. Store sealants, adhesives, and mastics at temperatures above 40 degrees F.
- 6. Store flammable materials in a cool dry area away from sparks and open flames. Follow precautions outlined on container or supplied by material manufacturer supplier.
- 7. Materials determined by Design Professional, and/or manufacturer's field representative to be damaged shall be removed from site and replaced at no cost to Owner.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 SEQUENCING

A. Apply waterproofing in a timely manner, including installation of protection and drainage layers in conjunction with work of other trades. Coordinate with other trades to avoid traffic over completed membrane surfaces. Coordinate with installation of drains as shown on Drawings, including flashing and associated waterproofing work.

B. Electronic leak detection tests of completed sections of waterproofing membrane shall be successfully completed prior to proceeding with installation of overburden. Schedule testing promptly to allow timely installation of protection layers.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
 - 1. Waterproofing materials and components shall not be applied unless correct solvent, adhesive, heat welding, or application temperature can be maintained. If proper application temperatures cannot be maintained, application shall cease.
 - 2. Do not apply waterproofing if precipitation of any kind is occurring or is imminent. Materials shall not be applied if liquid moisture, snow, or ice is present on substrate.

1.9 WARRANTY

- A. Manufacturer's Two-Ply Warranty: Provide a manufacturer's labor and material warranty. Warranty shall include repair of leaks in waterproofing membrane resulting from defects in membrane or workmanship for a period of 20 years from Date of Substantial Completion.
- B. Contractor's Warranty:
 - 1. Warranty shall include removing and reinstalling all overburden required to address deficient waterproofing.
 - 2. Provide a workmanship warranty for not less than two years commencing from Date of Substantial Completion.
 - 3. Work related to waterproofing membrane, flashing, or metal work found to be defective or not in compliance with Contract Documents shall be removed and replaced at no cost to Owner. Obligation of warranty shall run directly to Owner with a copy to membrane manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Waterproofing System: Obtain waterproofing materials and protection course from single source from single manufacturer.
- B. Acceptable Manufacturer: Hyload, 5020 Enterprise Pkwy.; Seville, OH 44273, 800-457-4056, www.hyload.com

2.2 TWO PLY WATERPROOFING SYSTEM

- A. Base Ply Membrane: Self-adhered, Hyload Hyproof SA fully adhered Elvaloy modified coal tar elastomeric sheet. Bottom of sheet coated with 15 mils of SBS-modified asphalt with a dry selvedge edge for hot air welds.
 - 1. Thickness:
 - a. 60 mils membrane/15 mils adhesive/75 mils total.

- B. Top Ply Membrane: Self-adhered, Hyload Hyproof SA fully adhered Elvaloy modified coal tar elastomeric sheet. Bottom of sheet coated with 15 mils of SBS-modified asphalt with a dry selvedge edge for hot air welds.
 - 1. Thickness:
 - a. 75 mils membrane/15 mils adhesive/90 mils total.
- C. Membrane Flashing: Hyload SA modified coal tar elastomeric sheet
 - 1. Thickness: No less than 60 mils.
- D. Preformed Three Dimensional Shapes: Hyload Cloaks
 - 1. Shapes: As needed to meet Project requirements including but not limited to detail corners, level changes, stop ends, and other similar special applications.

2.3 DRAINAGE BOARD

- A. Drainage Board: Hyload Hydrain 650 three-dimensional, two-part prefabricated soil sheet drain:
 - 1. Thickness: 7/16 inch nominal.
 - 2. Core: Polystyrene.
 - a. Flow Rate: Not less than 18 GPM per foot of width; ASTM D 4716.
 - b. Compressive Strength: 21,000 lbs/ft2; ASTM D 1621.
 - 3. Fabric Face: Woven geotextile fabric.
 - a. Fiber: Polypropylene.
 - b. Permeability: 0.003 in/sec; ASTM D 4491.
 - c. Permittivity: 1.36 sec; ASTM D 4491.
 - d. Apparent Opening Size: U.S. Standard sieve 40.
 - e. Puncture Strength: 105 lbs; ASTM D 4833

2.4 AUXILIARY MATERIALS

- A. Conductive primer: TruGround Conductive Primer manufactured by Detec (detecsystems.com)
- B. Protection Board: Hyload Hyglass asphaltic core protection board.
 - 1. Core: Mineral-filled high melt point asphalt.
 - 2. Top and Bottom Surfaces: Inert non-woven glass reinforcing mat.
 - 3. Thickness ¼ inch.
- C. Primer: Hyload Hyprime Primer acrylic polymer and highly refined asphalt primer.
- D. Sealant: Hyload Structural Sealant moisture cure, moisture-insensitive, high performance polyether sealant.
- E. Membrane Adhesive: Hyload Membrane Adhesive moisture cure, moisture insensitive, high performance polyether adhesive.
- F. Adhesive Mastic: Hyload Trowel-On Membrane waterproofing mastic that can be applied in beads from a 28 oz caulking tube or trowel-applied from 2 or 5 gallon pails.
- G. Metal Termination Bars: Extruded aluminum pre-punched at 6 inches on center; 1 inch wide by 1/8 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of waterproofing.
 - 1. Concrete substrate shall be cured not less than 7 days and be clean, dry and frost-free before application of waterproofing system.
 - a. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D4263.
 - 2. Substrates shall be inspected and repaired as needed to provide a proper surface to receive waterproofing system.
 - 3. Verify items penetrating surfaces to receive waterproofing are securely installed.
 - 4. Verify substrate surface slopes to drain for horizontal waterproofing applications, and crickets are installed where indicated.
 - 5. Identify incompatible substrates, if any.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent surfaces not designated to receive waterproofing.
- B. Clean surfaces thoroughly prior to installation.
- C. Exercise care that structure is not overloaded during application.
- D. Install temporary waterstops at end of each day's work and remove before proceeding with next day's work. Waterstops shall be compatible with materials and shall not emit dangerous or incompatible fumes.
- E. Liquid materials such as solvents and adhesives shall be stored and used away from open flames, sparks and excessive heat.
- F. Verify that drain lines are un-blocked before starting work.
- G. Take necessary precautions when using volatile materials around air in-takes. Coordinate equipment to be turned off and on with Owner if necessary.
- H. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- I. Surface Preparation:
 - 1. Provide a smooth, clean substrate suitable for adhesion of waterproofing system. Remove substances that could inhibit bonding of membrane and waterproofing system. Substantially clean substrate to provide a smooth, even surface to greatest extent practical.
 - 2. Remove concrete form release coatings and curing compounds. Contaminants such as dirt, debris, loose materials, moisture, or surface irregularities shall be removed.

- 3. Grind down projections greater than 1/8". Grind, round off, and smooth sharp corners and edges. Patch and fill voids and holes greater than 1/2 inch with patching mortar.
- 4. New concrete shall be dry to the touch before application of membrane sheets.
- 5. If covering over a previously existing waterproofing system, substantially remove such that a solid, undisturbed substrate is achieved. Contact Hyload for specific applications.

J. Conductive primer installation:

1. Apply conductive primer at manufacturer's recommended film thickness for entire waterproofing area, including vertical zones, and allow to dry completely.

K. Surface Priming (only):

- 1. Apply Hyload Hyprime Primer at minimum rate of 1 gallon per 100 square feet. Allow primer to dry completely.
- 2. Application of primer shall be limited to what can be covered with membrane in a given workday. Primed areas not covered by membrane during workday shall be re-primed.
- 3. Re-prime areas contaminated with dirt or dust.
- 4. Mask adjacent areas to control application of primer. Remove spilled and misapplied primer.

L. Concrete Joint and Crack Treatment:

- 1. Cracks in concrete less than 1/16 inch wide shall be pre-treated with a 1/16 inch (60 mil) coating of mastic adhesive 2 inches wide centered on crack.
- 2. Apply 6 inches Hyproof GL sealing strip membrane centered over cracks wider than 1/16 inch set in 2 continuous 1/4 inch beads of Hyload Structural Sealant, one on each side of crack.

M. Detailing:

- 1. Apply 6 inch flashing membrane centered over vertical corners and horizontal to vertical transitions set in 2 continuous 1/4 inch beads of Hyload Structural Sealant, one on each side of corner.
- 2. Make flashing membrane strips continuous. Overlap end joints by a minimum of 3 inches and either hot air weld or set in continuous 1/4 inch bead of Hyload Structural Sealant inside lap.
- 3. Seal joints in substrates.
- 4. Provide a minimum of 3/4 inch Hyload Structural Sealant fillet at inside corners.
- 5. Provide flashings at changes of plane and around penetrations.
- 6. Apply a liberal bead of Hyload Structural Sealant at obstructions to continuous sheet waterproofing.

3.3 SHEET MEMBRANE INSTALLATION

A. General Requirements:

- 1. Proceed with waterproofing application only after substrate preparation is complete. Obtain acceptance of concrete surface from membrane manufacturer's field representative before proceeding with membrane application.
- 2. Apply and detail waterproofing system in compliance with manufacturer's instructions, recommendations, standard details, and project specific details. Use only proprietary membrane components and materials, as supplied by membrane manufacturer. Form terminations to match manufacturer's standard details including sealed termination bars.
- 3. Continuously seal terminations including temporary terminations with Hyload Structural Sealant.

- 4. Flash sheet waterproofing system into drains, if any. Make installation 100 percent waterproof.
- 5. Ensure waterproofing system is concealed from view in completed work.
- 6. Coordinate installation of counterflashings with covering construction.
- 7. Apply only as much waterproofing as can be made weathertight in a single day, including flashings. Do not permit water to penetrate under waterproofing and flashings.
- 8. Apply Hyload sheets from low point to high point so that laps shed water. Perimeters and penetrations shall be picture framed with sheets that run parallel to perimeter or penetration opening.

B. Self-Adhering Base Membrane

- 1. Exercise care to not trap air pockets under membrane during application.
- 2. Roll entire membrane firmly and completely as soon as possible. For horizontal applications, roller shall be a minimum of 30 inches wide and 70 pounds. Roller shall be cushioned with a resilient material such as foam or carpet. For vertical applications, a hand-held roller with rubber or neoprene wheels shall be firmly used.

C. Self-Adhered Top-Ply Membrane:

- 1. Apply Hyload sheets beginning at low point of roof or center of drain to base sheet following manufacturer's printed instructions.
- 2. Exercise care to not trap air pockets under membrane during application.
- 3. Roll entire membrane firmly and completely as soon as possible. For horizontal applications, roller shall be a minimum of 30 inches wide and 70 pounds. Roller shall be cushioned with a resilient material such as foam or carpet. For vertical applications, a hand-held roller with rubber or neoprene wheels shall be firmly used.

D. Lapping and Joining Sheets:

- 1. Follow lap guidelines printed on sheet waterproofing.
- 2. Adjacent sheets of membrane shall be securely and completely joined together by either hot air welding or by application of Hyload Structural Sealant.
- 3. Side laps shall be a minimum of 3 inches end laps a minimum of 9 inches. Stagger end laps by a minimum of 12 inches. Exercise care to avoid stretching sheets as they are applied. If stretched, sheets will recover overnight to their original dimensions.
- 4. Hot air weld side laps. Dress end laps with a 1/2 inch bead of Hyload Structural Sealant. Dress T-joints with 1/2 inch beads of Hyload Structural Sealant. In situations where hot air welding of side laps is restricted or otherwise impractical, a finished lap shall be achieved by placing a continuous 1/2 inch bead of Hyload Structural Sealant positioned 3/4 inch from edge under overlying membrane. Set lap by applying sufficient pressure over bead such that it just starts to bleed out from under overlying membrane.
- 5. Make minimum 4 inches laps at patches, repairs, and penetrations.

E. Membrane Flashing:

- 1. Flashing membrane shall lap over onto field membrane by a minimum of 6 inches.
- 2. Flashing membrane shall extend vertically a minimum of 9 inches above finished wear surface or grade. Secure top of flashing sheet with a termination bar fastened every 6 inches.
- 3. Junction of flashing to substrate, termination bar, and fasteners shall be covered and sealed with Hyload Waterproofing Mastic applied a minimum of 1/8 inch thick.
- 4. Cover termination with a membrane counterflashing.

F. Corners and Intersections:

1. At intersections of one horizontal and one vertical plane forming a 2-way inside corner, or two vertical planes forming a 2-way inside corner, treat inside corner by creating a

- minimum 3/4 inch fillet, or cant, using Hyload Waterproofing Mastic. Extend mastic onto both horizontal and vertical planes a minimum of 6 inches by 1/8 inch thick. Apply membrane snugly into corner over mastic.
- 2. At intersections of one horizontal and one vertical plane, or two vertical planes, forming an outside corner, grind off sharp edges such that a minimum 1/8 inch beveled corner is created. Apply a full sheet of membrane snugly over treated corner during installation.
- 3. At intersections of one horizontal and two vertical planes forming a 3-way inside or outside corner, set appropriate pre-formed Hyload Cloak into a 1/8 inch continuous bed of Hyload Waterproofing Mastic that extends a minimum of 6 inches in all directions out from corner. Extend vertical and horizontal field sheet of membrane onto cloak by a minimum of 3 inches in each direction.
- 4. Field membranes shall be secured to Hyload Cloak by either hot air welding or by setting field membranes into a 1/8 inch bed of Hyload Structural Sealant that has been applied to cloak. Whether hot air welding to cloak or setting membranes in sealant onto cloak, edges of membrane on cloak shall be dressed with a 1/2 inch bead of Hyload Structural Sealant.

G. Penetrations:

- 1. Apply Hyload sheets to within 1 inch of base of penetration. Dress edge of Hyload sheet with a 1/2 inch bead of Hyload Structural Sealant.
- 2. Apply a minimum 1/8 inch of Hyload TOM (trowel-on mastic) around penetration a minimum of 6 inches onto Hyload membrane and up penetration to just below height of completed overlay.

3.4 INSTALLATION OF PROTECTION COURSE

- A. Waterproofing membrane is not designed for permanent exposure. Protect membrane from abuse as soon as possible following membrane application.
- B. Apply protection board promptly following application of membrane. Boards shall be adhered to membrane using adhesive mastic.
- C. Adhesive shall be applied in compliance with manufacturer's instructions.
- D. Boards shall be butted together with no gaps larger than 1/4 inch.

3.5 INSTALLATION OF DRAINAGE COURSE

- A. Filter fabric shall face direction from which water will come.
- B. It is not necessary to anchor drainage panels in most applications; follow panel manufacturer's recommendations.
- C. Tuck filter fabric behind core to cover exposed edges. Tears or punctures in fabric shall be covered with new filter fabric.
- D. Place a sacrificial layer of 3 to 4 ounce, non-woven filter fabric over filter fabric integral with drainage panels to prevent primary filter fabric from clogging from setting bed.
- E. Rebar chairs shall be placed on metal or plastic plates to distribute load to prevent primary filter fabric from clogging.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests.
- B. Manufacturer's Field Service: Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components; and to furnish weekly reports to Design Professional.
- C. Flood Testing for drains: Flood test each area of new waterproofing for leaks, according to procedures in ASTM D5957, after completing waterproofing but before placing overlying construction. Flood tests shall be constructed such that the field of the new waterproofing is tested as well as the perimeter of the new waterproofing areas. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
 - 1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and a maximum depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
 - 2. Flood each area for 48 hours.
 - 3. Testing agency shall observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.
 - 4. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.
- D. Electric Field Mapping of horizontal waterproofing:
 - 1. Leak detection of horizontal waterproofing shall be done utilizing electrical conduction method (EFM).
 - 2. Provide testing to verify membrane is free of holes, open seams and capillary defects that will allow water to pass.
 - 3. For areas to receive EFM testing provide following:
 - a. Thoroughly wet waterproofing membrane in area of test. Wetting can be accomplished by hand or mechanical spray devises. Membrane shall be wet during testing procedures. Ponded water shall not be necessary.
 - b. Place conductor wire on wetted, bare membrane. Secure wire with small strips of waterproofing or other compatible membrane or tape. Overburden, insulation, drainage composites and filter fabric shall not be installed prior to initial test.
 - c. Allow testing technician to locate membrane breaches, if any. Technician shall mark on waterproofing membrane or surface exact location of defect and assign an identification number to each location.
 - d. Visually inspect entire membrane area and repair breaches found. An EFM retest shall be performed to confirm integrity of repair(s).
 - e. Technician shall prepare a report of each day's test results containing a written description and photograph of defect(s) located and a schematic CAD drawing indicating location of conductor wire and of defect(s) located in testing field to within 1 inch of accuracy. This report shall be made available in hard copy.
 - f. Submit written report of EFM tests to Design Professional within 7 days following testing. Report results of tests, both successful and unsuccessful. In addition to results, report shall include date of test, project name, list of products being applied and tested, name of applicator, name of Contractor, and conditions causing failure of waterproofing in event of an unsuccessful test.
- E. Waterproofing will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.7 PROTECTION, REPAIR, AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.
- F. Inspect membrane before covering and make repairs immediately. Patch tears, punctures, seams, or other deficiencies with a membrane patch that extends a minimum of 6 inches in every direction beyond defect. Dress edges of patch with not less than 1/2 inch bead of Hyload Structural Sealant.

END OF SECTION 071300

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SECTION 073126 - SLATE ROOFING

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. Slate shingles.
- 2. Underlayment materials.
- 3. Ridge accessories.
- 4. Metal flashing and trim.

1.3 ALTERNATES

A. See Section 012300 "Alternates" for description of alternates affecting items specified under this Section.

1.4 DEFINITIONS

A. Roofing Terminology: See ASTM D1079 for definitions of terms related to roofing Work in this Section.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site.
 - 1. Required participants: general contractor, roofing contractor and carpentry contractor.

1.6 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Slate shingles.
 - 2. Underlayment materials.
 - 3. Ridge accessories.
 - 4. Asphalt roofing cement.
 - 5. Butyl sealant.
 - 6. Elastomeric sealant.
 - 7. Roofing asphalt.

- 8. Cold-applied adhesive.
- B. Shop Drawings: For metal flashing and trim.
- C. Samples: For each exposed product and for each color and texture specified, in sizes indicated.
 - 1. Slate Shingles: Full size, of each color, size, texture, and shape.
- D. Samples for Initial Selection:
 - 1. For each type of slate.
 - 2. For each type of accessory involving color selection.
- E. Samples for Verification: For the following products, in sizes indicated:
 - 1. Slates: Full size, of each color, size, texture, and shape.

1.7 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each slate variety, by a qualified testing agency.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Slate Shingles: 100 sq. ft. of each size, type, and color, in unbroken bundles.

1.9 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockups for slate shingles including related roofing materials.
 - a. General layout, starting at eave: 48 inches long by 48 inches wide.
 - 1) If Slate Alternate accepted, provide one mockup for new slate, and second for existing slate.
 - b. Ridge: 4 LF, atop new flashings and top course of slate.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Store underlayment rolls in a dry, well-ventilated location protected from weather, sunlight, and moisture in accordance with manufacturer's written instructions.
 - 1. Store on end, on pallets or other raised surfaces.
 - Do not double-stack rolls.
- B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.
- C. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with installation only when existing and forecasted weather conditions permit product installation and related Work to be performed in accordance with manufacturer's written instructions and warranty requirements.
 - 1. Install self-adhering, polymer-modified bitumen sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.12 WARRANTY

- A. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of slate-shingle roofing 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 SOURCE LIMITATIONS

A. Obtain each type of product from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Exterior Fire-Test Exposure: Provide slate shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance in accordance with ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.3 SLATE SHINGLES (NEW)

- A. Slate Shingles: ASTM C406/C406M, Grade S1; hard, dense, and sound; with chamfered edges and nail holes machine punched or drilled and countersunk; with no broken or cracked slates, no broken exposed corners, and no broken corners on covered ends that could sacrifice nailing strength or laying of a watertight roof.
 - 1. Basis of Design: Clay Heald New England Slate, Poultney, VT, 802.637.5283, https://newenglandslate.com/
 - 2. Graduated roof layout, approx..90" of slate exposure. Slate Schedule:

Course	Length	Width	Thickness	# of Holes	Approx. Exposure
Starter	18"	14"	¾" to 1"	Unpunched	None
1st and 2nd	26"	Random	1" +	4	11-1/2"
3 rd and 4 th	24"	Random	¾" to 1"	4	10-1/2"
5 th and 6 th	22"	Random	1/2"-3/4"	4	9-1/2"
7 th	20"	Random	3/8" to ½"	2	8-1/2"-9"
8 th	20"-see note	Random	3/8" to ½"	Unpunched	8-1/2"-9"
Ridge Cap	18"	9"	Nom. 3/8"	Unpunched	9"

Note: 8th course of slate shall be hand-trimmed and punched to provide required length/exposure, and allow construction tolerances for minor variations in roof ridge height with respect to the bottom course of slate.

- 3. Butt Shape: Standard square cut.
- 4. Color: Vary, refer to existing slopes with approx. 32 purple slates per roof area
 - a. General: Unfading greens and greys
 - b. Unfading purple for random locations.

2.4 SLATE SHINGLES (SALVAGED)

- A. Slate Shingles: Hard, dense, and sound with no broken edges or corners larger than 1".
 - 1. Acceptable slates for reuse shall ring when struck with a roofing hammer. Dull sounding slates shall be discarded.
 - 2. Sort and palletize slates into sizes that approximate schedule of new slates.

2.5 UNDERLAYMENT MATERIALS

- A. Asphalt-Saturated Organic Felt: ASTM D226/D226M Type II or ASTM D4869/D4869M Type IV, unperforated.
- A. Ice Dam protection membrane, self-adhering sheet underlayment per Section 076000.

2.6 RIDGE ACCESSORIES

A. Flashings per Section 076000.

2.7 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D4586/D4586M Type II, asbestos free.
- B. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied.
- C. Elastomeric Sealant: ASTM C920, Type S, Grade NS, one-part, non-sag, elastomeric polymer sealant; of class and use classifications required to seal joints in slate-shingle roofing and remain watertight; recommended in writing by manufacturer for applications indicated.
- D. Cold-Applied Adhesive: Manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with underlayments.
- E. Slating Nails: ASTM F1667, copper, smooth-shanked, wire nails; 0.135-inch-minimum thickness; sharp pointed; with 3/8-inch-minimum diameter flat head; of sufficient length to penetrate a minimum of 3/4 inch into sheathing or extend at least 1/8 inch through sheathing less than 3/4 inch thick.
 - 1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- F. Underlayment Nails: Stainless steel, or hot-dip galvanized-steel wire nails with low-profile metal or plastic caps, 1-inch-minimum diameter.
 - 1. Provide with minimum 0.0134-inch-thick metal cap, 0.010-inch-thick power-driven metal cap, or 0.035-inch-thick plastic cap; and with minimum 0.083-inch-thick ring shank or 0.091-inch-thick smooth shank of length to penetrate at least 3/4 inch into roof sheathing or to penetrate through roof sheathing less than 3/4 inch thick.
- G. Nailer Strips: Comply with requirements in Section 061000 " Carpentry."
- H. Nails for Wood Strips: ASTM F1667; common or box, steel wire, flat head, and smooth shank; stainless steel.

2.8 METAL FLASHING AND TRIM

A. Comply with requirements in Section 076000 "Sheet Metal Flashing and Trim."

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.

- 1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
- 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored and that provisions have been made for flashings and penetrations through roofing.
- 3. Verify that vent stacks and other penetrations through roofing are installed and securely fastened.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT MATERIALS

- A. Comply with slate-shingle and underlayment manufacturers' written installation instructions and with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" applicable to products and applications indicated unless more stringent requirements are specified in this Section or indicated on Drawings.
- B. Ice Dam Protection Membrane: refer to Section 076000 for installation in designated areas only.
- C. Asphalt-Saturated Organic Felt: Install on roof deck parallel with and starting at top of gutter liner and fasten with underlayment nails.
 - 1. Double-Layer Installation:
 - a. Install a 19-inch-wide starter course at top of gutter liner and completely cover with a 36-inch-wide second course.
 - b. Install succeeding 36-inch-wide courses lapping previous courses 19 inches in shingle fashion.
 - c. Lap ends a minimum of 4 inches.
 - d. Stagger end laps between succeeding courses at least 72 inches.
 - e. Apply a continuous layer of asphalt roofing cement over starter course and on felt surface to be concealed by succeeding courses as each felt course is installed. Apply at locations indicated on Drawings.
 - 2. Install fasteners in a grid pattern of 12 inches between side laps with 6-inch spacing at side and end laps.
 - 3. Install felt over areas protected by self-adhering, polymer-modified bitumen sheet.
 - 4. Terminate felt flush against sidewalls and other roof projections.

3.3 INSTALLATION OF METAL FLASHING AND TRIM

- A. Install metal flashings and other sheet metal to comply with requirements in Section 076000 "Sheet Metal Flashing and Trim."
 - 1. Install metal flashings in accordance with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems."

- B. Step Flashings: Install with a headlap of 3 inches and extend both horizontally and vertically. Install with lower edge of flashing just upslope of, and concealed by, butt of overlying slate shingle. Fasten to roof deck only.
- C. Counterflashings: Coordinate with installation of base flashing and fit tightly to base flashing. Lap joints a minimum of 4 inches secured in a waterproof manner.

3.4 INSTALLATION OF SLATE SHINGLES, NEW OR SALVAGED

- A. Beginning at eaves, install slate shingles in accordance with manufacturer's written instructions and with details and recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems."
 - 1. Install strip cant at eave edges under underlayment materials.
 - 2. Install shingle starter course chamfered face down.
- B. Install first and succeeding shingle courses chamfered face up. Install full-width first course at rake edge.
 - 1. Offset joints of uniform-width slate shingles by half the shingle width in succeeding courses.
 - 2. Offset joints of random-width slate shingles a minimum of 3 inches in succeeding courses.
- C. Maintain a 3-inch minimum headlap between succeeding shingle courses.
- D. Provide graduated exposure of slates per Slate Schedule in Products section.
- E. At eaves, install shingle starter course and first course at elevation determined from Slate installation mockups.
- F. Cut and fit slate neatly around roof vents, pipes, ventilators, and other projections through roof.
- G. Hang slate with indicated slating nails for each shingle, with nail heads lightly touching slate.
 - 1. Do not drive nails home, which draws slates downward, and do not leave nail heads protruding enough to interfere with the overlapping shingle above.
 - 2. At vented ridges, terminate slate shingles to produce a uniform airspace on each side of ridge apex.
- H. Ridges: Install ridge slate in combed configuration.
 - 1. Install and anchor wood nailer strips of thicknesses to match abutting courses of slate shingles, terminating nailer strip 3 to 4 inches from the eave. Cover with self-adhering, polymer-modified bitumen sheet, extending to underlying slate but concealed by ridge slate.
 - 2. Lay ridge slate in bed of asphalt roofing cement.
 - 3. Anchor ridge slate to supporting wood nailer strip with two nails for each slate shingle, without nails penetrating underlying slate.
 - 4. Extend combed-ridge slate over leeward ridge slate by 1/8 to 1/4 inch. Seal ridge joint with elastomeric sealant.
 - 5. Cover heads of exposed nails at final ridge shingle with tripolymer sealant of Section 079200.

I. Remove and replace damaged or broken slate shingles.

3.5 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS <Insert name > of <Insert address >, herein called the "Roofing Installer," has performed roofing and associated work ("the work") on the following project:
 - 1. Owner: <Insert name of Owner>.
 - 2. Owner Address: <Insert address>.
 - 3. Building Name/Type: <Insert information>.
 - 4. Building Address: <Insert address>.
 - 5. Area of the Work: <Insert information>.
 - 6. Acceptance Date: <Insert date>.
 - 7. Warranty Period: <Insert time>.
 - 8. Expiration Date: <Insert date>.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant the work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that, during Warranty Period, Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of the work as are necessary to correct faulty and defective work and as are necessary to maintain the work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
 - 1. Specifically excluded from this Warranty are damages to the work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Peak gust wind speed exceeding 120 mph;
 - c. Fire:
 - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. Faulty construction of copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. Vapor condensation on bottom of roofing; and
 - g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 - 2. When the work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 - 3. Roofing Installer is responsible for damage to the work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of the work.
 - 4. During Warranty Period, if Owner allows alteration of the work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this

Warranty shall become null and void on date of the alterations, but only to the extent the alterations affect the work covered by this Warranty. If Owner engages Roofing Installer to perform the alterations, Warranty shall not become null and void unless Roofing Installer, before starting the alterations, notified Owner in writing, showing reasonable cause for claim, that the alterations would likely damage or deteriorate the work, thereby reasonably justifying a limitation or termination of this Warranty.

- 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a use or service more severe than originally specified, this Warranty shall become null and void on date of the change, but only to the extent the change affects the work covered by this Warranty.
- 6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect the work and to examine evidence of such leaks, defects, or deterioration.
- 7. This Warranty is recognized to be the only warranty of Roofing Installer on the work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of the work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.
- E. IN WITNESS THEREOF, this instrument has been duly executed this <Insert day> day of <Insert month>, <Insert year>.
 - 1. Authorized Signature: <Insert signature>.
 - 2. Name: <Insert name>.
 - 3. Title: <Insert title>.

END OF SECTION 073126

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SECTION 075600 - FLUID-APPLIED ROOFING AND GUTTER LINERS

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. Roofing
 - 2. Gutter liners
 - 3. Installation of tapered insulation for drainage.
 - 4. Cover Board.
- B. Related Requirements:
 - 1. Section 061000 "Carpentry" for wood sheathing nailers, curbs, and blocking.
 - 2. Section 076000 "Sheet metal flashing and trim"

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM) Annual book of ASTM Standards
- B. National Roofing Contractors Association (NRCA)
- C. American Society of Civil Engineers (ASCE)

1.4 DEFINITIONS

A. Roofing terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) *Roofing and Waterproofing Manual* for definitions of roofing terms related to this section.

1.5 PERFORMANCE REQUIREMENTS

- A. Provide an installed roofing and flashing membrane that does not permit the passage of water (i.e., waterproof).
- B. Manufacturer shall provide all primary roofing materials that are physically and chemically compatible when installed in accordance with manufacturer's current application requirements.

1.6 SUBMITTALS

- A. Provide product data sheet for each type of product indicated in this section.
- B. Installer shall provide written documentation from the manufacturer of their authorization to install the system, and eligibility to obtain the warranty specified in this system.
- C. Provide a minimum 16" square roofing section to show all roof system layers including the cover board and the integration of a profiled piece of copper edge trim flashed as shown on the drawings. This sample shall provide for layering materials to be visible in exposed overlapping layering to show all system layers necessary to comply with the Contract Drawings. Top surface color shall be as noted below in the product description.
- D. Shop drawings: Provide shop drawings illustrating tapered insulation layout for gutters.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer shall demonstrate qualifications to supply materials of this section by certifying the following:
 - 1. Membrane Manufacturer must show evidence that the specified membrane has been manufactured by the same organization or direct affiliate for fifteen (15) years.
 - 2. Membrane Manufacturer shall have available an in-house technical staff to assist the contractor, when necessary, in application of the products and final inspection of the assembly.
- B. Installer's Qualifications: The Contractor shall demonstrate qualifications to perform the work of this Section by submitting the following documentation:
 - 1. Certification or license by the waterproofing membrane manufacturer as a trained applicator of the product the installer intends to use.
 - 2. Mechanics performing work of this Section shall have at least 3 years documented successful experience in the installation of cold fluid-applied membrane roof systems
- C. Source Limitations: All components listed in this section shall be provided by a single manufacturer or material as approved by the primary waterproofing manufacturer.

1.8 MOCK UP

- A. Provide a mock-up for evaluation of surface preparation, installation techniques and workmanship:
 - 1. Install a ten (10) feet long section of gutter liner to include but not limited to the following components:
 - a. All gutter liner system layers, as a stepped mockup.
 - b. Termination flashing at masonry wall and masonry parapet.
 - 2. Gutter liner mockup will serve as Central Roof mockup.

- B. Provide for review by the Engineer and Owner for workmanship and compliance with the design intent to provide waterproof construction.
- C. Do not proceed with remaining work until workmanship is approved by Engineer and Owner
- D. Coordinate this mockup with the slate roofing manufacturer mockup.
- E. This mockup shall provide for materials to be visible in exposed overlapping layering to show all system layers necessary to comply with the Contract Drawings.
- F. Refinish mock-up area as required to produce acceptable work.
- G. Final Inspection
 - 1. Manufacturer's representative shall provide a comprehensive review after completion of the integrated roofing/flashing system mock up.
 - 2. All application errors must be addressed prior to final mock up acceptance.

1.9 PREINSTALLATION MEETINGS

- A. Preinstallation meeting: Conduct meeting on site.
 - 1. Prior to scheduled commencement of the waterproofing installation and associated work, conduct a meeting at the project site with the installer, Engineer, Owner, manufacturer's representative and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party within 5 days. The main purpose of this meeting is to review foreseeable methods and procedures related to waterproofing work.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all waterproofing materials to the site in original containers, with factory seals intact.
- B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range.
- C. Do not expose materials to moisture in any form before, during, or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.
- D. Remove manufacturer supplied plastic covers from materials provided with such. Use "breathable" type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material will be installed.
- E. Materials shall be stored above 55°F (12.6°C) a minimum of 24 hours prior to application.

1.11 PROJECT CONDITIONS

A. Weather

- 1. Proceed with work only when existing and forecasted weather conditions permit.
- 2. Membrane installation can proceed when ambient temperatures are above 40°F (4.4°C), provided the substrate temperature is a minimum of 5°F above the dew point.
- 3. It is recommended that overnight temperatures be above 40°F (4.4°C) when applying the membrane system. Consult with the manufacturer for cold weather installation procedures when ambient temperatures are expected to fall below the minimums established herein.
- B. All surfaces to receive the membrane shall be clean and dry free from visible water, dew, frost, snow and ice.
- C. Substrate surface conditions shall meet all the requirements of the manufacturer specifications before the installation begins. Contractor shall be responsible to maintain the required substrate conditions until the work is complete.
- D. Application of membrane should be conducted in well ventilated areas.
- E. Over its service life, do not expose membrane to a constant temperature below -58°F (-50°C) or in excess of 176°F (80°C) (i.e., hot pipes and vents or direct steam venting, etc.).
- F. Contractor shall ensure adequate protection of surrounding areas and completed or in progress membrane surfaces during installation of the waterproofing system.

1.12 WARRANTY

- A. Comply with warranty requirements stated in Section 075419
- B. In addition to complying with warranty requirements stated above
 - 1. Contractor shall provide the following Manufacturer's Warranty:
 - a. Sikalastic RoofPro System Limited Labor & Materials Warranty, duration twenty-five (25) years

PART 2 - PRODUCTS

2.1 FLUID APPLIED MEMBRANE SYSTEM ACCESSORIES

- A. Roof Insulation
 - a. Polyiso insulation board, fluid membrane manufacturers recommended tapered insulation.
 - b. Provide tapered where shown on the drawings to create indicated drainage patterns.
- B. Cement cover board:
 - 1. Basis of Design Manufacturer / Product: USG ½" thick Securock Cement Board.

- C. Primer for metal surfaces: A two-component, cyclo-aliphatic, amine cured material with a high level of corrosion resistance for metal and modified bitumen surfaces.
 - 1. Basis of Design Manufacturer / Product: Sika Sikalastic EP Primer/Sealer (epoxy primer).
- D. Primer for wood:
 - 1. Primer for wood: two-component, rapid curing, epoxy primer.
 - a. Basis of Design Manufacturer / Product: Sika Sikalastic EP Primer/Sealer (epoxy primer).
- E. Primer for masonry surfaces:
 - 1. Masonry surfaces: two-component, rapid curing, epoxy primer.
 - a. Basis of Design Manufacturer / Product: Sika Sikalastic EP Primer/Sealer (epoxy primer).
- F. Reactivation primer
 - 1. Reactivation of existing flashing: single-component, polyurethane based primer for reactivation of existing flashing or roofing systems if the overcoat window specified in writing by the manufacturer is exceeded.
 - a. Basis of Design Manufacturer / Product: Sika Reactivation Primer.
- G. Sealant As specified in Section 079200:
 - 1. Sealant: Project Sealant Designation P1
 - a. Use for the sealing of joints related to and recommended by the manufacturer prior to installation of the fluid applied membrane system.
 - 2. Sealant: Project Sealant Designation P2
 - a. Use for the sealing plywood panel joints, covering surface imperfections, blocking joints and fastener heads in plywood roof sheathing prior to installation of the fluid applied membrane system.
 - 3. Sealant: Project Sealant Designation P3
 - a. Use for the sealing of cracks in metal substrates and providing a suitable transition at changes in direction of substrate and between dissimilar materials prior to installation of the fluid applied membrane system.
- H. Bond Break Tape: Tape for covering interface between dissimilar materials prior to stripping-in shall be 2" wide duct tape or 3M's blue painter's tape.
 - 1. Tape may be used to form clean limit lines to which the new membrane waterproofing system is to be installed.
- I. Metal Flashing: Flashing shall be red copper as specified in Section 076000 unless noted otherwise at specific locations on the drawings.

J. Provide fillets at all horizontal to vertical or other change in direction transition joints.

2.2 FLUID APPLIED MEMBRANE MATERIALS

- A. Single component, cold, fluid applied, moisture triggered, aliphatic, and polyurethane meeting the following physical properties and ASTM D7311-07: Standard Specification for Liquid Applied, Single Component, Moisture-Triggered, Aliphatic Polyurethanes used in roofing.
 - 1. Basis of Design Manufacturer / Product: Sika Sikalastic 621 TC. (www.sikaconstruction.com).
 - 2. Exposed Face Color of Top Coat: Copper Green.
 - a. Provide manufacturer's standard color chart / samples for final review, selection and approval by the Owner and Engineer.
 - 3. Vary color of base coat and intermediate coat to allow coats to be easily distinguished and help ensure full coverage.
- B. Conformable, random woven polyester mat for reinforcement of the roofing/waterproofing membrane system, which provides greater impact resistance and greater resistance to excessive thermal and structural movement while maintaining elasticity and membrane film integrity.
 - 1. Basis of Design Manufacturer / Product: Sika Fleece-170.
- C. Nylon mesh for local reinforcement of the roofing/waterproofing membrane at structural cracks, expansion joints, and transitions between dissimilar materials.
 - 1. Basis of Design Manufacturer / Product: Sika Flexitape Heavy.
- D. Additional liquid membrane layers / coats: Apply multiple coats of roof membrane system components as indicated on the drawings

2.3 OTHER MATERIALS

- A. Cement cover board / sheathing:
 - 1. Thickness: Nominal 1/2".
- B. Solvent for solvent wipes for cleaning of metals and epoxy parge prior to priming: clean acetone or denatured alcohol.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

- 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- 2. Verify that all roof openings or penetrations through the roof are solidly set.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SUBSTRATE PREPARATION

- A. Inspect membrane installation areas for defects.
- B. Repair substrates prior to installation of membrane with materials and techniques acceptable to membrane manufacturer.
- C. Perform final cleaning, priming and preparation of substrates as recommended and specified by the Fluid membrane manufacturer.
- D. Follow manufacturer's requirements for membrane adhesion and terminations at adjacent surfaces.
- E. Sealant: Install specified sealant as a rounded concave shaped fillet at changes in plane prior to the application of the fluid-applied membrane, and any other locations recommended by the roofing membrane manufacturer.
 - 1. Fillet beads shall be approximately one (1) inch wide.

3.3 INSTALLATION, GENERAL

- A. General: Install roofing and flashing membrane materials according to all current manufacturer published application requirements in addition to those listed in this section.
- B. Primer: Prime all wood, metal, and other surfaces prior to the installation of the membrane.
- C. Localized reinforcement: Reinforce designated areas as follows-
 - 1. Coat location with a stripe of fluid-applied membrane.
 - 2. While stripe coat is wet, embed tape reinforcement, using a brush or roller to embed the reinforcement, using more membrane as required.
 - 3. Ensure that the reinforcing tape is not in tension while embedding.
 - 4. Allow the membrane to fully cure.

3.4 FLUID-APPLIED MEMBRANE APPLICATION

A. Surface preparation

1. Metal

- a. All exposed metal surfaces to be coated must be cleaned by power tool cleaning (SSPC SP-3) to remove all corrosion deposits back to a clean, bright metal, followed by a solvent wipe prior to application of specified primer.
- b. Fill any gaps or voids at the juncture of the deck penetrations with a single component polyurethane sealant, and allow to cure per manufacturer's instructions prior to over coating with the waterproofing system.

2. Wood

- a. All existing wood surfaces should be inspected. Replace any deteriorated materials per Section 061600 (Sheathing).
- b. All surfaces should be blown clean using an air compressor to remove any remaining loose debris, and facilitate drying process.
- c. All cracks and voids >0.040 inch should be routed and caulked with sealant. Allow sealant to cure per manufacturer's instructions prior to over coating with the membrane system.
- d. Fill any gaps or voids at the juncture of the deck penetrations with a single component polyurethane sealant, and allow to cure per manufacturer's instructions prior to over coating with the waterproofing system.

B. Priming

1. Metal

- a. Apply one coat of metal bonding primer to previously prepared metal by brush, roller at a rate of 200-250 SF/gallon, to achieve an overall wet thickness of 6-8 mils.
- b. Allow primer to cure and dry in accordance with manufacturer's instructions.

2. Wood

- a. Apply one coat of bonding primer to all new wood scheduled to receive new fluid-applied membrane system by brush or roller at a rate of 200 SF/gallon in accordance with manufacturer's instructions.
- b. Allow primer to cure and dry in accordance with manufacturer's instructions.

C. Base sheet

- 1. Install base sheet without wrinkles, twists, or gaps that would affect positive drainage and long-term wear of the fluid-applied roofing assembly.
- D. Membrane application

- 1. The membrane installation shall follow all the latest published manufacturer issued specification and written instructions for the installation of the specified multi layered reinforced liquid roof membrane system.
- 2. The following system is specified for this project:

Sikalastic RoofPro 25	Film Thickness (wet mils)	*Est. Coverage Rate (sf/gal)
Sikalastic 621 TC	65	15
		1

*Note: Coverage rates <u>include</u> a reasonable amount of wastage. Rough and textured substrates can significantly affect coverage rates.

- 3. Add additional liquid material, if necessary, to ensure that the mesh is fully saturated and fully conformed to the substrate without any visible pinholes.
- 4. Minimum overlap of the reinforcement mesh shall be 2" in all directions.
- 5. Reinforcement shall turn up all adjacent wall surfaces, etc. until the termination point is accomplished according to the project details and specifications. Membrane terminations should be finalized prior to project start-up and documented in shop drawings, but in general, terminations should occur in saw cut terminations, and where feasible, under installed counter-flashing materials. Tape lines should always be used to achieve a straight and professional looking edge detail.
- 6. Apply liquid material by 0.5-0.75 inch nap roller, brush or airless spray to achieve minimum wet film thicknesses, as specified in the table above.
- 7. Allow top coat to dry overnight prior to exposing to foot traffic.

3.5 ROOFING/FLASHING PROTECTION

- A. Protect all partially and fully completed roofing/flashing work from other trades until completion.
- B. Whenever possible, stage materials in such a manner that foot traffic is minimized over completed areas.
- C. When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed areas from traffic and point loading during the application process.
- D. Temporary tie-ins shall be installed at the end of each workday and removed prior to commencement of work the following day.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Engineer.

- B. Final Roof Inspection: Contractor shall arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
 - 1. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements or with manufacturer's requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements

3.7 CLEANING AND PROTECTION

- A. All work areas are to be kept clean, clear and free of debris at all times.
- B. Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.
- C. All tools and unused materials must be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.
- D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.
- E. Properly clean the finished roof surface after completion, and make sure the drains are working properly and are not clogged.
- F. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Engineer and Owner.
- G. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- H. Clean and restore all damaged surfaces to their original condition including but not limited to overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
 - 1. Use the gentlest material and methods possible and recommended by the specific material manufacturer to not damage the surface or finish of the adjacent surfaces.

END OF SECTION 075600

SECTION 076000 - SHEET METAL FLASHING AND TRIM

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. Red copper gutter outlets.
- 2. Red copper base, and other hidden from view flashings, where indicated.
- 3. Z-T coated copper downspouts, and downspout accessories
- 4. Z-T coated copper counterflashings, and other flashings where indicated.

B. Related Requirements:

- 1. Section 024119 Selective Demolition
- 2. Section 040120 Historic Masonry Restoration
- 3. Section 061000 Carpentry
- 4. Section 073126 Slate Roofing
- 5. Section 075600 Fluid-Applied Roofing and Gutter Liners

1.3 COORDINATION

- A. Coordinate flashing and sheet metal fabrications layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate flashing and sheet metal fabrications installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

- 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
- 3. Review requirements for insurance and certificates if applicable.
- 4. Review sheet metal flashing observation and repair procedures after flashing installation.
- 5. Review Fire Watch requirements for installation of materials specified herein.

1.5 ACTION SUBMITTALS

- A. Product Data: For each of the following:
 - 1. Flux and solder for red copper.
 - 2. Underlayment materials.
 - 3. Butyl materials.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details for the following work scopes:
 - a. Center roof: counterflashings, including wind clips.
 - b. At constrained corners of gutter at center roof: counterflashings, including wind clips.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 6. Include details of edge conditions, flashings, and counterflashings.
 - 7. Include details of special conditions.
 - 8. Include details of connections to adjoining work.
 - 9. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.

C. Samples:

1. Fasteners: for every specified or proposed fastener, including rivets, for every substrate including, wood, metal, and masonry.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For flashing and sheet metal, and its accessories, to include in maintenance manuals.
- B. Warranty.

1.7 QUALITY ASSURANCE

- A. Fabricator/Installer Qualifications: Employs skilled workers with minimum of five (5) yrs experience with custom fabricate flashing and sheet metal similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical masonry wall counterflashing, approximately 4 feet long, including laps.
 - 2. Build mockup of center roof counterflashings, demonstrating changes in direction and varying coping stone widths, about 8 LF.
 - 3. Build mockup of north and south crenellated parapet counterflashings with armored cap joint (lead tee cap), about 4 LF, including a transition from merlon to crenel.
 - 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
 - 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
 - 6. Mockups will be evaluated by Engineer for conformance with the design intent of the construction drawings, and finished aesthetic appearance will be evaluated by Engineer and Owner.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
 - 1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
 - 2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 WARRANTY

A. Contractor shall provide warranty, covering repair and replacement of defective assemblies or materials, including costs associated with materials, access, and labor for defects within ten (10) years of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual"] requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Copper Sheet: ASTM B370, cold-rolled copper sheet, non-patinated, Grade 060, H00 or H01 temper.
 - 1. Source Limitations: Obtain sheet from single source from single manufacturer.
 - 2. General base flashings and other miscellaneous flashings not exposed to view: 20 oz, red copper, Grade H00.
 - 3. Slate ridge flashings: red copper, Grade 060.

- 4. Tabs & Cleats to secure flashings: red copper, Grade H00, 24 oz.
 - a. Fully coat exposed portion of any tab on Z-T coated counterflashings with solder to blend aesthetically.
 - b. Tabs & Cleats fastened to/through fluid-applied roofing shall be flashed with additional fluid-applied membrane to seal.
- C. Zinc-Tin Alloy-Coated Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 temper; coated on both sides with zinc-tin alloy (50 percent zinc, 50 percent tin).
 - 1. Basis of Design: Freedom Grey from Revere Copper.
 - 2. Source Limitations: Obtain sheet or products from single source from single manufacturer.
 - 3. Counterflashings, and other flashings to be permanently exposed to view: 20 oz, Grade H00.
 - 4. Overflow scupper, plain round downspouts, and prefabricated elbows in varying degrees: 16 oz, Grade H00.
 - a. Basis of Design product manufacturer: Berger Bros, https://www.bergerbp.com/
 - b. Sizes: As indicated in Contract Drawings.
- D. Lead Sheet: ASTM B749 lead sheet.
 - 1. Fabricate reglet wedges, folding sheet to provide thickness to secure regletted flashing enddams into joint.

2.3 PIPE

- A. Gutter outlets: Outlets shall comply with ASTM B370, Grade H00, 32 oz, in diameters indicated in Contract Drawings.
 - 1. Gutter outlet strainers shall be as specified in Plumbing Contract Drawings. Strainers shall be secured to gutter liner with copper clips that are flashed into gutter liner with additional fluid applied roofing.

2.4 UNDERLAYMENT MATERIALS

- A. Ice Dam Protection Membrane Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.
 - 1. Basis of Design: Basis of Design: Carlisle Syntec WIP 300HT, www.carlislesyntec.com
- B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.5 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. Fasteners for Copper Sheet: Copper, hardware bronze or passivated Series 300 stainless steel, as denoted in construction drawings.
 - a. Refer to construction documents for specific requirements for assemblies.
 - 2. Fasteners for affixing downspout brackets or cleats to masonry: nail-in anchor with mushroom head, with stainless steel pin.
 - 3. Fasteners for affixing leader heads to masonry shall be sleeve-type, nylon insert with stainless steel or bronze bolt.

C. Solder:

- 1. For Copper: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead.
- 2. For Zinc-Tin Alloy-Coated Copper: ASTM B32, 100 percent tin, with maximum lead content of 0.2 percent, as recommended by sheet metal manufacturer.
- D. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- E. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.
- F. Downspout hangers:
 - 1. Masonry fastener or bronze drive, rack, and key in copper-Freedom Grey from Berger Bros.

2.6 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standards that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
 - 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 2. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for design, dimensions, metal, and other characteristics of the item unless otherwise specified in this Section or indicated on Drawings.
 - a. Step Base Flashings: Fabricate with a headlap of 3 inches and a minimum extension of 4 inches both horizontally and vertically.

- b. Counterflashings: Fabricate to cover 4 inches of base flashing measured vertically; and in lengths required so that no step exceeds 8 inches and overall length is as indicated in Contract Drawings.
- c. Provide metal reglets or receivers for installation as indicated in Contract Drawings.
- d. Drip Edges: as indicated in Contract Drawings
- 3. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- 4. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
- 5. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
- 6. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

- 1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- 2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- E. Downspouts: Fabricate downspout assemblies to provide watertight construction. Solder all seams to seal.

F. Seams:

1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

- A. Ice Dam Protection Membrane --Self-Adhering, High-Temperature Sheet Underlayment:
 - 1. Install self-adhering, high-temperature sheet underlayment; wrinkle free in designated locations only.
 - a. Endwalls of slate roofing at masonry above gutter liner.
 - b. Ridge cap under slates.
 - 2. Prime substrate if recommended by underlayment manufacturer.
 - 3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
 - 4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
 - 5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
 - 6. Roll laps and edges with roller.
 - 7. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
 - 1. Refer to Section 040120 for general raking out and preparation of masonry reglets, and subsequent repointing, or sealing with lead tee cap (armored joint cover) per Section 079200.

- 2. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
- 3. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder.
- 4. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
- 5. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
- 6. Where indicated, install continuous cleats with fasteners spaced not more than 12 inches o.c.
 - a. Where cleats puncture fluid-applied roofing or gutter systems, seal base of cleat and fastener with additional fluid-applied roofing material.
- 7. Where indicated, space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
- 8. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
- 9. Do not field cut sheet metal flashing and trim by torch.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressuretreated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
 - 1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
 - 2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 - 3. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
 - 1. Use sealant-filled joints unless otherwise indicated.
 - a. Embed hooked flanges of joint members not less than 1 inch into sealant.
 - b. Form joints to completely conceal sealant.

- c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
- d. Adjust setting proportionately for installation at higher ambient temperatures.
 - 1) Do not install sealant-type joints at temperatures below 40 deg F.
- 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
 - 1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
 - 2. Do not use torches for soldering.
 - 3. Heat surfaces to receive solder, and flow solder into joint.
 - a. Fill joint completely.
 - b. Completely remove flux and spatter from exposed surfaces.
 - 4. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.

3.4 INSTALLATION OF OUTLET, SCUPPER & DOWNSPOUT ASSEMBLIES

- A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Downspouts:
 - 1. Join sections with 2-inch telescoping joints.
 - 2. Provide mounting brackets with fasteners designed to hold downspouts securely to walls. Locate hanger / mounting brackets, 2 per 10 ft length.
 - 3. Align downspouts to drain into subgrade dry wells.
- C. Parapet Scuppers:
 - 1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

3.5 INSTALLATION OF ROOF FLASHINGS

A. Slate base flashings per Section 073126.

- B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
 - 1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
 - 2. Extend counterflashing 4 inches over base flashing.
 - 3. Lap counterflashing joints minimum of 4 inches.

3.6 INSTALLATION OF METAL THROUGH-WALL AND OTHER WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.7 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

3.9 PROTECTION

- A. Remove temporary protective coverings and strippable films as flashing and sheet metal are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.
- C. Maintain completed work in clean condition during construction.
- D. Replace installed work assemblies or pieces that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Engineer.

END OF SECTION 076000

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SECTION 079200 - JOINT SEALANTS

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. Silicone joint sealants.
- 2. Polyurethane joint sealants.
- 3. Butyl joint sealants.
- 4. Butyl tape systems.
- 5. Lead wool joint fill.
- 6. Lead "T" armored joint cover
- 7. Other sealant joints

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product required.
 - 1. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations and project requirements controlling use of volatile organic compounds.
 - 2. Certification by the lead wool manufacturer that the lead wool is compatible with all parts of the system it is used with.
- B. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind of joint and each color of joint sealant selected or required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:

- 1. Joint-sealant application, joint location, and designation.
- 2. Joint-sealant manufacturer and product name.
- 3. Joint-sealant formulation.
- 4. Joint-sealant color.

E. Miscellaneous Samples

- 1. 6" length of the manufacturer's standard lead wool samples and an indication of any additional manufacturer's standard available sizes.
- 2. 6" length of standard manufacturer available widths of lead "T" armored joint covers.
- 3. 6" length of Butyl Tape in specified color, width and thickness.
- F. Shop Drawings: Submit shop drawings showing all joint conditions, indicating relation of adjacent materials, all joint sealant materials (sealant, bond breakers, backing, primers, butyl tape, lead "T" covers, lead wool, butyl tape etc.) and method of installation.
 - 1. Submit joint sizing calculations certifying that movement capability of sealant is not being exceeded.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency indicating sealants comply with requirements.
- C. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
- D. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing requirements specified in "Preconstruction Testing" Article.
- E. Field-Adhesion-Test Reports: For each sealant application tested.
 - 1. Submit reports to the Design professional and Owner within 10 days of test completion.
 - 2. Submit compilation of all test reports with Close Out Documents.
 - 3. Tests shall be based upon the test requirements specified in "Field Quality Controls" Article.

F. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups:

- 1. Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- 2. Install mockup of Armored Joint Cover installation in a prepared joint.
- 3. Install mockup of lead wool installation in a prepared joint.
- 4. Install mockup of butyl tape installation in a prepared joint.

D. Preinstallation Conference:

- 1. Conduct conference at Project site.
- 2. Attendees shall include, by not limited to, representatives from the following:
 - a. Owner
 - b. Owner's Representative Firm
 - c. Construction Manager (CM) / General Contractor (GC)
 - d. Subcontractor / Installer
 - e. Supplier
 - f. Manufacturer
 - g. Design Professional
 - h. Others as deemed necessary by the CM / GC or the Owner.
- 3. CM / GC shall provide a written notification no less than 7 days prior to the scheduled conference.
- 4. After the conference, CM / GC shall provide a written document (minutes) that includes but not limited to the following:

- a. Project data.
- b. Attendees list
- c. List of items discussed and related conclusions or action items
- d. Open issues / responsible party
- 5. Contractor shall issue the meeting minutes for review within 5 days of the completion of the conference.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
 - 3. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
 - 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 5. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
 - 6. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test sealant adhesion to Project joint substrates as follows:
 - 1. The manufacturer's representative for each sealant used shall participate in, oversee and review field tests to confirm the test and results meet or exceed the manufacturer and project specifications, performance requirements and expectations for a watertight installation.
 - 2. Locate test joints where indicated or as directed by Design Professional.
 - 3. Conduct field tests for each kind of sealant and tape system and joint substrate.
 - 4. Notify Design Professional in writing seven days in advance of dates and times when test joints will be performed.
 - 5. The joint-sealant manufacturer's technical representative shall be present and participate in the testing with the General Contractor and designated sealant Subcontractor.

- a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
- 6. Report specific failure type, i.e., whether sealant failed to adhere to joint substrates or tore cohesively.
 - a. Include data on pull distance used to test each kind of product and joint substrate.
 - b. For sealants that fail
 - 1) Document type of failure.
 - 2) Follow all manufacturer recommendations to correct deficiency.
 - 3) Retest until satisfactory results are obtained.
- 7. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
- 8. See additional Field Test requirements in "Field Quality Control" Article.

1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.

- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.
- D. Warranties shall be in a form acceptable to the Owner and executed by an authorized individual.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply 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.
- C. Colors of Exposed Joint Sealants: As selected by Design Professional from manufacturer's full range of standard colors.

2.2 SILICONE JOINT SEALANTS

- A. Project Sealant Designation S1
 - 1. Single component non-sag, gun grade, single-component, neutral curing, non-staining, Silicone Sealant meeting or exceeding the requirements of ASTM C920, Type S, grade NS, Class 100/50. Use group T, NT, M, G, A and O. Color shall be selected by the Design Professional as part of a mock-up.

- a. Products: Subject to compliance requirements, the basis of design shall be:
 - 1) "Dow 790", Dow Corning Corp., Midland, MI 48686.
 - 2) OR Design Professional approved Substitution following all the procedures required by Specification Section 012500.

2.3 POLYURETHANE JOINT SEALANTS

- A. Project Sealant Designation P1
 - Single-Component, Gun-Grade, advanced polyurethane, elastomeric sealant / adhesive: meeting or exceeding the requirements of Federal Specification TT-S-00230C, Class A, ASTM C 920, Type S, Grade NS, Class 12.5, for Use NT,I, M, G, A, O.
 - a. Products: Subject to compliance with requirements, compatibility with adjacent material and approval of adjacent material manufacturer, basis of design shall be:
 - 1) Sika Corporation, Construction Products Division; Sikaflex 11 FC.
 - 2) OR Design Professional approved Substitution following all the procedures required by Specification Section 012500.
- B. Project Sealant Designation P2
 - 1. Single-Component, premium grade, high-performance, nonsag, Polyurethane Joint Sealant: meeting or exceeding the requirements of Federal Specification TT-S-00230C, Type II, Class A, ASTM C 920, Type S, Grade NS, Class 35, for Use T, NT, O, M, G, I, A.
 - a. Products: Subject to compliance with requirements, compatibility with adjacent material and approval of adjacent material manufacturer, basis of design shall be:
 - 1) Sika Corporation, Construction Products Division; Sikaflex 1a+.
 - 2) OR Design Professional approved Substitution following all the procedures required by Specification Section 012500.
- C. Project Sealant Designation P3
 - 1. Single Component low-modulus, high performance, non-sag elastomeric sealant meeting or exceeding the requirements of Federal Specification TT-S-00230C, Type II, Class A, ASTM C 920, Type S, Grade NS, Class 35, for Use T, NT, O, M, G.
 - a. Products: Subject to compliance with requirements, compatibility with adjacent material and approval of adjacent material manufacturer, basis of design shall be:
 - 1) Sika Corporation, Construction Products Division; Sikaflex 15LM.

2) OR - Design Professional approved Substitution following all the procedures required by Specification Section 012500.

2.4 BUTYL JOINT SEALANTS

- A. Project Sealant Designation B1
 - 1. Butyl-Rubber-Based Joint Sealants: single-component sealing compound formulated from virgin butyl rubber, ASTM C 1311 (+/- 7.5% joint movement), non-drying, non-bleeding, non-hardening, non-skinning, non-migrating, gun grade, meeting or exceeding the requirements of Federal Specification TT-S-001657, Type 1 and TT-C-1796A.
 - a. Products: Subject to compliance with requirements, compatibility with adjacent material and approval of adjacent material manufacturer, basis of design shall be:
 - 1) Pecora Corporation, Harleysville, PA 19438 (610) 723-6051; BC-158 Butyl Rubber Sealant.
 - 2) OR Design Professional Approved Substitution following all the procedures required by Specification Section 012500.

2.5 TRIPOLYMER JOINT SEALANTS

- A. Project Sealant Designation T1
 - 1. Construction Tripolmer Sealant: single component, high performance elastomeric sealant
 - a. Products: Subject to compliance with requirements, compatibility with adjacent material and approval of adjacent material manufacturer, basis of design shall be:
 - 1) Geocel Corporation, Cleveland, Ohio 44115, 800-348-7615; Geocel 2300
 - a) Color clear.
 - 2) OR Design Professional Approved Substitution following all the procedures required by Specification Section 012500.

2.6 BUTYL TAPE

- A. Butyl Tape Joint Sealant: Double sided butyl tape with manufacturer specified cover / release paper:
 - 1. Products: Subject to compliance with requirements, compatibility with adjacent material and approval of adjacent material manufacturer, basis of design shall be:
 - a. MB-10A High Temperature Self Adhering Double Sided Butyl Rubber Sealant Tape as provided by Best Materials 800-474-7570;

OR

b. Design Professional Approved Substitution - following all the procedures required by Specification Section 012500.

2. Properties

- a. Color Gray
- b. UV resistance
- c. High-performance elastomeric butyl rubber sealant
- d. High temperature resistance: 90°C
- e. Width 1"
- f. Thickness 1/8"
- g. Solids 100%
- h. Premium-grade
- i. Peel Strength: 15 pounds per linear inch
- j. Water Resistant
- k. Service Life greater than 20 years

2.7 LEAD WOOL JOINT FILL

A. Contractor shall provide and install lead wool in indicated masonry joints.

2.8 ARMORED JOINT COVER

- A. Lead Tee Caps. Use size of strips as recommended by sealant manufacturer and compatible with style and configuration of existing masonry.
- B. Basis of design manufacturer and product.
 - 1. Weathercap Joint Protective System, as manufactured by Weathercap, Inc.
- C. Configuration and size:
 - 1. Joints at horizontal surfaces TYPE A Flat Cap Strips should be of sufficient size to cover the joint width, plus a percentage allowance for anticipated joint movement, plus ¼".
 - 2. Joints at vertical to horizontal surfaces TYPE B 90 Degree Cove Cap Strips should be of sufficient size to cover the joint width, plus a percentage allowance for anticipated joint movement, plus ¼".

2.9 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.10 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Sand for Dusted Sealant Joints: Pointing mortar sand from approved repointing mortar.
- C. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- D. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, 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 of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

- 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include but not limited to the following:
 - a. Concrete.
 - b. Masonry.
 - c. Wood.
- 3. Remove laitance and form-release agents from concrete.
- 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include but not limited to the following:
 - a. Metal.
 - b. Glass.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind required or indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully prepared joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
 - 4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 INSTALLATION OF LEAD WOOL

- A. Install lead wool at all joints where indicated on the drawings.
- B. In all existing joints where lead wool is indicated to be installed, Contractor to remove all existing joint fill material to a minimum depth 2½ times the width of the joint or the bottom of the existing slot. All loose material shall be removed from the existing slot to provide a stable substrate for the lead wool installation.
- C. Lead wool joint fill shall be packed tight to fill joint and be raised to be smooth and just above adjacent surface.
- D. Provide backing material as recommended by lead wool manufacturer if the depth is greater than specified.
- E. Final surface of lead wool to shed water away from the building surface.

3.5 INSTALLATION OF LEAD ARMOR JOINT COVERS

- A. The installation of the cover is part of a multi component installation of joint protection where indicated on the drawings.
- B. Installation shall follow the latest issued manufacturer specification and instructions including but not limited to:
 - 1. Joint preparation and cleaning.
 - 2. Protection of surrounding masonry surfaces
 - 3. Installation of back up components
 - 4. Installation of armored cover including proper trimming of material
 - 5. Finishing of joint.
 - 6. Removal of protection.

3.6 INSTALLATION OF BUYTL TAPE SYSTEM

- A. The installation of the tape is part of a multi component installation of joint protection where indicated on the drawings at the existing metal cornice.
- B. Installation shall follow the latest issued manufacturer specification and instructions including but not limited to:
 - 1. Install butyl tape at all joints where indicated on the drawings.
 - 2. Joint preparation and cleaning.
 - 3. Protection of surrounding metal surfaces.
 - 4. Finishing of joint.
 - 5. Removal of protection.

3.7 FIELD QUALITY CONTROL

- A. The manufacturer's representative for each sealant used shall participate in, oversee and review field tests to confirm the test and results meet or exceed the manufacturer and project specifications, performance requirements and expectations for a watertight installation
- B. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Perform test at each different substrate and sealant type.
 - 2. Perform test at butyl tape installation location.
 - 3. Extent of Testing: Test completed and cured sealant joints as follows:

- a. Perform three (3) tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
- b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.
- c. Perform one (1) test at the competition of the installation matching the same criteria listed here (but at a different location from previous tests).
 - 1) Follow manufacturer requirements for the repair / replacement of joint installation as required and if test joint failed.
- 4. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
- 5. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
- 6. Record and submit test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
 - a. Submit test results as specified in "Information Submittals" Article.
- 7. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- C. Evaluation of Field-Adhesion-Test Results:
 - 1. Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory.
 - 2. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements.
 - a. Follow all manufacturer recommendations to correct joint deficiencies.
 - b. Retest failed applications until test results prove sealants comply with indicated requirements.

3.8 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- B. Contractor shall use cleaning products and methods as required to prevent damage to the finish of the adjacent surfaces.

3.9 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.10 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Sealant Type Silicone S-1.
 - 2. Joint Locations:
 - a. Control and expansion joints in unit masonry.
 - b. Noted joints in dimension stone. Where noted on drawings, provided "dusted" sealant joints by embedding approved repointing mortar sand in newly installed sealant joints.
 - c. Joints to be covered with Armored Joint Cover.
 - d. Joints between different materials.
 - e. Perimeter sealant joints around penetrations through new vapor retarder at basement floors and walls.
 - f. Other joints as indicated on Drawings.
- B. Joint-Sealant/ Adhesive Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Sealant Type Polyurethane P-1.
 - 2. Joint Locations:
 - a. Joints related to and as recommended by the manufacturer related to the installation of the fluid applied roof membrane system and PVC roof membrane system.

- C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Sealant Type Polyurethane P-2.
 - 2. Joint Locations:
 - a. Exposed painted wood trim surfaces and joints
 - b. Concealed wood surfaces and joints.
 - c. Concealed painted surfaces
 - d. Joints between different materials listed above.
 - e. Perimeter joints between materials listed above and frames of doors, windows and louvers.
 - f. Joints related to and as recommended by the manufacturer related to the installation of the fluid applied roof membrane system and PVC roof membrane system.
 - g. Other joints as indicated.
- D. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Sealant Type Polyurethane P-3.
 - 2. Joint Locations:
 - a. Concealed transition joints related to and as recommended by the manufacturer related to the installation of the fluid applied roof membrane system and PVC roof membrane system
- E. Joint-Sealant Application: Concealed mastics
 - 1. Joint Sealant Type: Butyl-rubber based B-1
 - 2. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. Sheet metal joints
 - d. Bedded sealants at wood windows and flashings.
- F. Sealant application Exterior joints related to specified roofing systems

- 1. Joint Sealant Type: Tripolymer T1
- 2. Joint Locations
 - a. Locations where indicated or shown on the Construction Document details.
- G. Lead Wool Joint Fill: Fill masonry joint in stone trim after installation of metal flashing into existing stone slot.
- H. Butyl Tape Application: In locations indicated or shown on the Construction Document details.
- I. Armored Joint Cover: Exterior where indicated on the drawings in horizontal surfaces and vertical to horizontal intersection.
 - 1. Joint sealant Silicone (see above) with backer rod and lead tee cover embedded.
 - 2. Joint Locations
 - a. TYPE A Joints in horizontal stone
 - b. TYPE B Joints in 90 degree change from horizontal to vertical masonry

END OF SECTION 079200

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SECTION 21 00 00 - FIRE SUPPRESSION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Drawings and the General Provisions of the Contract, Including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specifications apply to the work of this Section.
- B. The Work of Section 21 05 00 Basic Materials and Methods applies to the work of this Section.

1.2 WORK INCLUDED

- A. This project involves removal of an existing wet pipe sprinkler system in the War Memorial tunnel to enable demolition of the tunnel roof slab and installation of coverage in the tunnel after completion of the replacement slab.
- B. The existing fire protection lateral, fire department connections and bulk mains to Lyon and McFaddin running through the tunnel were renewed as part of Phase 1 and will remain in place and active throughout construction. The General Contractor shall provide suitable shoring above the piping to protect it during construction.
- C. The work of this Division shall include providing all materials, labor, services, permits and related work to furnish a complete, operating, tested, functioning, documented sprinkler system alteration including all work shown, specified, or required for proper system operation including but not limited to the following:
- D. Provide all City of Ithaca Permits and Inspections and pay all fees.
- E. Provide Submittals to Owner's Insurance Carrier and City of Ithaca Codes Department and provide any required changes to obtain approval. Provide this work to allow timely construction. The fire protection shop drawings shall be stamped by a licensed New York State Professional Engineer as required by the City of Ithaca.
- F. Provide removals of portions of sprinkler system piping and appurtenances in all renovated spaces as shown on the Contract Drawings.
- G. Provide Basic Materials and Methods.
- H. Provide renovations to wet pipe sprinkler systems as indicated on the Contract Documents.
- I. Provide painting of all newly installed and existing fire suppression piping and supports throughout the War Memorial tunnel.

- J. Provide an allowance for providing and installing one (1) sprinkler head in addition to the heads shown on the Contract Drawings, at locations directed by the Engineer. Provide a separate lump sum cost for this allowance in the Bid.
- K. Provide black Schedule 40 A53 Type F steel for all interior pipe provided under this Project. Black C.I. or black M.I. fittings are acceptable. Groove fittings and couplings provided shall be standard finish. Provide cement lined flanged ductile iron pipe for replacement Fire Department Connection.
- L. The Fire Protection Contractor shall provide a hydrostatic pressure test at 200 psi for 2 hours on the wet pipe system following rough-in of the Contract provided piping. This test shall be scheduled through Cornell EH&S and be witnessed by the Engineer, Cornell EH&S and the Ithaca City Fire Department. Do not cover new piping with ceiling or walls until after hydrostatic test is complete. All joints and piping need to be exposed for inspection.
- M. Provide Product Submittals and Shop Drawings. The sprinkler shop drawings being submitted to the Project Engineer shall be stamped by a licensed New York State Professional Engineer as required by the City of Ithaca.
- N. Provide Owner's Operation Instruction.
- O. Provide Operation and Maintenance Manuals.
- P. Provide Warranty.
- Q. Provide As-Built Drawings.
- R. Provide Firestopping and Smokestopping.
- S. Provide openings in existing construction as required for the work of this project.
- T. Provide a full flow 2" drain test and record on the test certificate.
- U. Provide testing of all tamper switches, alarm pressure and air supervisory switches for the affected zones of the existing wet pipe system as part of the final closeout work. All testing shall be coordinated with Cornell University Environmental Health & Safety, the City of Ithaca Codes Division, the Fire Alarm Contractor, and the Engineer.
- V. Provide certification that all fire protection work has been provided per the Contract Documents and per NFPA 13 and FM Global's data sheets.

1.3 FACTORY MUTUAL REQUIREMENTS

- A. Pipes, fittings, hangers, valves, sprinklers, and all other fire protection equipment should be FM Approved. Please submit copies of manufacturer technical data sheets for all fire protection equipment being utilized in this project to this office for review and comment when they become available.
- B. All new sprinkler protection should be installed per Data Sheet 2.0, Installation Guidelines for Automatic Sprinklers. This Data Sheet offers recommendations for horizontal sprinkler spacing, sprinkler distances from ceiling, and avoiding obstructions. Final acceptance of the automatic sprinkler systems will be by field examination and satisfactory completion of the Contractor's Material and Test certificate.

1.4 RELATED WORK NOT INCLUDED

- A. The Electrical Contractor is responsible only for the electrical connections included under Division 26, 27, 28 and the Electrical Drawings. The Fire Protection Contractor shall provide all other electrical work necessary for satisfactory operation of equipment furnished under Division 21-Fire Suppression.
- B. The Painting Contractor is responsible under Division 9 for painting of the fire protection piping, which is not concealed in soffits, above drop ceilings or in chases.

1.5 DIVISION 21 FIRE SUPPRESSION DESCRIPTION

- A. The technical specifications of this Contract are arranged for the convenience of the Owner and Designers into Divisions of Work. The Work of Division 21 Fire Suppression is further described in Specification Sections of the 21 00 00 Series and on Contract Drawings of the "F" series.
- B. The organization of the work into Divisions shall not relieve the Prime Contractor from providing all of the work shown on the complete set of Drawings or specified herein, whether or not the individual subcontractors correctly identify their respective responsibilities.

1.6 OTHER DIVISION SPECIFICATIONS APPLICABLE TO THIS WORK

A. To the extent that the Work of the Division of Contract includes the work of other trades, the Contractor for this Division shall adhere to the requirements of other specification sections. All electrical work shall be performed in accordance with the Division 26, 27 and 28 specifications. All General Construction work shall be performed in accordance with the provisions of the appropriate Division 2 through Division 14 Sections. Fire detection work shall conform to the Division 28 sections. Painting shall be performed by the Painting Contractor under Division 9.

1.7 CODES AND STANDARDS

- A. Conform to 2015 ICC Codes as amended by the New York State 2017 Uniform Code Supplement.
- B. Sprinkler Systems NFPA 13 2013.
- C. FM Global's Data Sheets.
- D. Inspection Testing and Maintenance of Water Based Fire Protection Systems NFPA 25.

1.8 APPROVAL CERTIFICATES

- A. The work of this Contract shall comply with the requirements of the City of Ithaca and the Owner's Insurance Carrier.
- B. Contractor shall submit at least four (4) sets of the Contractor's working Drawings to the City of Ithaca Codes Office and secure its approval. The Contractor shall submit four (4) sets of working Drawings to the Owner's Insurance Carrier and secure its comments.
- C. Before seeking final approval of the installed system from the Authority Having Jurisdiction, the installing company shall furnish a written statement that the work covered by the Contract has been completed, flushed, and tested in accordance with the approved Plans and Specifications. This shall be the "Sprinkler Contractor's Certificate Covering Materials and Tests" described in NFPA 13. The Contractor shall provide a minimum of three original sets of Material & Test Certificates for each area to be signed by the Contractor and the Engineer or designated Owner's Representative.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Provide Products as detailed in Specification Section 21 05 00.

PART 3 - EXECUTION

3.1 SPECIAL CHARACTER OF THE WAR MEMORIAL

A. While this building is not currently listed on the National Registry of Historical Places, it is a building with significant historical significance and character. Many details and facets of the Memorial are irreplaceable. One of the primary intents of this project is to both preserve and restore the historical character and fabric of the Memorial.

B. To this end, it is of utmost concern that all work be performed with care. This includes protection of all existing surfaces and finishes including, but not limited to, all decorative stonework and engraved tablets, and protection of existing copper wall-mounted lanterns. Where shown, all electrical work at the main First Floor Memorial Level shall be concealed. Any exposed work requires explicit and specific permission of the Owner and/or Architect and Engineer.

3.2 EXECUTION

- A. Provide Execution as detailed in Specification Section 21 05 00.
- B. Do not remove any sprinkler protection until temporary heat detection is installed and tested with EHS.

END OF SECTION 21 00 00

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SECTION 21 05 00 - FIRE SUPPRESSION BASIC MATERIALS & METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work of Division 21 - Fire Suppression Systems Sections applies to the Work of this Section.

1.2 WORK INCLUDED

- A. Provide Basic Materials and Methods.
- B. Provide valve signage. Provide metal enamel valve signs on each valve provided under this project, identifying the function of each fire protection control, drain and test valves provided.
- C. Provide labeling of piping in mechanical and non-public spaces indicating direction of flow, with label reading "Fire Sprinkler Water" for sprinkler systems and "Fire Standpipe Water" for standpipe systems on all exposed piping 2" and larger. Tags may be decals, painted on templates or wrap around tags securely fastened.
- D. Provide firestopping and smokestopping.
- E. Provide openings in existing construction as required for the work of this project.
- F. Provide complete testing of all fire protection alarm devices for sprinkler systems which had fire protection work performed as part of this Contract.

1.3 SUBMITTALS

- A. Provide submittals for the following:
 - 1. Steel pipe (Schedule 40 A53 Type F).
 - 2. Pipe fittings and couplings.
 - Valves.
 - 4. Pipe hangers, brackets, supports and attachments.
 - 5. Sprinkler heads.
 - 6. Sprinkler head cabinets and wrenches.
 - 7. Signage.
 - 8. Firestopping and smokestopping.
 - 9. Pipe markers.
 - 10. Sleeves, inserts and openings.
 - 11. Protection and storage of materials and the work.
 - 12. Fire Department Connection (FDC).

- Before actual installation, the Contractor shall prepare complete detailed Construction Drawings for the various systems in a form required by the insurance organization having jurisdiction. Submittals shall be job specific and shall not include any spurious or catalog materials not related to the specific project. These Drawings shall indicate the location of ductwork and lights as shown on the Mechanical and Electrical Drawings and verified by the Contractor in the field. Comply with Section 23 05 01 Mechanical Coordination Drawing Requirements. The contractor will be provided with one (1) set of AutoCAD Compatible Drawings of the building prepared by the Architect/Engineer. The Contractor shall field verify and confirm all dimensions and details on the AutoCAD Drawings prior to using the information on the Drawings. The Contractor shall note that the Drawings were prepared to identify general Scope of the Work for bidding purposes and are not considered or intended to be the shop drawings. The pipe sizes shown on the Drawings are based upon the Engineer's calculations and shall be adjusted by the Contractor as required to meet the Construction Calculations. Contractor shall check the existing and proposed building Construction Drawings so as to avoid conflicts with the structure of the building.
- C. Submit a sufficient quantity of the above Drawings for review by the Engineer of construction details, as necessary, considering that the Engineer will file one copy, will provide one copy to the Owner, and return remaining copies to the Contractor. An original stamped and reviewed copy of all product submittals and shop drawings are to be included in each O&M Manual.
- D. Shop drawings must include in addition to the information required by NFPA 13-2013 Edition, the following:
 - 1. Room names.
 - 2. Room numbers.
 - 3. Door openings.
 - 4. Door swings.
 - 5. Room dimensions.
 - 6. Critical dimensions for placement of sprinkler heads, where a mechanic might misinterpret the drawing.
- E. Provide shop drawings and submittals as required by Division 21 Specification Sections.
- F. All submittals shall be provided to, and approved by, the Engineer, Cornell EH&S, and the Ithaca Fire Department.

1.4 SIGNS AND NAMEPLATES

A. Furnish and install approved enamel on metal identification signs at all new water flow alarms, control valves, drain valves, test valves and alarm valves as required in NFPA 13-2013 Edition. Provide additional nameplates on main control valves and supply water valves to identify their function.

B. Mark each sprinkler and standpipe isolating valve or low point drain valve provided under this Contract with suitable permanent tag. Where located above dropped ceiling provide permanent plastic nameplate "Fire Valve" fastened at corner of dropped ceiling tile or ceiling access door.

1.5 EXTRA PARTS

A. This Contractor shall provide a supply of extra sprinklers including corresponding escutcheons/cover plates, together with a special sprinkler wrench for each type of head installed, to be housed in a steel cabinet. Sprinklers in cabinet shall include all types and ratings installed, including corresponding escutcheons. Refer to Contract Drawing F001 for quantities required. Cabinet shall be located adjacent to the sprinkler valve header. Spare head quantities shall be provided as indicated in the Division 21 Specification Sections. The cabinets shall be labeled indicating the specific areas for which these spare sprinklers are suited.

1.6 OPERATING INSTRUCTIONS

- A. Upon completion of the work of this Section, instruct a representative of the Owner fully in the operation and maintenance of all systems and equipment installed under this work.
- B. Operating Manuals: Include in the operating manuals the inspection schedule and report form as described in NFPA 25 Standard for the Inspection Testing and Maintenance of Water Based Fire Protection Systems. Also include the "Contractors Material and Test Certificate for Above Ground Piping" as described in NFPA 13-2013 Edition, as referenced by the ICC Codes.

1.7 APPROVALS

A. All materials and equipment furnished as a part of this work shall be Underwriters' approved or FM approved.

PART 2 - PRODUCTS

2.1 PIPING

- A. Interior Piping:
 - 1. Pipe: Black steel, Schedule 40, A53, Type F.
 - a. Manufacturer: Allied Tube or approved equal.

B. Fittings:

1. Grooved fittings and couplings for type of pipe employed:

- a. Standard finish.
- b. Manufacturer: Victaulic, Gruv-lok or approved equal.
- 2. Threaded fittings for screwed piping:
 - a. Type: Black cast-iron Class 125 or black malleable iron, Class 150.
 - b. Manufacturer: Ward Manufacturing or approved equal.
- 3. Mechanical Tee Fittings:
 - a. Mechanical tees are acceptable for use.
 - b. Standard finish.
 - c. Manufacturer: Victaulic, Gruv-Lok or approved equal.

C. Joints:

- 1. As per NFPA 13-2013 Edition.
- 2. Use of grooved joints on pipe shall be acceptable.
- 3. Rigid couplings for grooved end pipe shall be used.
 - a. Standard finish.
 - b. Manufacturer: Victaulic, Gruv-lok or approved equal.
 - c. Victaulic EZ couplings or similar products are not permitted for use on this project.
- 4. Threaded joints shall be acceptable on pipe sizes 2" and smaller and shall generally be provided for pipe sizes 2" and smaller.

2.2 EXTERIOR PIPING

- A. Ductile Iron Pipe: 3" and Larger (Push-On):
 - 1. Class 52 ductile iron pipe per AWWA C151, with C104 cement lining, and asphaltic coating inside and out. Pipe shall be push-on joint. Provide (4) serrated silicon bronze wedges at each push-on joint for electrical continuity.
 - 2. Fittings for water shall be compact ductile iron per AWWA C153, mechanical joints with Series 1100 Megalug retainer glands by EBAA Iron, Inc.
 - 3. Provide swivel x solid adapters per AWWA C153, mechanical joint for all piping connections to adjacent valves, tees, and fittings. Provide extra-long tee bolts to accommodate adapters. The intent is to utilize these adapters to the greatest extent possible.
- B. Ductile Iron Pipe: 3" and Larger (Restrained Joint):

- Class 52 ductile iron pipe per AWWA C151, with C104 cement lining, and asphaltic coating inside and out. Pipe shall be restrained joint with locking segments. Pipe shall be TR Flex manufactured by US Pipe or approved equal.
- 2. Fittings and adapters shall be as stated above.

C. Flanged Fitting Connection:

- 1. Restrained flange adapter shall be ductile iron conforming to ASTM A536 with a flange bolt circle compatible with AWWA C110 Class 150 pattern.
- 2. Series 2100 Megaflange by EBAA Iron, Inc.

2.3 VALVES

A. Ball Valves:

- 1. Brass, full port valves with minimum rating of 250 psi.
- 2. Manufacturer: Anvil Star Fig 171N full port or approved equal.
- 3. Provide ball valves for low point drains and flushing connections.
- B. Control Valves: 2½" and Larger:
 - 1. OS&Y Gate Valve: Nibco or approved equal.
 - 2. Groove End Butterfly Valve with Integral Tamper Switch: Victaulic #705W or approved equal.

C. Check Valves:

- 1. $2\frac{1}{2}$ " and Larger:
 - a. Grooved end, Victaulic Series 717 or approved equal.

2.4 HANGERS, BRACKETS AND SUPPORTS

- A. Hangers shall be installed in accordance with the requirements of NFPA Standards 13. Provide inserts in slab prior to pour. No drilling or attachment to the ceiling slabs shall be allowed post-pour.
- B. All hanger attachments, brackets and supports shall be plated.
- C. Provide the following:
 - 1. Plated Clevis rings for piping size 2½" and larger. Make: PHD Manufacturing or approved equal.

- 2. Plated loop rings or plated clevis rings are acceptable for pipe sizes 2" and smaller. Make: PHD Manufacturing or approved equal.
- 3. Provide stainless steel hanger rings on all piping exposed in bathrooms. Make: PHD Manufacturing or approved equal.

D. Hanger Rods:

- 1. Provide hot dipped galvanized all-thread rod for hangers on all pipe.
- 2. Make: PHD Manufacturing or approved equal.

2.5 SPRINKLERS

A. All sprinklers provided on this Project shall be Quick Response and of the manufacturer that matches the existing sprinklers. Field-verify sprinkler head manufacturer prior to making product submittals to the Engineer.

B. Pendent Sprinklers:

- 1. Recessed and Exposed; Standard Coverage:
 - a. Description: Quick Response pendent sprinkler with glass bulb. Orifice shall be ½2" with K=5.6. Temperature rating shall be 155°F; mechanical room shall be 200°F. Provide two-piece recessed escutcheon where installed in drop ceilings. Sprinklers and escutcheons finish shall be as indicated on the Contract Drawings. Pendent sprinklers on exposed piping shall be white finish in public spaces and brass finish in mechanical rooms. Provide sprinklers with head cage.
 - b. Make: Viking Microfast Quick Response, SIN: VK302 or approved equal.

C. Upright Sprinkler:

1. Standard Coverage:

- a. Description: Quick Response upright sprinkler with glass bulb. Orifice shall be ½" with K=5.6. Temperature rating shall be 155°F. Rating for Mechanical Rooms shall be 200°F. Provide white finish in unfinished spaces and brass finish in mechanical rooms
- b. Make: Viking Microfast Quick Response, SIN: VK300 or approved equal.

D. Sprinkler Finishes:

1. Finishes for Sprinklers in finished rooms shall be standard white or as scheduled. Refer to Contract Drawings for specific finishes in defined spaces. All finishes shall be reviewed and approved by the Architect.

- 2. Finishes for Sprinklers in unfinished rooms on exposed pipe shall be white.
- 3. Finishes for Sprinklers in Mechanical Rooms shall be brass or white.

2.6 SPRINKLER ACCESSORIES

- A. All sprinkler accessories shall be by the same manufacturer as the sprinkler heads.
- B. Head Cabinets:
 - 1. Provide steel sprinkler head cabinets of sufficient size and quantity to house all spare sprinklers, cover plates, escutcheons, and head wrenches.
 - 2. Manufacturer: Viking Corporation Products or approved equal.

C. Sprinkler Wrenches:

- Provide sprinkler head wrenches for each specific type of sprinkler provided under this Contract.
- 2. Manufacturer: Viking Corporation Products or approved equal.

2.7 VALVE SIGNAGE AND TAGS

- A. Nameplate Co. or approved equal.
- B. Provide custom FDC signage. Refer to detail on Contract Drawing.

2.8 FIRESTOPPING AND SMOKESTOPPING

- A. Bio-Stop sealant.
- B. Manufacturer: Rectorseal Corporation or approved equal.

2.9 ELECTRICAL DEVICES

- A. Valve tamper switches, Potter Electric or approved equal.
- B. Water flow switches, both retardable and non-retardable, Potter Electric or approved equal.

2.10 PIPE MARKERS AND/OR LABELS

A. Seton Nameplate Co. or approved equal.

B. Provide "Fire Sprinkler Water" and "Fire Standpipe Water" signage for each type of system with direction arrows indicating water flow. Provide "Fire Protection Water" with direction arrows for piping serving both standpipes and sprinklers. Wrap around, stick-on, or stenciled pipe markers are acceptable.

2.11 FIRE DEPARTMENT CONNECTIONS

- A. 4" IPT x 5" Storz Fire Department Connection with cap and chain.
- B. Round I.D. plate marked "Standpipe/Sprinkler" Fire Department Connection.
- C. Manufacturer: Potter Roemer or approved equal.

PART 3 - EXECUTION

3.1 PIPING

A. Aboveground Piping:

- 1. Support pipe using hanger spacing requirements in NFPA 13-2013 Edition.
- 2. Supports shall be in such a quantity and in such an arrangement as to sustain the loads and retain the piping securely in position. Hangers shall prevent the lateral movement of piping in the event of reactive forces due to sprinkler activation.
- 3. Pitch all piping to low point drain connections for proper drainage.
- 4. No holes are to be cut in the concrete shear walls or in floors without the prior review and approval of the Structural Engineer.

B. Underground Piping:

1. Provide and maintain all temporary barricades, fences, walkways, enclosures, signs, and lighting as may be required to carry on work in a safe and satisfactory manner for the protection for the public, workmen, pavements, and other installations in the area of operations. Any damage shall be fully repaired to the satisfaction of the Engineer at no additional cost.

2. Pressure Testing:

- a. Test all systems as described herein. Provide all necessary equipment and gauges for making tests. Pay all costs involved in making tests and adjustments.
- b. Time of Tests: Before restoration of surfaces.
- c. Correctional Action: When tests reveal that the line has faulty joints, joints that have leaked shall be remade and the system retested.

- d. Witnesses: Notify Cornell University and Engineer at least 48 hours in advance of the test so that he may be present at the test.
- e. Water System Test:
 - i. Block off all inlets and outlets in new, altered, extended, or replaced water distribution piping but one.
 - ii. Fill system with potable water. System may be tested in sections.
 - iii. Using a pump and a separate gauge attached to system with gate valve between pump and pressure gauge, underground piping shall be tested at 200 psig.
 - iv. Remove source of pressure.
 - v. There shall be no drop in pressure for a period of two (2) hours.
 - vi. Prepare reports of all tests and required corrective action.
- 3. Backfill Water Lines:
 - a. Pipe Bedding:
 - i. Ductile Iron Piping:
 - 1. Run-of-Crusher:
 - (a.) Run-of-crusher shall be angular crusher run stone as delivered unsorted from the crusher. Limestone material shall be used, and shall be well graded, durable, and composed of rock pieces, chips and fines. The amount of fine material shall be sufficient to fill all voids between large stones when the material is compacted.
 - (b.) Run-of-crusher shall be NYSDOT Type 2 per Table 4.

TABLE 4
GRADATION REQUIREMENTS: RUN-OF-CRUSHER

SIEVE SIZE	PERCENT PASSING BY WEIGHT
1½"	100
1/4"	25 - 60
No. 40	5 - 40
No. 200	0 -10

4. Compaction:

- a. Compaction to not less than 95% density compared to maximum laboratory tests by weight, per modified ASTM D-1557-64T, latest editions, method "C" in all areas whether under roadways or sidewalks. Grass or planting areas shall be compacted to not less than 90% density compared to maximum laboratory tests by weight, per modified ASTM D-1557-64T, latest edition, Method "A".
- b. Any settlement of backfill shall be repaired to proper grade by placing additional backfill and compacting.
- c. During the backfill and compaction of the final materials, care must be taken to keep the materials from mixing together.
- d. Tamping by portable plate tampers shall be permitted only to consolidate #2 stone for first layer at bottom of trench. Remaining layers shall be compacted by use of "jumping jack" type tampers or vibrator packers.
- e. During the backfill and compaction of the final materials care must be taken to keep the materials from mixing together.

3.2 SLEEVES

A. Special requirements regarding sleeves:

- 1. Provide sleeves on all gypsum drywall and concrete block walls unless permitted to be omitted per subparagraph 2 below.
- 2. Where the listing of the firestop sealant shows an approval for the actual type of wall encountered, and that approval is without the requirement for a sleeve, wall sleeves may be omitted in the cases that the piping on at least one side of the wall is fully enclosed in a gypsum wallboard soffit.
- 3. If the pipe is passing through a wall and is exposed on both sides of the wall, a sleeve will still be required.
- 4. If the pipe is passing through a wall which is not smooth or may damage the pipe, a sleeve will still be required.
- 5. If the pipe is passing through a solid concrete or solid block wall, and the opening is smooth, sleeves may be omitted.
- 6. If the pipe is passing through a new floor or an existing floor of other than concrete construction, sleeves are required in all cases. Extend the sleeve to 1" above finished floor.
- 7. If the pipe is passing through an existing concrete floor, sleeves are desired unless placing the sleeve will require drilling an opening so large as to affect the structural integrity of the building. In cases where it is possible to core an opening in existing concrete floors, which will be large enough to admit a sleeve, it is desired to provide a sleeve which will extend 1½" above finished floor level to assist in minimizing water migration to lower floors. See details on the Plans.

3.3 SPRINKLER SYSTEM

- A. Install complete wet pipe sprinkler system renovations at the War Memorial (McFaddin System), conforming to NFPA 13-2013 Edition, FM Global's data sheets and as shown on the Contract Drawings.
- B. Temporary heat detection must be in place and accepted by EH&S prior to the commencement of any fire protection work.
- C. Provide piping, sprinkler heads, flushing connections and all appurtenances as shown on the Contract Drawings.
- D. Provide a hydrostatic test as shown on the Drawings, following rough-in of Contract provided piping. In addition, provide a final test which shall consist of system pressure test pressure, maintained for a minimum of two (2) hours, with no visible leaks or loss in pressure per owner direction. The test shall be witnessed by the Engineer, Cornell EH&S, and the Ithaca Fire Department. In the event that leaks are discovered on existing piping that was not compromised by the work performed under this Contract, the Fire Protection Contractor shall make the necessary repairs under a separate change order or accepted proposal request as authorized by the Architect. Do not cover new piping with ceiling until after hydrostatic test is complete. All joints and piping shall be exposed for inspection.

3.4 IDENTIFICATION OF VALVES

A. All control, drain, and test connection valves provided under this Contract shall be provided with permanently marked weather-proof metal or rigid plastic identification signs. The sign shall be secured with corrosion-resistant chain, or other approved means. The signs shall consist of red lettering, 1" in height on a white background.

3.5 AS-BUILT DRAWINGS

- A. The Contractor shall be required to prepare and submit a set of Division 21 "As-Built" Drawings as the portions of work are completed and prior to application for final payment.
- B. The "As-Built" Drawings shall include a full set of the 'as bid' or 'conformed' Contract Drawings or Engineer approved shop drawings for Division 21, and Divisions assigned to Division 21 such as Divisions 26, 28 and 33, plus all drawings prepared by the Contractor, Subcontractors, suppliers, and vendors for those Divisions.

- C. The submitted Drawings shall be in the form of full size as-bid or approved fire protection shop drawings first plus additional drawings and attachments following. The Drawings shall be clean, original paper copies of the Contract Drawings or approved Fire Protection Contractor shop drawings, marked up in red pencil or pen with the Contractor's markups. For Floor Plans drawn at less than 1/4" scale, the field drawings shall be expanded to 1/4" scale to provide room for mark ups.
- D. The Contractor shall maintain a dedicated set of Construction Drawings at a protected location at the job site for the continuous documentation for these as-builts. The Contractor shall record the actual installed locations of devices, valves, sprinkler heads, bulk mains, cross mains, branch line piping and fire protection risers for all fire protection systems. Record any and all variations from the original Construction Drawings or approved fire protection shop drawings in neat, legible, hand drawn lines and text. Attach copies of Contractor's field sketches and note where they pertain.
- E. Confirm that all information provided to the Contractor in the Form of Request for Information (RFI) responses, accepted Requests for Proposal (RFPs), Change Orders and Supplemental Instructions (SIs) are properly conveyed on the Drawings. Show the actual changes made, do not just paste a copy of the RFI, RFP, ASI, CO unless that document includes a full scale drawing which accurately represents the work actually installed.
- F. Confirm that the room names and numbers shown on the As-Built's are the actual room numbers and names posted on the rooms at the time of turn over.
- G. Confirm that extra sprinklers, cabinets, and wrenches are provided and properly labeled and located as specified.
- H. Confirm that fire protection valves are properly labeled with specified signage and that hydraulic placards are provided.
- I. For work which becomes concealed as part of the project, keep an accurate record, and show on "As-Built" Drawings the actual installed location of any concealed work such as underground services, piping, valves, etc. Provide location on Record Drawings for outside services by indicating actual dimensions from fixed reference points which will be available after completion of construction. "Tie" two (2) dimensions from different reference points to confirm locations of concealed work.
- J. For projects extending more than three (3) months, provide the original "As-Built" to the Engineer as the work is completed on sections of the project and obtain a receipt from the Engineer. The Contractor shall be responsible for the safe keeping and maintenance of the "As-Built" Drawings throughout construction, and for maintenance of one (1) photocopy at the Contractor's office for a period of not less than three (3) years following final acceptance.

K. Provide the original copies of the "As-Built" Drawings to the Architect or Engineer in accordance with the provisions of the General Conditions and Division 1. Unless reproducible "As-Built" Drawings are required under the General Condition and Division 1, provide the original paper copy of "As-Built" Drawings to the Engineer.

3.6 CERTIFICATES AND GUARANTEE

A. At completion of the job and prior to final payment, Contractor shall deliver to the Owner and Architect copies of Certificates of Approvals by all organizations having jurisdiction over this Project, and "Contractor's Material and Test Certificate" for both the sprinkler and standpipe system as required by NFPA 13-2013 Edition.

3.7 EXTRA PARTS

A. The Contractor shall provide extra sprinklers and corresponding escutcheons or cover plates, together with a special sprinkler wrench for each type of head installed. Provide spare head quantities as indicated in the Sprinkler Legend on Drawing F001. All sprinklers, cover plates, escutcheons and wrenches shall be housed in approved sprinkler head steel cabinets. Sprinklers in cabinet shall include all types and ratings installed. Cabinets shall be located next to sprinkler valve header. Each cabinet shall be labeled to designate the specific areas for which the spare sprinklers are supplied.

3.8 INSPECTIONS, TESTS AND APPROVALS

- A. A full functional test shall be conducted of all pressure switches, water motor gongs, flow switches, valve tamper switches and any other alarm switches or limit switches, existing and new provided on the building's fire protection systems. The test shall be coordinated with the Fire Alarm Installation Contractor (Division 28), the Cornell University Environmental Health & Safety, and the City Codes Enforcement and shall be witnessed by the Engineer. Provide a completed checklist of each device in the O&M Manuals. It is the intent that all new and existing fire suppression systems, alarms and trouble devices be tested, and the results recorded with a complete report submitted to the Engineer for review and included in the O&M Manuals.
- B. Provide adequate time and manpower to coordinate and conduct testing with all parties involved.

3.9 TESTING AND FLUSHING

A. At the completion of rough-in, all piping provided under this project shall be flushed in accordance with NFPA 25. Provide sufficient adapters, proper size hose and manpower to perform the flushing operation as efficiently as possible. Flushing shall be scheduled through Cornell EH&S and shall be witnessed by the Engineer, Cornell EH&S, and the Ithaca Fire Department.

B. A 200 psi hydrostatic test of all Contract piping is required upon completion of the rough-in. The test shall provide for a 200 psi test pressure, with no visible leaks or pressure loss, for two (2) hours as directed by the Owner. The test shall be scheduled through Cornell EH&S and shall be witnessed by the Engineer, Cornell EH&S, and the Ithaca Fire Department. Do not cover new piping with ceiling until after hydrostatic test is complete. All joints and piping shall be exposed for inspection.

3.10 HANGERS, BRACKETS, SUPPORTS

A. Install all necessary supports to hold pipe and other apparatus in their permanently installed position per NFPA 13-2013 Edition.

3.11 SPRINKLERS

- A. Upright Sprinklers and Pendent Sprinklers on Exposed Pipe:
 - 1. Install in any unfinished area without a ceiling or where indicated on the Drawings.
- B. Install sprinklers in accordance with manufacturer's instructions and per NFPA 13-2013 Edition.
- C. Sprinkler heads shall not be painted. Provide temporary coverings to protect heads while painting of walls and ceilings is proceeding. Painted sprinkler heads shall be replaced.

3.12 SUBMITTALS

- A. Type Provide Submittals for materials and equipment including product data of Shop Drawings, Coordination Drawings and Samples as scheduled in respective Sections of this Division. All Shop Drawings shall be submitted electronically through the Prime Contractor.
- B. Contractor Verification of Appropriateness of Submittal The Contractor shall personally verify that the products depicted on the submittal are in conformance with the Contract and that the capacity and quantities are accurate. The Contractor shall thoroughly verify sizes, dimensions, and connection requirements. The Contractor shall then mark the Project Name, the Date, the Contractor firm name, the words "Checked for Compliance" and signature of the Contractor employee.
- C. Submittals which have not been checked and marked by this Division Contractor (and by the General Contractor if this Division Contractor is a subcontractor) will not be reviewed by the Engineer.

- D. Product Data Provide submittals of product data for each product to be utilized on the Project. Submittals for equipment shall include detailed and dimensional literature and catalog data showing detailed compliance with the Contract documents. Submittals shall include a copy of the manufacturer's printed installation instructions for the equipment proposed. Submittals for electrically energized equipment shall show all electrical characteristics and inter-connection requirements. Where the product data shows products and materials of different sizes, the Contractor shall circle, arrow, or otherwise designate the specific equipment for this project. Submittals not so designated or full product line catalogs will be rejected.
- E. Engineer's Review of Shop Drawings The Engineer's review of Shop Drawings signifies only that such drawings appear to be in substantial conformity with the Contract Drawings and Specifications. Such a review does not relieve the Contractor from complying with the Plans and Specifications. The Engineer shall not verify quantities, nor shall he indicate approval of every detail on the submittal nor acceptance of any omission.

3.13 MARKING OF SUBMITTALS

- A. The Engineer shall return copies of the Submittals marked as follows:
 - 1. "Reviewed for General Compliance Only No Exception Taken" Drawings bearing this comment have been found to be generally in conformance with the intent of the Plans and Specifications.
 - 2. "Reviewed for General Compliance Only Make Noted Corrections" Drawings bearing this comment have been found to be generally in conformance with the intent of the Plans and Specifications, with the exception of the noted items. A resubmittal to the Engineer is not required and it is understood the Contractor will make the noted corrections.
 - 3. "Reviewed for General Compliance Only Revise and Resubmit" Drawings bearing this comment have been found to contain a substantial departure from the Plans and Specifications. The Contractor must make a new corrected submittal.
 - 4. "Reviewed for General Compliance Only Rejected" Drawings bearing this comment depict materials, equipment or supplies which are not judged by the Engineer to meet the requirements of the Plans and Specifications. The Contractor shall provide a new submittal on alternative equipment.
 - 5. "Reviewed for General Compliance Only Not Reviewed; Returned" Submittals bearing this comment have not been reviewed and are returned to the Contractor.
 - 6. "Reviewed for General Compliance Only Additional Submittal Required" Submittals bearing this comment have been found to be generally in conformance with the intent of the Plans and Specifications; however, more information is required, and a resubmittal is required.

3.14 SAMPLES

A. The Contractor shall, when required, submit to the Engineer for review, typical samples of materials equipment and products. The Samples shall be properly identified by tag and shall be submitted sufficiently in advance of the time when they are to be incorporated into the work so that rejection thereof will not cause delay.

3.15 PROCEDURE AND SCHEDULE OF WORK

A. Where work occurs within or attached to an existing structure perform all work only on approved schedule. Do not interfere with normal operation of existing systems. Do not shut off any heating, fire protection, plumbing or electric facilities without permission of proper party in charge. Do as much as possible prior to the shutdown to minimize the shutdown time. Contractor shall make temporary connections to enable an orderly progress of the work.

3.16 ORDER OF WORK

A. If, in the judgement of the Architect, it becomes necessary at any time during construction in order to accelerate work and/or complete certain areas of project, the Contractor shall concentrate his entire efforts and manpower to certain designated areas. The Contractor shall complete work in certain areas ahead of the rest of the work so same can be turned over to the Owner. Contractor shall confer with the Architect, Engineers, all other Contractors to agree upon schedule procedure. Contractor shall follow this schedule diligently. Contractor shall expedite certain portions of work to avoid delaying other Contractors' work.

3.17 PROTECTION AND STORAGE OF MATERIALS AND THE WORK

- A. Protection from freezing During construction and until final acceptance, protect from freezing all fixtures, equipment, and piping, both in building, trenches, etc. Any damage shall be replaced at Contractor's expense to meet Architect's approval.
- 3. Materials and Equipment Store on dry base six (6) inches above ground or floor. Protect from rusting or other weather damage. Keep covered with waterproof covering. Protect against theft or damage from any cause or by any person; assume full responsibility; replace items stolen or damaged at no cost to Owner. Items subject to corrosion shall be kept in building under cover or other weather-tight enclosure. Boilers or tanks shall not be stored outside for more than one month. Items subject to moisture damage shall be stored in a heated area, such as oil and gas burner controls, electrical devices, motors, etc.
- C. Store materials and equipment at site in an orderly manner, in such location that will not interfere with other work and will not obstruct access to building or existing buildings or facilities.

D. After installation and until acceptance, protect from damage by plaster, concrete, paint, falling objects, other workmen. etc. Protect all finished surfaces of equipment, fixtures, unit cabinets, finned pipes, etc. Full responsibility rests with Contractor supplying equipment for replacing any equipment damaged or marred prior to final acceptance. Contractor shall immediately replace any of his protective covering removed at any time by others.

3.18 CUTTING AND PATCHING

- A. Each Contractor shall do all cutting and patching required for installation of this work. He shall do all cutting and patching required for improperly located or sized sleeves or openings in new construction. He shall not cut waterproofed walls or floors except as directed. He shall not cut reinforcing steel or pierce structural members without special written permission of Architect. He shall cut in approved manner to avoid damage to adjacent work.
- B. Each Contractor shall patch all cut holes as directed by Architect.
- C. Each Contractor shall examine General Plans for new construction for proper clearances and inspect all pipe chases and crawlspaces.

3.19 CLEAN UP

- A. Cleaning equipment Clean all equipment, fixtures, and piping. Remove labels at completion of work. Do not remove permanently installed labels such as U.L. approval, etc. Remove all protective grease, paper, etc., using approved detergent and water. Remove rust, scale, etc. with wire brush, sandpaper or other approved means. Leave ready for painting when directed.
- B. Disposal of Unused Materials Clean up debris frequently and when directed by Architect. Remove from premises. Minimize dust generation while removing debris by wetting down. Existing Buildings:
 - 1. Material, equipment, etc. specified to be removed and not reused shall be removed from premises and becomes property of Contractor.
 - 2. Material, equipment, etc., specified to be removed and remain property of Owner shall be removed carefully, avoiding damage, and stored where directed.
 - 3. Material, equipment, etc., specified to be removed and reused shall be removed carefully, avoiding damage, relocated as shown, and reconnected and put into operating condition.
- C. Disposal of Discarded Materials The Division 21 Contractor shall make his own arrangements for the removal from site and legally approved disposal of all debris, packaging, unused materials, and refuse generated by his portion of the Project. The Division 21 Contractor shall not discard any materials in receptacles maintained by the Owner.

3.20 AS-BUILT DRAWINGS

- A. Refer to Division 23, Section 23 05 00.
- 3.21 OPERATION AND MAINTENANCE INFORMATION
 - A. Refer to Division 23, Section 23 05 00.
- 3.22 INSTRUCTION OF OWNER'S DESIGNATED REPRESENTATIVE
 - A. Refer to Division 23, Section 23 05 00.
- 3.23 GUARANTEE
 - A. Refer to Division 23, Section 23 05 00.

END OF SECTION 21 05 00

SECTION 21 05 53 - FIRE SUPPRESSION PAINTING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The painting of fire suppression piping, hangers, rods, fittings, attachments, and accessories shall be provided by the Fire Protection Contractor.

B. Section includes:

- 1. Preparation of surfaces.
- 2. Painting and finishing of exposed pipe, hangers, rods, and fittings.
- 3. All fire suppression piping and supports provided in this project shall be painted.
- C. Provide preparation and painting of all work conducted by the work of this Contract.
 - 1. Paint all exposed sprinkler and standpipe piping, hangers and hanger rods installed under this Project.
 - a. In Mechanical Rooms, Electric Rooms and Storage Rooms, the piping, hangers, hanger rods, and fittings shall be painted Safety Red.
 - b. In public spaces or areas as directed by the Owner, finish color shall match adjacent walls or ceilings as directed by the Owner.
 - 2. Provide painting of exposed piping, fittings and hangers not enclosed in a soffit or concealed above ceilings.

1.2 RELATED WORK NOT INCLUDED

A. Do not paint sprinkler heads, pre-finished items, concealed surfaces, finished metal surfaces, operating parts, and labels. Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.3 DEFINITIONS

- A. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.
- B. DFM (Dry Film Mils): thickness, measured in mils, of a coat of paint in the cured state.
- C. General: Standard Coating Terms Defined in ASTM D 16 Apply to this Section:

- 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
- 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
- 3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
- 4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
- 5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

- A. Product Data: Submit Manufacturer's technical information, label analysis, and application instructions for materials proposed for use.
 - 1. List materials and cross-reference the specific coating and finish system and application. Identify materials by the manufacturer's catalog number and general classification.
- B. Samples: Submit initial color selection in the form of manufacturer's color charts.
- C. Provide a list of materials and applications for each sample. Label each sample as to location and application.

1.5 QUALITY ASSURANCE

A. Materials:

- All coating materials required by this section shall be provided by a single manufacturer, unless otherwise required or approved. For a given application (i.e., interior walls in student rooms) a single brand, color and mix shall be used.
- B. Applicator: Firm with not less than 10 years of successful experience in painting work similar in scope to work of this project.
- C. Crew: Maintain throughout duration of the work a crew of painters who are fully qualified to satisfy requirements of the specifications.
- D. VOCs: Certify that all products supplied comply with Federal State and Local regulations controlling the use of Volatile Organic Compounds (VOCs).
- E. Requirements:

- 1. Paints and coatings used on the interior of the building (i.e., inside of the weatherproofing system and applied on-site) must comply with the following criteria as applicable to the project scope:
 - Architectural paints and coatings applied to interior walls and ceilings must not exceed the volatile organic compound (VOC) content limits established in Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993.
 - Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit of 250 g/L established in Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997.
 - c. Clear wood finishes, floor coatings, stains, primers, sealers, and shellacs applied to interior elements must not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Provide products of the following:
 - 1. Benjamin Moore Paint Company.
 - 2. Strathmore Paint Company.
 - 3. Sherwin-Williams Company.
 - 4. Or as directed by the Owner.

2.2 EAD CONTENT

- A. Not more than 0.06 percent lead by weight (calculated as lead metal) in the total nonvolatile content of the paint or the equivalent measure of lead in the dried film.
- B. Not more than permitted by applicable regulations where they are more stringent than above.

2.3 MATERIAL SCHEDULE

- A. Provide paint materials as scheduled.
- B. Piping, hangers, hanger rods, hardware one (1) coat of Direct to Metal (DTM) primer and two (2) coats of Alkyd semi-gloss enamel with rust-inhibitive properties.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:
 - 1. Product name or title of material.
 - 2. Product description.
 - 3. Federal Specification number, if applicable.
 - 4. Manufacturer's stock number and date of manufacture.
 - 5. Contents by volume, for pigment and vehicle constituents.
 - 6. Thinning instructions.
 - 7. Application instructions.
 - 8. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45°F (7°C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
- C. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

3.2 PREPARATION

- A. Clean all surfaces of moisture, rust, plaster, dirt, and foreign matter before painting. Schedule painting so that dust and other contaminants do not fall on wet painted surfaces.
- B. Remove dirt, dust, grease, oils, and foreign matter. Prepare surface for proper texture necessary to achieve optimum coating adhesion and intended finished appearance. Plan cleaning, preparation, and coating operations to avoid contamination of freshly coated surfaces.
- C. Remove hardware, cover plates, and similar items before applying coatings. After application of coatings, install removed items. Use only skilled workers for removal and replacement of such items.
- D. Provide protection for non-removable items not scheduled for coating.
- E. Protect surfaces not scheduled for coating. Clean, repair, or replace to the satisfaction of the Engineer any surfaces inadvertently spattered or coated.

- F. Before hand or power tool cleaning, remove visible oil, grease, soluble welding residue, and salts by solvent cleaning. After hand or power tool cleaning, re-clean surfaces if necessary.
- G. Before touching up coatings damaged by handling or welding, re-prepare damaged surfaces.
- H. For piping equipped with lubricated groove lock type fittings, such as Victaulic, clean all lubricant from fitting and pipe prior to priming. Take all necessary steps to eliminate bleed through of lubricants.

3.3 MIXING AND THINNING

A. Remove and discard any skin formed on surface of coatings in containers. Discard any containers where skin comprises 2% or more of the remaining materials. Do not add thinner except as specifically recommended (not merely permitted) by the coating manufacturer for proper coating application under the circumstances prevailing at the project site when application equipment recommended by the coating manufacturer is employed. Use only the quantities and the types of thinner recommended.

3.4 APPLICATION

- A. Apply coatings in accordance with manufacturer's instructions and use applicators and techniques best suited for substrate and type of material being applied.
- B. Apply additional coats when undercoats show through the final coat of paint until paint is of uniform color and finish and is approved by the Engineer.
- C. Apply coats of paint as scheduled.
- D. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pre-treated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 - 2. Omit primer on metal surfaces that have been shop primed and touch-up primed.
 - 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

- 4. Allow sufficient time between successive coats to permit proper drying. Do not re-coat surfaces until paint has dried to where it feels firm, does not deform, or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- E. Techniques: Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. Paint colors, surface treatments, and finishes as indicated in the schedules.
 - 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 - 3. Provide finish coats that are compatible with primers used.
 - 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 - 5. Paint surfaces behind moveable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 6. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
 - 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 - 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 - 9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
 - 10. Sand lightly between each succeeding enamel or varnish coat.
- F. Application Procedure: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
 - 1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 - 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the materials and texture required.
 - 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- G. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

- H. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Re-coat primed and sealed surfaces where evidence appears of suction spots or unsealed areas in first coat, to endure a finish coat with no burn through or other defects due to insufficient sealing.
- I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.5 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied.
 - 1. The Owner may engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project may be taken, identified, sealed, and certified in the presence of the Contractor.
 - 2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:
 - a. Quantitative material analysis.
 - b. Abrasion resistance.
 - c. Apparent reflectivity.
 - d. Flexibility.
 - e. Washability.
 - f. Absorption.
 - g. Accelerated weathering.
 - h. Dry opacity.
 - i. Accelerated yellowness.
 - j. Recoating.
 - k. Skinning.
 - I. Color retention.
 - m. Alkali and mildew resistance.

3. The Owner may direct the Contractor to discontinue painting if test results show material being used does not comply with specified requirements. The Contractor shall remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.6 CLEAN UP

- A. Clean paint spattered surfaces by washing or scraping and use care not to damage adjacent finished surfaces.
- B. Provide "Wet Paint" signs to newly painted surfaces.
- C. Remove protection from surfaces, equipment, and operating parts. Remove tape and adhesive residue.
- D. Protect sprinkler heads they <u>ARE NOT</u> to be painted.

END OF SECTION 21 05 53

SECTION 21 13 00 - FIRE SUPPRESSION WET PIPE SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide a wet pipe sprinkler system utilizing the existing 6" sprinkler feed and the existing building.
- B. Provide hydrostatic testing and flushing of new and existing equipment and piping.

1.2 SUBMITTALS

- A. Provide submittals on all products to be used in the installation of the sprinkler systems.
- B. Provide sprinkler shop drawings, coordination drawings and hydraulic calculations.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide products as listed in Section 21 05 00 Fire Suppression System Basic Materials and Methods.
- B. Piping (Allied Tube or Equal):
 - 1. Pipe $-2\frac{1}{2}$ " and larger: Black Schedule 40 A53 steel pipe. Schedule 40 is intentionally to be used on this project.
 - 2. Pipe 2" and smaller: Black Schedule 40 A53 steel pipe.
 - 3. Pipe Galvanized Schedule 40 A53 steel pipe for all piping and for all systems installed in a more than ordinary corrosive environment. Refer to Contract Drawings for any such area and condition.
 - 4. Provide galvanized Schedule 40 A53 steel pipe for all preaction systems.

C. Fittings:

- 1. Grooved Fittings and Coupling Acceptable in sizes 2½" and over for general use. Groove connections for 2" and smaller sizes may be used on a limited basis as approved by the Engineer. Victaulic or Gruv-Lok brands. Grooved couplings used on preaction systems shall have "flush seal" gaskets.
- 2. Black cast-iron Class 125, threaded fittings for use on wet pipe or preaction systems.
- 3. Black malleable Iron Class 150, threaded fittings for use on wet pipe or preaction systems.

- 4. Galvanized malleable Iron Class 150 threaded fittings for use on preaction systems and exposed bathroom piping, Ward or equal.
- D. Provide additional zone control assemblies (check valve, butterfly valve with tamper switch, flow switch, drain and test connection and pressure gauge) where indicated on Plans.

2.2 ZONE CONTROL ASSEMBLY

- A. Zone control assembly, check valve, butterfly valve, flow switch, drain and test connection and pressure gauge.
 - 1. Grooved swing check.
 - 2. Butterfly valve with tamper switch.
 - 3. Riser manifold as manufactured by Viking Corporation or equal.

2.3 SPRINKLER HEADS AND ESCUTCHEONS

- A. Provide as shown on Drawings.
- B. Provide as indicated in Section 21 05 00, Part 2.06 Sprinklers.

2.4 VALVES – CONTROL, DRAIN AND FLUSHING

- A. Provide as shown on Drawings.
- B. Provide as indicated in Section 21 05 00 Valves.

2.5 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and support per the requirements of NFPA 13.
- B. Provide Clevis rings for pipe sizes 2½" and larger.
- C. Loop rings for pipe sizes 2" and smaller are acceptable.
- D. Refer to Section 21 05 00 Hangers, Brackets and Supports.

2.6 FIRESTOPPING AND SMOKESTOPPING

- A. Provide firestopping and smokestopping as required for individual wall ratings as shown and recommended by the product manufacturer.
- B. Provide Rectorseal Bio-Stop or equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide as listed in Section 21 05 00 Fire Suppression Basic Materials and Methods.
- B. Provide hydrostatic testing and flushing of new and existing equipment and piping. It is intended that the contractor perform a complete testing and flushing of all systems piping through the new flushing connections.

END OF SECTION 21 13 00

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SECTION 21 84 00 - FIRESTOPPING & SMOKESTOPPING FOR FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Specification Section 07 84 13 - Firestop Penetration Systems applies to the work of this Section.

1.2 WORK INCLUDED

- A. Provide firestopping and smokestopping for Fire Suppression Systems to comply with IBC 714.
- B. Provide submittals and installation detail sheets.
- C. Coordinate product to be used with the General Contractor and other trades so as to provide one product that will be used by all trades on this project. Submit on this elected product only.

1.3 SUBMITTALS

- A. Provide a schedule of each type of penetration together with the proposed method of protecting that penetration type. Schedule shall include the following details:
 - 1. Penetrated item (e.g., wall, floor, roof).
 - 2. Construction of item (e.g., metal studwall with gypsum wallboard).
 - 3. Fire rating of item (e.g., 1 hour wall).
 - 4. Description of penetrating item (e.g., 1" to 3" Schedule 40 pipe).
 - 5. Identification of penetrating seal to be used in this case (e.g., Rectorseal biostop pipe collar).
 - 6. UL or FM detail sheet (e.g., per attached example).
 - 7. UL of FM system number (e.g., WL1200).
- B. Submittal shall include complete details for each penetration covered by this Division.
- C. It is intended that the submittal include each detail in full for each system used, so that it is clear that the installing Contractor has the correct reviewed information in the field.

1.4 QUALITY ASSURANCE

- A. Firestopping Materials: Provide penetration seal assemblies whose fire-resistance ratings have been determined by testing in the configurations required and which have fire-resistance ratings at least as high as that of the fire-rated assembly in which they are to be installed.
 - 1. Comply with all applicable codes including but not limited to:

- a. American Society of Testing and Materials (ASTM).
- b. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials.
 - i. ASTM E 119 Method of Fire Tests of Building Construction Materials.
 - ii. ASTM E 814 Test Method for Fire Tests of Through Penetration Firestops.
 - iii. ASTM C 665 (Corrosion & Microbial Resistance Portions) Standard
 Specification for Mineral-Fiber Thermal Insulation for Light Frame
 Construction and Manufactured Housing.
 - iv. ASTM E 90 Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- 2. Listed by Underwriters Laboratories (UL) and /or Factory Mutual Research Corporation for each specific intended application.
 - a. UL Building Materials Directory.
 - b. UL Fire Resistance Directory.
 - c. UL 2079 Test.

PART 2 - PRODUCTS

2.1 GENERAL

A. Firestopping and smokestopping materials shall allow normal expansion and contraction (intumescent) of the penetrating item without failure of the penetrations seal and shall be heat absorbing (endothermic). Products may not emit hazardous, combustible, or irritating byproducts during installation or curing. Products shall not require special tools for installation.

2.2 MASONRY EXEMPTION

- A. The Contractor shall note IBC Section 714.3.1 Exemption, which states:
 - 1. **Exception:** Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, the annular space between the penetrating item and the fire-resistance-rated wall is permitted to be protected by either of the following measures:
 - a. In concrete or masonry walls where the penetrating item is a maximum 6-inch (152 mm) nominal diameter and the area of the opening through the wall does not exceed 144 square inches (0.0929 m2), concrete, grout or mortar is permitted where installed the full thickness of the wall or the thickness required to maintain the fire-resistance rating.

b. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.

2.3 MANUFACTURERS

- A. Manufacturers: Provide products complying with requirements of the Contract Documents and made by one (1) of the following:
 - 1. Rectorseal.
 - 2. Hilti, Inc.
 - 3. 3M Fire Protection Products.
 - 4. Specified Technologies Inc.
 - 5. U.S. Gypsum Company.
 - 6. Johns Manville.
 - 7. BlazeMaster.

2.4 FIRESTOPPING PRODUCTS

- A. Provide firestopping products which:
 - 1. Provide firestopping systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain fire resistance rating of assembly.
 - a. F-rated systems in accordance with ASTM 814.
 - b. T-rated systems in accordance with ASTM 814.
- B. Firestopping Flamespread Performance Requirements:
 - 1. Provide products with flame-spread ratings of less than 25 and smoke-development rating of less than 50 as determined in accordance with ASTM E 84.
- C. Firestopping UL Performance Requirements:
 - 1. Provide products with UL ratings specified for assembly indicated as determined in accordance with UL listing.
- D. FM approval in lieu of UL shall be accepted by the Owner.

- E. Where a specific firestopping product is identified on the drawings, either that product or a similar product which has been tested in the exact application shown on the drawings shall be employed, after review by the Engineer.
- F. Firestop caulk shall be Johns Manville Firetemp Cl, Rectorseal Biostop 500+, or approved equal, except where otherwise shown on the drawings.

2.5 SMOKESTOPPING PRODUCTS

- A. Provide smokestopping products which:
 - 1. Allow normal expansion and contraction movement of the penetrating item without the failure of the penetration seal.
 - 2. Maintain at least the smoke resistance of the barrier penetrated.
 - 3. Firestop caulk shall be Johns Manville Firetemp Cl or approve equal.

PART 3 - EXECUTION

3.1 INSTALLATION AND QUALITY ASSURANCE

- A. Install firestopping materials in exact accordance with the manufacturer's instructions and conditions of the testing; provide all accessory materials required.
- B. Provide the services of a factory representative of the fire proofing product to review the installation practices and conduct training of the applications.
- C. Installer shall be trained to perform work.
- D. Inspection: The Authority Having Jurisdiction (AHJ) shall have final inspection review of all work performed. Contractor shall make modifications to completed and uncompleted work as directed by the AHJ at the Contractor's expense.
- E. Refer to the Certified Installation Instructions sheet on the following page for an example of an acceptable installation method.

3.2 FIRESTOPPING AND SMOKESTOPPING ITEMS

- A. Under Division 21, provide and pay for all firestopping materials, assemblies, and labor to provide complete firestopping and smokestopping.
- B. Provide firestopping of penetrations at each fire-rated floor, wall, or roof assembly of the following components:

1. Sprinkler, standpipe, and bulk main piping provided by Division 21.

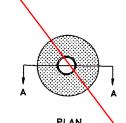
Attachment(s): Example Detail Sheet

END OF SECTION 21 84 00





500+GW-92 Wall Penetration 1, 2 Hr. Rating



1 layer of 5/8" **UL Classified** Gypsum Wallboard for 1 Hr. Rating or 2 layers of 5/8"

Max. 1" Corrugated Stainless Steel Tubing (PVC Coated)

for 2 Hr. Rating 1/2" depth Metacaulk® 1000 Steel Sleeve/ Mineral Wool Wire Mesh **Backing Material**

SECTION A-A

EXAMPLE

SYSTEM CONFIGURATION INFORMATION															
PRODUCT(S)		PENETRATING ITEM(S)		HOLE ANNULAR SIZE SPACING		ADDITIONAL INSTALLATION MATERIALS AND AIDS		BACKING MATERIAL		ASTM E 814 RATING					
FILL MAT'L	MIN. THICK.	OTHER	TYPE	SIZE	INSULATION	MAX.	MIN.	MAX.	WIRE MESH	STEEL SLEEVE	OTHER	TYPE	DEPTH	Т	F
500+	1/2" both sides	none	PVC Coated Corruagated Stainless Steel Tubing	up to	none	3"	1/4"	1 1/2"	No. 8 steel wire mesh	min. 20 gauge	none	minimun 4.0 pcf mineral wool	1	0	2

INSTALLATION INSTRUCTIONS

These instructions are for the installation of through-penetration fire stop system 500+GW-92 in minimum 4 1/2 inch thick steel or wood stud fire rated gypsum wallboard partitions as listed by Underwriters Laboratories Inc. Refer to above drawings and System Configuration Information for component details.

Step Procedure

- 1 Cut hole in wall in required size to accommodate pipe penetrations and allowable annular spacing. Do not exceed maximum specified hole diameter.
- Install 1 inch PVC Coated Corrugated Stainless Steel Tubing. Support pipe rigidly on both sides of wall. 2
- Install specified wire mesh or minimum 20 gauge steel sleeve cut to size, formed to hole shape centered inside wall 3 around tubing and allowed to spring back snugly against periphery of hole.
- Install backing material by tightly packing annular space in between and around tubes with specified mineral wool 4 flush with wall. Recess mineral wool 1/2" on both sides of wall.
- 5 Apply a 1/2" depth of Biostop™ 500+ into annular space around tubing on both sides of wall. Tool surface to a smooth defect-free finish.

JOBNAME:

ARCHITECT:

CONTRACTOR:

CUSTOMER:

REPRESENTATIVE:

CUSTOMER ORDER NO:

REPRESENTATIVE ORDER NO:

RECTORSEAL

2601 SPENWICK HOUSTON, TEXAS 77055

REVISION NUMBER: 121499

SHEET NUMBER:

OF

SECTION 22 00 00 - PLUMBING GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes general administrative and procedural requirements for Division 22 Plumbing Work.
- B. The Contract Drawings and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 through Division 19 Specification Sections apply to the work of this Division.

1.2 DIVISION 22 DESCRIPTION

- A. The Technical Specifications of this Contract are arranged for the convenience of the Owner and Contractor into Divisions of work. The work of Division 22, Plumbing, is further described in Specification Sections of the 22 00 00 Series and on Contract Drawings of the "M" series.
- B. The organization of this work into Divisions shall not relieve the prime Contractor from providing all of the work shown on the complete set of drawings or specified in the complete set of specifications, whether or not the individual subcontractors correctly identify their respective responsibilities.

1.3 OTHER DIVISION SPECIFICATIONS APPLICABLE TO THIS WORK

- A. The work of Section 22 05 00 Plumbing Basic Materials & Methods applies to the work of this Section.
- B. To the extent that the work of this Division or Contract includes the work of other trades, the Contractor for this Division shall adhere to the requirements of other Specifications. All General Construction work shall be performed in accordance with the provisions of the appropriate Division 01 through Division 19 Sections. All electrical work shall be performed in accordance with appropriate Division 26 Sections.

1.4 WORK INCLUDED

A. This project includes work of storm and deck drainage systems and interior piping related to that work. A Phase 1 project has been completed which covered Domestic Water piping.

- B. The work of this Division shall include providing all materials, labor, services, permits and related work to furnish a complete, operating, tested, functioning, documented, commissioned Plumbing System for the Project including all work shown, specified, or required for proper system operation including but not limited to the following:
- C. Demolition and removal of existing plumbing work as required and removal of all debris from site and proper disposal of same.
- D. Provide and install piping, equipment and all fixtures as specified herein and as shown on the Drawings.
- E. Provide openings in existing and new construction as required for work of this Division.
- F. Provide coordination with Architectural Treatments.
- G. Provide Plumbing Basic Materials & Methods. (Section 22 05 00)
- H. Provide Insulation of Piping Systems. (Section 22 07 19)
- I. Provide Plumbing Identification System. (Section 22 05 00)
- J. Provide Firestopping of Plumbing Work. (Section 22 84 00)
- K. Provide Submittals.
- L. Provide extension and relocation of existing storm and domestic water piping to new locations, as shown on the Drawings.
- M. Provide Maintenance of systems in good condition until final acceptance.
- N. Provide Permits and Inspections.
- O. Provide Operation and Maintenance Manuals.
- P. Provide Owner's Operation Instruction.
- Q. Provide one (1) year warranty on all equipment, materials, and installation.
- R. Provide As-Built Drawings.

1.5 RELATED WORK NOT INCLUDED

- A. Electrical connections by Electrical Contractor specifically shown in his/her Contract are not included in the Work of this Section. The Electrical Contractor is responsible only for the electrical connections included under Division 26 and the Electrical Drawings. Plumbing Contractor 22 shall provide all other electrical work necessary for satisfactory operation of equipment furnished under Division 22.
- B. GC shall furnish and install the bathroom FD-1 where shown on the Drawings. Division 22 shall provide connection to drain body outlets, stainless steel floor drain bodies and grates. Provide ptraps for all drains and hair/lint basket strainers for shower drains.
- C. GC shall provide lavatories. Division 22 to provide trim.

PART 2 - PRODUCTS

2.1 GENERAL

A. Refer to specific Technical Specification Sections.

PART 3 - EXECUTION

3.1 SPECIAL CHARACTER OF THE WAR MEMORIAL

- A. While this building is not currently listed on the National Registry of Historical Places, it is a building with significant historical significance and character. Many details and facets of the Memorial are irreplaceable. One of the primary intents of this project is to both preserve and restore the historical character and fabric of the Memorial.
- 3. To this end, it is of utmost concern that all work be performed with care. This includes protection of all existing surfaces and finishes, including but not limited to, all decorative stonework and engraved tablets, and protection of existing copper wall-mounted lanterns. Where shown, all electrical work at the main First Floor Memorial Level shall be concealed. Any exposed work requires explicit and specific permission of the Owner and/or Architect and Engineer.

3.2 QUALITY OF WORK

A. Conform to the Execution provisions of the various 22 series Technical Specifications.

END OF SECTION 22 00 00

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SECTION 22 05 00 - PLUMBING BASIC MATERIALS & METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. To the extent that the Work of this Division or Contract includes the work of other trades, the Contractor for this division shall adhere to the requirements of other Specification Sections. All General Construction work shall be performed in accordance with the provisions of the appropriate Division 1 through Division 14 Sections.

1.2 WORK INCLUDED

- A. Provide Permits and Inspections.
- B. Provide Balancing Valves.
- C. Provide Cleanouts.
- D. Provide Dielectric Flanges and Couplings.
- E. Provide Escutcheons.
- F. Provide Fire Wall Sealant.
- G. Provide Hangers, Riser Clamps, Attachments and Rods.
- H. Provide Identification Systems.
- I. Provide Insulation.
- J. Provide Pipe and Fittings.
- K. Provide Testing of All New Piping and Fittings.
- L. Provide Sleeves.
- M. Provide Valves.
- N. Provide Miscellaneous Painting of pipe, supports and hangers as noted on Drawings.

- O. Provide Equipment Installation.
- P. Provide Noise and Vibration Free Installation.
- Q. Provide Adjustment and Initial Lubrication.
- R. Provide Maintenance of systems in good condition until final acceptance.
- S. Provide Submittals.

1.3 SUBMITTALS AND OPERATION & MAINTENANCE MANUAL/PARTS DATA

- A. Provide Submittals, O&M and Parts Data for the following:
 - 1. Insulation.
 - 2. Balancing valves.
 - 3. Dielectric pipe fittings/unions.
 - 4. Escutcheons.
 - 5. Fire wall sealant.
 - 6. Hangers, riser clamps, attachments, and rods.
 - 7. Identification systems.
 - 8. Cleanouts.
 - 9. Valves and valve tags.
 - 10. Pipe and pipe fittings.
 - 11. Water closets and flush valves.
 - 12. Faucets.
 - 13. Shower control valve and shower head.
 - 14. All other fixtures and equipment as shown on the Drawings.

1.4 PERMITS AND INSPECTIONS

A. Division 22 shall be responsible to apply for, obtain and meet the requirements of all permits and inspections required by authorities having jurisdiction for the work of Division 22. Division 22 shall pay all fees associated with these permits and inspections.

1.5 LAWS AND REGULATIONS

A. Division 22 shall conform to all Federal, State, County and Municipal Laws, Ordinances and Regulations. Comply with the Occupational Safety and Health Act (OSHA).

1.6 CONTRACTOR EXAMINATION OF THE SITE

A. It shall be the responsibility of each prospective Contractor to visit the project site and to examine existing conditions. The Contractor shall be responsible to include under this Division all effort, materials, supplies, temporary installations, and other work to relocate, remove or modify existing work as required to complete the work of this Division.

1.7 PLANS AND SPECIFICATIONS

- A. It shall be the responsibility of the Contractor to examine the complete project documents including Plans and Specifications thoroughly prior to bid and to notify the Architect/Engineer of any uncertainties or apparent omission, conflicts, or discrepancies between the Plans and Specifications. In any case of a conflict between the Plans and Specifications or between two (2) Specification sections it shall be assumed that the larger capacity or quantity, or higher quality, shall govern until a determination can be made by the Architect/Engineer.
- B. Plans and Specifications are of abbreviated form. Omitted words or phrases shall be inferred.
- C. Plans and Specifications are complementary. Provide all work which is either shown or specified or both.
- D. Where provided on the Drawings, typical details shall be assumed to be applied to each installation of the equipment whether or not specifically identified at each point in the Plans.
- E. The Division 22 Contractor shall assume that all work on the Plumbing Drawings is included in his work unless specifically noted otherwise.

1.8 DEFINITIONS

Where used in the Plans and Specifications the following words and corresponding definitions shall apply:

- A. HV The Contractor performing the Division 23 Heating and Ventilation work. In the Plans and Specifications, the words "By Div 23" and "By HV" or "By H&V" shall be considered synonymous.
- B. Elect or EC the Contractor performing the Division 26 work. In the Plans and Specifications, the words "By Div 26", "By EC" and "By Elect" shall be considered synonymous.
- C. Plumb, Plumbing or Plg The Contractor performing the Division 22 Plumbing work. In the Plans and Specifications, the words "By Plumb" or "By Plumbing" or "By PC" shall be considered synonymous.

- D. FP The Contractor performing the Division 21 Fire Protection. In the Plans and Specifications, the words "By Div 21 FP" or "By FP" shall be considered synonymous.
- E. Provide Contractor shall supply, install, start-up and maintain until final acceptance.
- F. Furnish Submit, receive approval, purchase, and turn over. Do not include the costs to install if furnish only is indicated. Include one year guarantee on material furnished.
- G. New Work occurring as part of this Project, usually employed on a drawing to distinguish from existing work. All work shown on the drawings shall be assumed to be new unless specifically identified as existing.
- H. Exist Existing work.
- I. Salvage Carefully remove, protect, and turn over to Owner, equipment, and materials, using methods that allow the Owner to reuse the materials and equipment on other projects.
- J. Shown Shown on the Plans.
- K. Specified Specified on the Technical Specifications.

1.9 RELATED WORK NOT INCLUDED

- A. Cost of water and electricity for Construction by the Owner.
- B. Electrical connections by Electrical Contractor specifically shown in their Contract. The Division 26 Contractor is responsible only for the electrical connections included under Division 26 and the electrical drawings. Division 22 Contractor shall provide all other electrical work necessary for satisfactory operation of equipment furnished under Division 22.

1.10 REGULATIONS GOVERNING ASBESTOS AND OTHER HAZARDOUS MATERIALS

- A. The Owner has reported that he has investigated the project site for asbestos containing and other hazardous materials and has scheduled remediation activities if required. This does not guarantee that the site is 100% asbestos or other hazardous materials free.
- B. If any material which appears to possibly contain asbestos or other hazardous materials is encountered, the Contractor shall notify the GC/Construction manager and immediately take steps to suspend work in the area and isolate the area from the workers and the public.

PART 2 - PRODUCTS

2.1 BALANCING VALVES

- A. Description: Bi-directional, blow-out resistant, tight shut-off ball design with position indicator, memory device, checked metering ports, drip caps and integral drain ports. Valves shall be lead free in compliance with State and Federal Codes.
- B. Threaded or soldered bronze body Sizes ½"- 2".
- C. Sizing Table: Provide valves sized according to the table below to provide a pressure drop of 2 ft. wg in full open position:

GPM Flow	<u>Size</u>	<u>Connection</u>
0 - 4.1	1/2"	Sweat or Thread
4.2 - 6.0	3/4"	Sweat or Thread
6.1 - 8.2	1"	Sweat or Thread
8.3 - 20	11/4"	Sweat or Thread
20.1 - 29	11/2"	Sweat or Thread
29.1 - 40	2"	Sweat or Thread
40.1 - 102	2½"	Flanged
102.1 - 125	3"	Flanged
125.1 - 210	4"	Flanged
210 - 300	5"	Flanged
300.1 - 430	6"	Flanged

- D. Manufacturer: Tour Anderson.
- 2.2 CLEANOUT TYPES See Schedule on Contract Drawings.

2.3 DIELECTRIC PIPE FITTINGS/UNIONS

- A. Construction: Rated at 250 psi at 180°F and be designed to meet the requirements of ANSI B16.39, including hydrostatic strength, tensile strength, and air pressure testing. All pipe threads to be in accordance with ANSI B2.1 and solder joints to meet national plumbing standards.
- B. Make: Watts, No. LF3001A LF3008 and LF3110 LF3200 or approved equal.

2.4 ESCUTCHEONS

A. Cast Brass: Rough finish escutcheons shall be of cast brass construction, solid type with set screw. CS&B No. 13 or equal by Grinnell, Elcen.

B. Chrome Plated: Chrome plated escutcheons shall be of cast brass construction with polished chrome plated finish, split type with springs, CS&B Cadwell No. 40, or equal by Grinnell, Elcen.

2.5 FIRE WALL SEALANT

- A. Intumescent, hand moldable putty.
- B. Make: 3M Fire Barrier Moldable Putty or equal by Flamesafe, Dow Corning.

2.6 FLOOR DRAINS

A. Floor Drains - See Schedule on Contract Drawings.

2.7 HANGERS, RISER CLAMPS, ATTACHMENTS AND RODS

A. Hangers:

- 1. Regular: Adjustable clevis type, steel construction with electro-galvanized finish. Cooper B-line Fig. B3100, PHD Fig. 451, or approved equal.
- 2. With Insulation Shield: Adjustable clevis type, black steel construction, galvanized steel saddle welded to lower strap, Carpenter and Paterson Fig. 100SH. Type 1 plus Type 40, PHD Fig. 170, or approved equal by M-Co.
- 3. Copper Tubing Lines: Steel construction with Dura-Copper finish. Copper B-line Fig. B3104CT or approved equal.

B. Riser Clamps:

1. Riser clamps shall be of steel construction, two-piece type, Carpenter and Paterson Fig 126. Type 42, PHD Fig 550, or approved equal by M-Co. Provide hot-dipped galvanized construction.

C. Attachments:

1. C-Clamps: Clamps shall be of steel construction with locking nut Carpenter and Paterson Fig. 47 clamp. Type 23, PHD Fig 250, or approved equal by M-Co. Provide hot-dipped galvanized construction.

D. Beam Clamps:

Beam clamp shall be of malleable iron construction, Carpenter and Paterson Fig. 15.
 Center Beam Type 21, or approved equal by M-Co, PHD. Provide hot-dipped galvanized construction.

E. Hanger Rod:

1. Hanger rod shall be steel, full threaded type, Carpenter and Paterson Fig. 94 or machine thread eye rod, Fig. 33, or approved equal by M-Co. Provide hot-dipped galvanized or stainless steel construction.

2. Rods:

<u>Pipe Sizes</u>	Rod Diameter
Up to 2"	3/8"
2½" to 3"	1/2"
4" and 5"	5/8"
6"	3/4"
8" to 12"	⁷ /8"

Floor Supports:

1. Threaded rod extended up from the floor shall not be used to support piping and equipment.

Wall Hangers:

1. Unistrut type wall brackets shall not be used. Provide prefabricated or shop fabricated angle iron wall brackets of sturdy design. Provide with hot-dipped galvanized finishes. Submit shop drawing.

2.8 **FASTENERS**

- A. All fasteners shall be stainless steel.
- B. Exposed fasteners, bolts, nuts, etc. to match existing as close as possible. Coordinate with the GC.
- C. Submit actual samples for review and approval.

2.9 **IDENTIFICATION SYSTEMS**

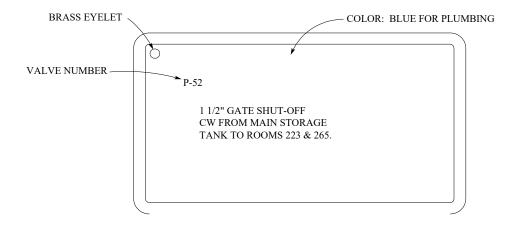
Equipment Labels: Α.

- 1. Small: Labels shall be adhesive backed plastic tape with embossed letters in contrasting color. Tape shall be 3/8" wide.
- 2. Large: Labels shall be adhesive backed plastic tape with embossed letters in contrasting color. Tape shall be 3/4" wide.
- Make: Seton Name Plate Company, Setmark or Brady.
- Piping Markers:

- 1. Pipe markers shall be adhesive type indicating pipe contents and sizes on a colored background conforming to American National Standards Institute (ANSI) Standard A13.1. Direction of flow shall be indicated:
 - a. Domestic hot water yellow with black lettering.
 - b. Domestic cold water green with white lettering.
 - c. Domestic hot water circulating yellow with black lettering.
 - d. Steam yellow with black lettering.
 - e. Condensate yellow with black lettering.
 - f. Sanitary piping green with white lettering.
 - g. Storm piping green with white lettering.
- 2. Make: Seton Name Plate Company Setmark, or equal by Dover, Brady.

C. Valve Tags:

- 1. Tags: Tags shall be $1\frac{3}{4}$ " x $3\frac{1}{4}$ " laminated with two 0.020" thick plastic sheets with matte finish and with a brass eyelet in the corner. Typed information shall include appropriate alphanumeric code (prefixed with the letter "H" for heating etc.), system designation, the fluid in the pipe, and size and function of the valve.
- 2. Make: Dover Enterprises, Syracuse, NY, phone: 315-446-1550 or approved equal by Seton Name Plate Company.



D. Provide valve tag chart.

2.10 PIPE

- A. Copper Pipe:
 - 1. Type:

- a. Type K, ASTM B 88.
- b. Type L, ASTM B 88.
- c. Type DWV, ASTM B 306.
- 2. Fittings: Wrought or cast solder type pressure fittings.
- 3. Make: Anaconda or equal by Mueller, Revere.
- 4. Unions:
 - a. Description: Cast brass with solder ends. Working pressure: 200 PSI W.O.G.
 - b. Make: Nibco or equal by Mueller, Revere.
- 5. Solder and Flux:
 - a. Solder shall be in solid wire form of Type II 95-5 tin antimony solder conforming to ASTM B-32, Grade 5A. Flux shall be zinc chloride or a mixture or zinc and ammonium chlorides. Solders containing lead shall not be used. 96.5 3.5 and 95-5 tin/silver solders may be used.
 - b. Make: J.W. Harris Bridgit, Wolverine (formerly Englehardt), Silvabrite 100.
- B. Cast-Iron Pipe:
 - 1. Service weight cast-iron hub and spigot (Underground)
 - a. Fittings: Push-on gaskets.
 - 2. Service weight cast-iron No-Hub Pipe (Above Ground)
 - a. Couplings for No-Hub Pipe: Charlotte heavy-duty no-hub couplings (HD-1).
- C. Polyvinyl Chloride (PVC) Pipe:
 - 1. Schedule 40, solid wall pipe, PVC, DWV fittings.
 - 2. Pipe and fittings shall be manufactured in conformance with ASTM D1784.
 - PVC Schedule 40 pipe shall be Iron Pipe Size (IPS) conforming to ASTM D1785 and ASTM D2665. PVC DWV fittings shall conform to ASTM D2665. Pipe and fittings shall conform to National Sanitation Foundation Standard 14.
 - 4. Primer and solvent cements shall conform to ASTM D2564. Primer shall be purple in color and conform to ASTM F656.
 - 5. PVC pipe shall be manufactured in the United States.
 - 6. Manufacturer: Charlotte Pipe, National Pipe and Plastics or approved equal.
- D. SDR Pipe:

- 1. PVC pipe conforming to ASTM D3034.
- 2. Sidewall to Diameter Ratio (SDR) = 35.
- 3. Stiffness value of 48.
- 4. Push on fittings.
- 5. ASTM F477 gaskets.

2.11 SLEEVES

A. Refer to detail on Drawings.

2.12 VALVES

A. Ball Valves:

1. Two piece, full port (1/4" through 1"), conventional port (1/4" through 2"), bronze body, stainless steel ball and stem, 150 psig sat. Steam, 600 psig W.O.G., two piece construction, blow-out proof stem, removable operation handle screwed: Design Valve: Apollo Model 70LF-140/240 Series, Nibco T/S 580-66-LF, T/S 585-66-LF or Watts LFB 6000-SS, LFB 6001-SS.

B. Check Valves:

- 1. Up to 2" valve size:
 - a. Bronze body, horizontal swing 150 lb. SWP, Y-pattern, threaded or soldered end.
 - b. Manufacturer: Nibco S-413LF or T-413Y-LF, Apollo 61Y-LF.
- C. All valves for domestic water systems shall be lead free in accordance with "Federal Public Law 111-380", effective January 4, 2014.

2.13 QUALITY ASSURANCE

A. All equipment, materials and products shall conform to the applicable ANSI, ASA, NFPA, UL, AGA, or ARI standard. All electrical equipment shall be UL or ETL listed.

2.14 WARRANTY

- A. Provide one year manufacturer's warranty on all equipment, materials, and products. Where shown or specified, provide manufacturer's extended warranty.
- B. Provide warranty information in O&M Manuals and provide a separate copy to the Cornell Project Manager for inclusion in the project file and Maximo system.

2.15 DELIVERY, STORAGE AND PROTECTION

- A. All materials shall be delivered to the site in their original, unopened labeled containers.
- B. All materials shall be stored in clean, dry area as required by the Owner.
- C. All materials shall be properly protected from weather, damage, and theft. The Contractor shall be responsible for the proper care and protection of all materials, equipment, etc. on site.

PART 3 - EXECUTION

3.1 QUALITY OF WORK

- A. All work shall be executed in accord with recognized standards of workmanship. All work shall be installed in a neat and orderly manner. If, in the judgment of the Engineer, the workmanship is not acceptable, the work in question is to be removed and reinstalled in a manner satisfactory to the Engineer.
- B. Furnish at site during construction a competent and experienced foreman. He/she shall have complete charge of all field work of this Contract. He/she shall be authorized to act for the Contractor in his/her absence and to represent the Contractor with the Engineer or Owner. The Project foreman shall not be changed during the Project except for single day occurrences for personal needs. It is essential that the same foreman be provided for the duration of the Project to maintain continuity on the job site. The Owner shall view any departure from this requirement by the Contractor as an indication of the Contractor's unwillingness to meet the needs of the Owner.
- C. The project foreman shall be present at site whenever any Contractor or subcontractor employees are working at the site. In the event of absence by the project foreman, the Prime Contractor shall designate an Assistant Foreman and advise the Owner and Engineer of the designated individual's name. The Assistant Foreman shall have been working on the site for a minimum of five (5) working days prior to being designated acting foreman and shall be designated at least two (2) working days prior to becoming acting foreman.
- D. All personnel employed by or subcontracted by the Contractor shall at all times be suitably clothed and shall conduct themselves in a professional manner. Shirts shall be worn at all times. Any employee found to have been making gestures or harassing remarks to the staff, students or general public shall be disciplined by the Contractor and removed from the site.
- E. No radios or other portable sound equipment shall be played on the site.
- 3.2 SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

- A. The Contractor shall be solely responsible for compliance with all applicable safety and health regulations including, but not limited to, U.S. Department of Labor Safety and Health Regulations for Construction. Construction employees are required to comply with the most stringent rule or standard in the event of dual or concurrent State and Federal jurisdiction. Detailed information on this subject may be obtained from the Office of Information Services, Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C. 20210.
- B. No obstructions are to be placed on or around fire hydrants or fire department connections that could make them inaccessible or inoperative for firefighting purposes.
- C. All temporary construction sheds, trailers, and flammable liquid storage areas belonging to Contractors shall be so placed on the construction site to minimize any danger to Owner's property and the public. Construction trailers and sheds shall require the pre-approval of the Owner.
- D. Conduct of the work shall be such that pestilence does not occur. To prevent influx of rats, vermin and other pestilence, the Contractor shall retain an approved exterminating firm until such time that the danger of pestilence has passed as approved by the Engineer. Contractor shall remove all garbage and trash from the site daily.

3.3 FIRE SAFETY

- A. Fire Watch: Provide a fire watch wherever welding, brazing, cutting, or other processes involving an open flame or potential for generating sparks is used. Fire watch shall consist of a person with a 10 pound carbon dioxide fire extinguisher. While on fire watch, the person so assigned shall have no other duties or assignments.
- B. Fire Blanket: In addition to providing a fire watch, have available an approved fire blanket to cover any combustible materials in the immediate area.

3.4 INSPECTIONS

A. The Engineer or Owner may visit the site at intervals appropriate to the stage of construction according to the General Conditions. The periodic observation or inspection of the general project progress shall not be construed as supervision of actual construction, nor make the Engineer or Owner responsible for providing a safe place for performance of work by the Contractors or Contractor's employees or those of suppliers of Contractors or for access, visits, use, work, travel, or occupancy by any person.

3.5 MANUFACTURER'S DIRECTIONS

A. In the case where any manufactured article, material, or equipment is specified, then the Contractor must install, apply, connect, erect, use, clean and document it in strict accord with the manufacturer's directions.

3.6 MARKING OF SHOP DRAWINGS

- A. The Engineer shall return copies of the Shop Drawings marked as follows:
 - 1. "Reviewed for General Compliance Only No Exception Taken" Drawings bearing this comment have been found to be generally in conformance with the intent of the Plans and Specifications.
 - 2. "Reviewed for General Compliance Only Make Noted Corrections" Drawings bearing this comment have been found to be generally in conformance with the intent of the Plans and Specifications, with the exception of the noted items. A resubmittal to the Engineer is not required and it is understood the Contractor will make the noted corrections.
 - 3. "Reviewed for General Compliance Only Revise and Resubmit" Drawings bearing this comment have been found to contain a substantial departure from the Plans and Specifications. The Contractor must make a new corrected submittal.
 - 4. "Reviewed for General Compliance Only Rejected" Drawings bearing this comment depict materials, equipment or supplies which are not judged by the Engineer to meet the requirements of the Plans and Specifications. The Contractor shall provide a new submittal on alternative equipment.
 - 5. "Reviewed for General Compliance Only Not Reviewed; Returned" Submittals bearing this comment have not been reviewed and are returned to the Contractor.
 - 6. "Reviewed for General Compliance Only Additional Submittal Required" Submittals bearing this comment have been found to be generally in conformance with the intent of the Plans and Specifications; however, more information is required, and a resubmittal is required.

B. Samples:

1. The Contractor shall, when required, submit to the Engineer for review, typical samples of materials, equipment, and products. The Samples shall be properly identified by tag and shall be submitted sufficiently in advance of the time when they are to be incorporated into the work so that rejection thereof will not cause delay.

3.7 EXAMINATION OF ACTUAL CONDITIONS

- A. Before ordering any material or doing any work, the Contractor shall verify all measurements at the site and shall be responsible for the contingencies which may be encountered. No extra compensation will be allowed on account of a difference between actual dimensions and measurements at the site and those indicated on the drawings. Any difference which may be found shall be submitted to the Architect/Engineer for consideration before proceeding with the work.
- B. Contractor shall work accurately to benchmarks and to proper elevations and dimensions established by the Contractor. Contractor shall check conditions and details of the work in relation to the progress of the work.
- C. The Contractor shall lay out the work, establishing heights and grades for all work included in these specifications in strict accordance with the intent of the drawings, the physical conditions of the Project and the finished site grades. He shall be responsible for the accuracy of the work and that the work meets all physical conditions of the Project and the requirements of these specifications.
- D. Prefabrication of equipment, finishes, piping, fittings, expansion joints, flanges, etc., may be preformed at the risk of the Contractor. Changes to prefabricated piping required by actual site conditions shall be made by the Contractor without extra compensation from the University.
- E. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. which may be required. Make all such changes in piping, location of equipment, etc., to accommodate work to obstacles encountered, at no increase in compensation. Submit drawings detailing all major deviations or changes. All changes must be approved before installing.

3.8 BARRIERS

- A. The contractor shall furnish, erect, and maintain barricades, fences, railings, enclosures, guard lights, danger signals, warnings, cribbing, shoring, and other such precautions necessary to protect all installations and structures in the area of the work to ensure the safety of the public and to avoid damage or injury to any and all persons and property. Warning lights shall be of blinker type, battery or electrically operated.
 - 1. The Contractor shall be solely and without exception, responsible for safety on the project site.
 - 2. All barricade and security measures shall be implemented before work starts.

3.9 PROTECTION

- A. The Contractor shall provide adequate protection to the work, his workmen, the General Public, and private property.
- B. The Contractor shall use all means and precautions necessary to ensure on-site safety during construction. All OSHA construction requirements covering a project of this type shall be required of the Contractor.
- C. All fencing and security measures must be implemented before work starts.
- D. The Contractor shall use all means and precautions to ensure the safety of the occupants of the buildings during construction. Occupied portions of the buildings shall have a minimum of two (2) exits available at all times. Major assembly, residence and classroom buildings shall have all exits available at any time the building is occupied by the public.

3.10 LAYING OUT WORK

- A. The Plans are in part diagrammatic. Contractor shall verify rough-in dimensions with fixture Shop Drawings and with the Architectural Plans. Conform to dimensions shown on the Plans in preference to scaling from the Mechanical Drawings. Provide all fittings and appurtenances required for proper system operation.
- B. Conform to Specification Section 01 01 05.

3.11 ORDER OF WORK

- A. Conform to Specification Section 01 01 05.
- B. If, in the judgment of the Architect/Engineer or Owner, it becomes necessary at any time during construction in order to accelerate work and/or complete certain areas of project, the Contractor shall concentrate his entire efforts and manpower to certain designated areas. The Contractor shall complete work in certain areas ahead of the rest of the work so same can be turned over to the Owner. Contractor shall confer with the Architect/Engineer, Owner, and all other Contractors to agree upon schedule procedure. Contractor shall follow this schedule diligently. Contractor shall expedite certain portions of work to avoid delaying other Contractors' work.

3.12 CLEANOUTS

A. General:

1. Units shall meet all design parameters shown on the Drawings.

- 2. Units shall be complete with all design features and accessories necessary to provide a coordinated installation (such as carpet markers, tile recesses, etc.).
- 3. Units shall be of the following sizes:
 - a. Line size for piping to 4".
 - b. 4" for piping from 5" to 8".
- 4. Location:
 - a. At each bend of more than 45°.
 - b. At bottom of soil or waste stacks.
 - c. At 50' intervals or less on horizontal pipe lines 4" or smaller.
 - d. At 100' intervals or less horizontal pipe lines 5" or larger.
 - e. At exit of sanitary drains from building.
 - f. Wherever shown on the Drawings.
 - g. At the end of each branch line serving more than two (2) fixtures.
- 5. Placement:
 - a. Must be located where they will be accessible. Check General Construction Drawings for location equipment or obstructions which may prevent access.
- B. Install drains in strict accordance with the manufacturer's recommendations and in locations indicated.
- C. Coordinate drain installation with other trades. Trap all drains connected to the sanitary sewer.
- D. Types and sizes shall be as shown on the Drawings.
- E. Floor Drain Installation:
 - 1. Install floor drains with deep seal 'P' trap.
 - 2. Adjust drain head to proper floor level and remove protective covering over grate on completion of floor installation.
- F. Confirm types, sizes, and rough-in dimensions prior to any work.

3.13 ESCUTCHEONS

A. Every pipe penetrating a wall, ceiling or floor surface exposed to view shall be provided with an escutcheon.

- B. Units in unfinished spaces (boiler rooms, etc.) shall be of the rough finish type.
- C. Units in finished spaces shall be of the chrome plated type.
- D. Units shall be of sufficient diameter to cover sleeves and where used with extended sleeves shall be of sufficient depth to fit over the sleeve and reach the finish surface snugly.
- E. Provide escutcheons for both insulated and uninsulated piping.

3.14 HANGERS AND SUPPORTS

A. Supports: Investigate thoroughly, Plans and Shop Drawings related to work, to determine how equipment and piping are to be supported, mounted, or suspended. Provide extra steel, bolts, inserts, pipe stand brackets, or any other items required for proper support. Provide supporting accessories where required, whether or not shown on the drawings. Where directed, furnish drawings showing supports, etc., for approval.

3.15 IDENTIFICATION SYSTEMS (General Installation Requirements):

A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting.

B. Equipment:

- General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. For outdoor equipment, provide engraved stainless steel tag. Provide signs for the following general categories of equipment and operational devices.
 - a. Meters, gauges, thermometers, and similar units.
 - b. Fuel-burning units including water heaters.
 - c. Pumps and similar motor-driven units.
 - d. Storage tanks and pressure vessels.
 - e. Strainers, filters, humidifiers, water treatment systems and similar equipment.
 - f. Air handling units.
 - g. Fans.
 - h. Heat exchangers.
 - i. Energy recovery ventilators.

- 2. Lettering Size: Minimum ¼" high lettering for name of unit where viewing distance is less than 2'- 0", ½" high, for distances up to 6'-0", and proportionately larger lettering for greater distances. Provide secondary lettering ½" to ¾" of size of principal lettering.
- 3. Test of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Piping:

- 1. After piping has been painted or insulated, apply pipe labels as specified above.
- 2. Space labels on 15' centers in mechanical rooms. Space at 25' centers elsewhere and at each side of partitions and interior walls. Also, at each branch and riser take off and adjacent to each valve (except at fixtures and equipment).

D. Valves Identification:

- 1. General: Provide valve tag on every valve, cock, and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience hose bibs, and shut-off valves at plumbing fixtures, and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.
- 2. Provide a valve tag chart, framed, and securely fastened to the wall, using anchors and fasteners, where directed by the Owner.
- 3. Submit list of valve tags, including wording, for approval BEFORE ordering.

3.16 SEALING SLEEVES

A. All openings in floors and all openings in full height walls shall be firestopped to meet the fire rating of the wall or floor and to make floor penetrations watertight.

3.17 SLEEVES, INSERTS AND OPENINGS

- A. Provide sleeves for all piping systems, ducts, and vertical conduits through slabs. Set all sleeves, inserts, conduit, outlet, junction, and panel boxes in place ahead of new construction. Cooperate with other trades. Contractor shall correct all omitted or improperly located sleeves without additional compensation.
- B. Where drilling through floors and walls has been allowed, sleeves may be installed after drilling.
- C. Where sleeves have been omitted or improperly located, pay for cutting and patching as required to make corrections.

- D. Install all sleeves, inserts and anchor bolts ahead of the general construction work. Make sleeves in floors and partitions of galvanized steel with lock seam joints. Make sleeves of extra heavy castiron pipe or galvanized steel pipe in outside walls, bearing walls, foundations, and footings. Where sleeves are for insulated pipe, make sleeves of sufficient size to pass insulation. Where sleeves are for bare pipe, make sleeve two pipe sizes larger than pipe passing through. Terminate sleeves flush with walls, partitions, and ceilings. Terminate sleeves ½" above finished floors. Fill space between sleeve and pipe in below grade walls with "Link-Seal" type sleeve seal. In any mechanical room whose floor does not rest upon a slab on grade, sleeves shall extend to 4" above the finished floor.
- E. Use sheet metal sleeves for pipe 6" and larger. Use Schedule 40 steel pipe sleeves for pipe smaller than 6".
- F. Mechanical Contractor shall identify and plug all abandoned openings in an acceptable manner.

3.18 SLEEVE SIZES

- A. Insulated pipe shall pass through sleeves of sufficient size to pass both pipe and insulation. Generally, this will mean the interior of the sleeve shall be at least 2" larger than the exterior diameter of the pipe passing through it.
- B. Bare pipe shall pass through sleeves whose interior diameter will be that of a pipe two sizes larger than that of the pipe passing through it.

3.19 SLEEVE INSTALLATION

- A. Where drilling through floors and walls has been allowed, sleeves may be installed after drilling.
- B. Where sleeves have been omitted or improperly located, pay for cutting and patching as required to make corrections.

C. Install as follows:

- 1. Sleeves through walls, partitions and ceilings shall terminate flush with exterior surfaces.
- 2. In any mechanical room whose floor does not rest upon a slab on grade, sleeves shall extend to 2" above the finished floor.
- 3. Sleeves through finished floors shall be terminated ¼" above the finished floor.
- 4. Use sheet metal sleeves for pipe 6" and larger. Use Schedule 40 steel pipe sleeves for pipe smaller than 6".
- 5. Mechanical Contractor shall identify and plug all abandoned openings in an acceptable manner.
- 6. Refer to details on the Drawings.

3.20 VALVES

- A. Install valves where required for proper operation of piping system. Locate valves so as to be accessible.
- B. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward or horizontal plane unless approved by the Owner and Engineer.
- C. Select and install valves with ends to match piping system requirements.
- D. Select and install valves with renewable seats, except where otherwise indicated.
- E. Install swing check valves in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.
- F. Install drain valves on strainer blow off connection, and where indicated on Drawings.

3.21 VALVE SCHEDULE

Service	Size	Туре	
	Less than 2½"	'Lead Free' Bronze Body Two Piece Stainless Ball and Stem	
Domestic Water Isolating	2½"	'Lead Free' Bronze Body Three Piece Stainless Ball Valve and Stem	
	3" and Larger	Butterfly Valve, Epoxy Coated Ductile Iron, Full Lug, Aluminum Bronze Disc Certified 'Lead Free'	
Domestic Water Check Valve	neck Valve to 2" Class 125 'Lead Free' Silicone Bronze Body, Swing Check Valve		

3.22 PIPE SCHEDULE

Service	Pipe Size	Pipe	Fittings	Joints
Domestic Water, Above Grade	All Sizes	ASTM B88 Type 'L' Hard Copper	ASME B16.22 Wrought Copper	ASTM B32 Solder 95 Sn/5 Sb 95.5 Sn/4 Cu/0.5 Ag

Service	Pipe Size	Pipe	Fittings	Joints
	2" and Below (Contractor's Alternative)	ASTM B88 Type 'L' Hard Copper	ASME B16.22 Wrought Copper	ASME B16.22 Copper Pressure Seal EPDM Sealing Element
Sanitary Waste & Vent, Above Grade	All Sizes	ASTM A888, CISPI 301 Service Weight Cast Iron Hubless	ASTM A888, CISPI 301 Service Weight Cast Iron Hubless	ASTM C564 Elastomeric Serling Sleeve Stainless Steel Band
	4" and Below	ASTM B306 Type DWV	ASME B16.29 Wrought Copper, DWV	ASTM B32 Solder 95 Sn/5 Sb 95.5 Sn/4 Cu/0.5 Ag
Sanitary Waste & Vent Below Grade	All Sizes	ASTM D1784 Schedule 40 Solid Wall Pipe	DWV Fittings ASTM D2665	Solvent Joints ASTM D2564
Storm Piping	As shown on Drawings			

3.23 CONSTRUCTION AIDS

- A. Contractor shall supply and assemble, erect, and move into proper location all derricks, hoists, lifting apparatus and similar equipment necessary for the execution and installation of the work.
- B. Hoists, derricks, and other lifting apparatus shall be equipped with safety devices required by law and shall be maintained until no longer required. All such equipment shall be so placed as to not interfere with or damage the work or endanger the general public.
- C. The Contractor shall furnish, at his own cost and expense, all scaffolding, trestles, ladders and platforms and all other equipment required for the execution of the work under his contract.
- D. All trucks, pay-loaders, and other moving equipment shall be equipped with back-up alarm devices.
- E. All scaffolds shall be built in accord with the regulations of all State and Local Laws and Regulations.

3.24 EQUIPMENT CHECKOUT AND TESTING

- A. Notify Engineers when installation(s) is/are ready for testing, as specified with ample time in advance. Provide all metered and unmetered services, tools, equipment, and manpower necessary to perform tests.
- B. Perform all equipment testing as specified as recommended by manufacturer and directed by Engineers. Demonstrate that all operating and safety devices are in proper working order.
- C. Perform necessary operating and pressure testing for all piping and equipment which shall be buried underground, before backfilling; installed in or under slabs, before pouring; buried in building walls, before being buried and installed above furred ceilings before ceiling installation.

3.25 AS-BUILT DRAWINGS

- A. The Contractor shall be required to prepare and submit a set of Division 22 "As-Built" Drawings as the portions of work are completed and prior to application for final payment.
- B. The "As-Built" Drawings shall include a full set of the 'As-Bid' or 'Conformed' Contract Drawings for Division 22.
- C. The submitted Drawings shall be in the form of full size 'As-Bid' Drawings first plus additional drawings and attachments following. The Drawings shall be clean, original paper copies of the Contract Drawings, marked up in red pencil or pen with the Contractor's markups. For Floor Plans drawn at less than 1/4" scale, the field drawings shall be expanded to 1/4" scale to provide room for mark ups.
- D. The Contractor shall maintain a dedicated set of Construction Drawings at a protected location at the job site for the continuous documentation for these As-Builts. The Contractor shall record the actual installed locations of plumbing equipment, main domestic water and sanitary risers, vents thru roof, routing of pipe mains, main shut-off valves, and tie-in locations for all underground work. Record any and all variations from the original Construction Drawings in neat, legible, hand drawn lines and text. Attach copies of Contractor's field sketches and note where they pertain.
- E. Confirm that all information provided to the Contractor in the Form of Request for Information (RFI) responses, accepted Requests for Proposal (RFPs), Change Orders and Supplemental Instructions (SIs) are properly conveyed on the drawings. Show the actual changes made, do not just paste a copy of the RFI, RFP, ASI, CO unless that document includes a full scale drawing which accurately represents the work actually installed.
- F. Confirm that the room names and numbers shown on the As-Builts are the actual room numbers and names posted on the rooms at the time of turn over.

- G. For work which becomes concealed as part of the project, keep an accurate record, and show on "As-Built" Drawings the actual installed location of any concealed work such as underground services and piping. Provide location on Record Drawings for outside services by indicating actual dimensions from fixed reference points which will be available after completion of construction. "Tie" two (2) dimensions from different reference points to confirm locations of concealed work.
- H. For projects extending more than three months, provide the original "As-Built" to the Engineer as the work is completed on sections of the project and obtain a receipt from the Engineer. The Contractor shall be responsible for the safe keeping and maintenance of the "As-Built" Drawings throughout construction, and for maintenance of one (1) photocopy at the Contractor's office for a period of not less than three (3) years following final acceptance.
- I. Provide the original copies of the "As-Built" Drawings to the Architect or Engineer in accordance with the provisions of the General Conditions and Division 1. Unless reproducible "As-Built" Drawings are required under the General Condition and Division 1, provide the original paper copy of "As-Built" Drawings to the Engineer.

3.26 OPERATION AND MAINTENANCE INFORMATION

- A. Prepare copies of an Operation and Maintenance Manual and submit to the Engineer for approval. The number of copies of the Operation and Maintenance Manual shall be one (1) electronic and two (2) hard copies. A digital version of the O&M Manual may be submitted for review by the Engineer for approval prior to submitting the hard copies. Digital copy shall follow same format as described below.
- B. The original Operation and Maintenance Manual shall be bound in a 3-ring binder. The binder shall be a view binder with clear vinyl panels on cover and spine, as available at Office Max or other office supply stores. On the spine of the manual mark the project number, the name of the building, the name of the project, the words "O&M Manual" and the trade (plumbing, HVAC, electric, etc.), in letters ¼" to ½" high. On the cover provide similar information. It is the intent of this paragraph to require O&M Manuals to be identifiable while stored in a bookshelf. Stick-on labels are not acceptable. Contractor names on spine of binders are not acceptable.
- C. The first page of the O&M Manual shall be a cover sheet listing the Contractor, Contractor's address, contact person, telephone and fax number, and the same information for major subcontractors. Identify the name and contact person of the Engineer, Architect, and project manager.
- D. The second page of the O&M Manual shall be a typed guarantee from the Contractor with a one (1) year guarantee stated as commencing on the date of final acceptance. Identify this date.

- E. The third page of the O&M manual shall be an index sheet listing the type of equipment (e.g., "switchgear"). The vendor or distributor (e.g., "Elect Sales Co Inc."), the contact person (e.g., "John Smith") and the phone and fax number. This information shall be provided for each source of supply or subcontractor used on the contract.
- F. The remaining pages in the Manual shall include tabs for sections. Each section shall be a specification section of type of equipment installed under the contract. It shall include information on each replaceable part, valve, and appurtenance and on each item capable of requiring lubrication, maintenance, or adjustment.
- G. Each tab section shall include the following:
 - 1. Original approved Shop Drawing.
 - 2. Manufacturer's O&M information.
 - Parts list.
- H. The Operation and Maintenance information for each item shall include a copy of the accepted Shop Drawing, plus all manufacturer's printed installation, operation, and maintenance instructions. Photocopies of manufacturer's information are not acceptable. Only original manufacturer's catalog and O&M information is acceptable. Delete information not specific to this project and highlight by arrows the specific parts furnished under the project.
- I. In each manual, provide spare parts lists and directories for all equipment.
- J. In each manual provide a photocopy of all test reports, electrical, plumbing, or other inspections, fire system test reports and any other data test or certification data.
- K. Compilation of Shop Drawings only is not considered an adequate Operation and Maintenance Manual and will be returned to the Contractor for re-submission.
- L. The Contractor shall include a completed copy of the O&M Manual checklist which follows this section as the last page of the O&M Manual.
- M. The CD version of the O&M Manual shall be a legible scan of the O&M Manual in a resolution of at least 600 dpi for black and white pages and 400 dpi for color pages in an Adobe (.pdf) format. Portions of the manual which are clear and readable in black and white format shall be scanned in black and white format. Portions which are readable only in color shall be scanned in color. The preparer of the manual shall utilize the Adobe "Reduce File Size" option for compatibility of Adobe Version 7.0 and above to minimize electronic file size.

3.27 INSTRUCTION OF OWNER'S DESIGNATED REPRESENTATIVE

- A. After submission and acceptance of the Operating and Maintenance information and prior to final acceptance of the Project, provide a scheduled instruction period for the Owner's designated representative. Instruction period shall be sufficient to cover the contents of the Operating and Maintenance portfolio, a walk-through of the Project and a review of all systems.
- B. At the conclusion of the instruction period, provide approved copies of the accepted Operation and Maintenance Manual to the Owner's representative and obtain a signed receipt.

3.28 GUARANTEE

- A. Prior to application for final payment, the Contractor shall provide a written guarantee covering all portions of the work of this Division. The guarantee shall include all work and materials for a period of one (1) year from the date of final acceptance. The guarantee shall provide for the repair or replacement of any defective equipment, materials, products, or work at no cost to the Owner.
- B. Items or work which are repaired or replaced under this guarantee shall be covered under an extended guarantee by the Contractor so that the replaced products or work shall have performed satisfactorily without repair or replacement for a period of one (1) year.
- C. The failure of any manufacturer to provide a one (1) year warranty, or the failure of any manufacturer or vendor to honor a warranty shall not relieve the Contractor from his obligation to provide a complete parts and labor guarantee on all work provided under his Contract for a period of one (1) year.
- D. Supplemental Guarantees Supplemental Guarantees and extended warranties may be included under this Contract as part of specific specification sections.

3.29 GUARANTEE PERIOD

- A. During the guarantee periods, the Owner may respond to emergency situations. Emergency situations for the purposes of this section are those situations determined to be potentially harmful to the surrounding personnel, equipment, or environment. In cases where work is performed by the Owner's employees, the Contractor will be charged for all labor and material needed to complete emergency repairs, if the repairs are determined to be the result of faulty material or workmanship. The performance of these repairs by the Owner shall not void any Contractor guarantee.
- B. The act of the Owner in responding to any emergency situation shall not relieve the Contractor from the obligation of responding to the emergency and from correcting any problems as part of the original Project cost.

C. The Owner shall begin preventive maintenance programs immediately following final inspections. Preventive maintenance activities will not relieve Contractor from any equipment warranties.

O&M Manual Checklist		Date	
	(Include completed copy of this Ch	ecklist in O&M Manua	l when submitted)
Project		Trade	
Project Name			
Submitted as an electro	onic file per Section 01 78 23		YES / NO
Composite electronic P	DF file		YES / NO
Minimum readable text	size		YES / NO
Title page "Recognize T	ext" turned on for all scanned docur	nents	YES / NO
O&M Manual:			
Cover Sheet listing:			
Building Name			
O&M Manual Table of G Format Specification Se	Contents: Hyperlinked book-marked ection in manual YES / NO	information with links	to each CSI Master
O&M Manual Contact l	.ist:		
Contractor Contractor Name Contractor's Address Contact person Tel. & Fax #'s	Cc	ontractor Name contractor's Address contact person el. & Fax #'s	<u>or</u>
<u>Project Manager</u> Name			
<u>Engineer</u> Name Company Name Contact person	Co	r <u>chitect</u> ame ompany Name ontact person	

O&M Manual - Remaining Pages:	Checklist Page 2
O&M Manual Project Guarantee & Warranties:	
Typed guarantee from Contractor with 1 year guarantee star on the date of final acceptance by the University. Date of the University Dat	ted as commencing
Hyperlinks to any special warranties included in Equipment	
 Organized by CSI Specification Section number. Each CSI Specification Section included. Includes final submittal, updated to contain A/E rem Includes any special Contractor or manufacturer wa Includes the Installation, Operation and Maintenand manuals for each piece of equipment, up to date for version of equipment supplied. Includes IOM data for accessory data. Includes test reports for each piece of equipment. 	rranty. <u>YES / NO</u> ce (IOM)
Scan of spare parts list. Scan of all test reports (i.e., fire alarm). Scan of all inspections (i.e., plumbing, electrical). Scan of all certification data. Scan of facility lubrication chart. Scan of facility valve chart. Scan copy of complete temperature control and operating instructions. Completed copy of checklist last page of O&M Manual.	

END OF SECTION 22 05 00

SECTION 22 14 00 - INTERIOR STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Drawings and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections, apply to the work of this Section.
- B. The Work of Section 22 05 00 Plumbing Basic Materials and Methods applies to the Work of this Section.

1.2 WORK INCLUDED

A. Provide a complete, operating, tested, functioning, documented Storm Water Drainage System including all Work shown, specified, or required for proper system operation.

1.3 SUBMITTALS

- A. Submit the following storm drainage system components:
 - 1. Pipe and fittings.
 - 2. Roof drains.
 - 3. Couplings.
 - 4. Push-on gaskets, sealant.
 - 5. Pipe hangers.
 - 6. Pipe insulation.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. As scheduled.

2.2 COUPLINGS FOR NO-HUB PIPE

- A. Description: A heavy duty 24 gauge type 304 stainless steel shield and 3/8" slot head 304 stainless steel screws. All other component metal parts shall be 304 stainless steel. The coupling sealing gasket shall be made of Neoprene as the sole elastomer. A cast-iron coupling may be used. Do not use underground.
- B. Make: Charlotte heavy duty HD-1, or heavy duty "Husky" by Anaheim Co., Cast-iron Coupling by M.G.

2.3 ROOF & DECK DRAINS

A. As Scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Survey: <u>Before</u> beginning the installation of drainage piping, survey the route and check for interferences.

3.2 GENERAL PIPING INSTALLATION

- A. Install piping approximately as indicated, straight, plumb, and as directly as possible.
- B. Keep all piping as high as possible.
- C. Do not install piping across windows or doors.
- D. Install exposed risers as close to wall as possible (without cutting escutcheons).
- E. Concealed Piping:
 - 1. Conceal all piping in finished rooms unless otherwise noted.
 - 2. Install pipe in time for tests and/or approvals.
 - 3. Expose fixture branches only as much as is necessary for final connections.
 - 4. Install pipe in furred spaces so that minimum furring will be required.
- F. Provide drainage piping of sizes noted or as required for equipment requiring drains.
- G. Use proper adapters between dissimilar pipes. These shall be manufactured products designed for the purpose.
- H. Use full length of pipe wherever possible.
- I. Ream and file ends of pipe before installation to remove all burrs. Remove all metal chips and filings.
- J. Do not use bent pipe.
- K. Use only strap wrenches or other non-marring tool on chrome plated, brass or copper pipe and fittings. Replace marred pipe and fittings.
- L. Arrows shown on pipelines on Drawings indicate the direction of flow within the pipeline.

3.3 ROOF DRAIN INSTALLATION

- A. Units shall be installed in strict accordance with the manufacturer's written instructions. Install where indicated on the Plans.
- B. Unit installation shall be fully coordinated with others.

C. Be fully responsible for the water tightness of the installation.

3.4 NO-HUB PIPE INSTALLATION

A. Use heavy duty couplings as specified following manufacturer's recommended torquing in inchpounds.

3.5 PROTECTION

A. Protect all pipe and equipment openings during construction with temporary plugs, caps, or burlap.

3.6 TURNS AND OFFSETS

A. Turns:

- 1. From vertical to horizontal:
 - a. Less than 3": Use long sweep or extra-long turn elbow.
 - b. 3" and larger: Use short sweep or 90° short turn fittings.
- 2. From horizontal to vertical: Use guarter bends or 90° short turn fittings.
- 3. Horizontal piping: Use 45° wyes, long sweeps; 1/4, 1/6, 1/8, and 1/16 bends or any combination of same.
- 4. For vents in any direction; Use quarter bends or 90° short turn fittings.

B. Offsets:

- 1. Make offsets at no less than 45 angle to the horizontal in the following cases:
 - a. Offsets in stack vent portion of soil and waste stacks (above the highest fixture drainage connection).
 - b. Offset in vent stacks.

3.7 DRAIN AND SEWER GRADES

- A. Pitch storm drains down in the direction of flow without sags or pockets. Grade at 1/8" per foot minimum for lines 4" and larger, 1/4" per foot for lines 3" and smaller.
- B. Tolerance: Pipe deviating more than 1" in alignment grade or invert elevation must be replaced.
- C. Survey: <u>Before</u> beginning installation of drainage piping, survey the route and check for interferences, either from the other pipe lines or from the structure or work of other crafts.

3.8 INSPECTION AND TEST

A. New drainage piping shall be subjected to a static pressure test.

- 1. Block all openings below the highest roof terminal.
- 2. Fill system with water to highest roof terminal.
- 3. System shall be drop tight for period of two (2) hours.
- B. When test reveals that a line has faulty joints, joints that have leaked shall be remade and the system shall be retested. There shall be no drop in pressure for a minimum of four (4) hours.
- C. Prepare a report of test and required corrective action and submit to Engineer.

3.9 CLEANOUTS

- A. Cleanouts shall be installed as follows:
 - 1. At each bend exceeding an angle greater than 45°.
 - 2. At the bottom of stacks.
 - 3. At 50 foot intervals maximum in horizontal runs of piping 4" and smaller.
 - 4. At 100 foot intervals maximum in horizontal runs of piping 5" and larger.
 - 5. Where building drain leaves the building.
- B. Cleanouts shall be same size as pipe on which they are installed up to a maximum of 4".
- C. Cleanouts shall be installed so as to be accessible.

END OF SECTION 22 14 00

SECTION 22 84 00 - FIRESTOPPING & SMOKESTOPPING FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 7 Specifications apply to the work of this Section.

1.2 WORK INCLUDED

- A. Provide firestopping and smokestopping for Plumbing Systems to comply with the IBC 714.
- B. Provide submittals and installation detail sheets.

1.3 SUBMITTALS

- A. Provide a schedule of each type of penetration together with the proposed method of protecting that penetration type. Schedule shall include the following details:
 - 1. Penetrated item (e.g., wall, floor, roof).
 - 2. Construction of item (e.g., metal studwall with gypsum wallboard).
 - 3. Fire rating of item (e.g., 1 hour wall).
 - 4. Description of penetrating item (e.g., 1" to 3" Schedule 40 pipe).
 - 5. Identification of penetrating seal to be used in this case (e.g., Rectorseal biostop pipe collar).
 - 6. UL or FM detail sheet (e.g., per attached example).
 - 7. UL of FM system number (e.g., WL1200).
- B. Submittal shall include complete details for each penetration covered by this Division.
- C. It is intended that the submittal include each detail in full for each system used, so that it is clear that the installing Contractor has the correct reviewed information in the field.

1.4 QUALITY ASSURANCE

- A. Firestopping Materials: Provide penetration seal assemblies whose fire-resistance ratings have been determined by testing in the configurations required and which have fire-resistance ratings at least as high as that of the fire-rated assembly in which they are to be installed.
 - 1. Comply with all applicable codes including but not limited to:
 - a. American Society of Testing and Materials (ASTM).

- b. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials.
 - i. ASTM E 119 Method of Fire Tests of Building Construction Materials.
 - ii. ASTM E 814 Test Method for Fire Tests of Through Penetration Firestops.
 - iii. ASTM C 665 (Corrosion & Microbial Resistance Portions) Standard Specification for Mineral-Fiber Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - iv. ASTM E 90 Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- 2. Listed by Underwriters Laboratories (UL) and/or Factory Mutual Research Corporation for each specific intended application.
 - a. UL Building Materials Directory.
 - b. UL Fire Resistance Directory.
 - c. UL 2079 Test.

PART 2 - PRODUCTS

2.1 GENERAL

A. Firestopping and Smokestopping materials shall allow normal expansion and contraction (intumescent) of the penetrating item without failure of the penetrations seal and shall be heat absorbing (endothermic). Products may not emit hazardous, combustible, or irritating byproducts during installation or curing. Products shall not require special tools for installation.

2.2 MASONRY EXEMPTION

- A. The Contractor shall note IBC 714.3.1 Exemption, which states:
 - 1. **Exception:** Where the penetrating items are steel. ferrous or copper pipes, tubes or conduits, the annular space between the penetrating item and the fire-resistance-rated wall is permitted to be protected by either of the following measures:
 - a. In concrete or masonry walls where the penetrating item is a maximum 6-inch (152 mm) nominal diameter and the area of the opening through the wall does not exceed 144 square inches (0.0929 m2), concrete, grout or mortar is permitted where installed the full thickness of the wall or the thickness required to maintain the fire-resistance rating.

- b. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.
- B. Note that this exception may be used by the Contractor for cast iron sanitary and vent piping and for steel sleeves. Supply piping and copper drain and vent piping requires a sleeve in masonry and concrete walls and floors.

2.3 MANUFACTURERS

- A. Manufacturers: Provide products complying with requirements of the contract documents and made by one (1) of the following:
 - 1. Rectorseal.
 - 2. Hilti, Inc.
 - 3. 3M Fire Protection Products.
 - 4. Specified Technologies Inc.
 - 5. U.S. Gypsum Company.
 - 6. Johns Manville.
 - 7. BlazeMaster.

2.4 FIRESTOPPING PRODUCTS

- A. Provide firestopping products which:
 - 1. Provide firestopping systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain fire resistance rating of assembly.
 - a. F-rated systems in accordance with ASTM 814.
 - b. T-rated systems in accordance with ASTM 814.
- B. Firestopping Flame Spread Performance Requirements:
 - 1. Provide products with flame-spread ratings of less than 25 and smoke-development rating of less than 50 as determined in accordance with ASTM E 84.
- C. Firestopping UL Performance Requirements:

- 1. Provide products with UL ratings specified for assembly indicated as determined in accordance with UL listing.
- D. FM approval in lieu of UL shall be accepted by the Owner.
- E. Where a specific firestopping product is identified on the drawings, either that product or a similar product which has been tested in the exact application shown on the Drawings shall be employed, after review by the Engineer.
- F. Firestop caulk shall be Johns Manville Firetemp Cl, Rectorseal Biostop 500+, or approved equal, except where otherwise shown on the Drawings.

2.5 SMOKESTOPPING PRODUCTS

- A. Provide smokestopping products which:
 - 1. Allow normal expansion and contraction movement of the penetrating item without the failure of the penetration seal.
 - 2. Maintain at least the smoke resistance of the barrier penetrated.
 - 3. Firestop caulk shall be Johns Manville Firetemp Cl or approve equal.

PART 3 - EXECUTION

3.1 INSTALLATION AND QUALITY ASSURANCE

- A. Install firestopping materials in exact accordance with the manufacturer's instructions and conditions of the testing; provide all accessory materials required.
- B. Provide the services of a factory representative of the fire proofing product to review the installation practices and conduct training of the applications.
- C. Installer shall be trained to perform work.
- D. Inspection: The Authority Having Jurisdiction (A.H.J.) shall have final inspection review of all work performed. Contractor shall make modifications to completed and uncompleted work as directed by the A.H.J. at the Contractor's expense.
- E. Refer to the Certified Installation Instructions sheet on the following page for an example of an acceptable installation method.

3.2 FIRESTOPPING AND SMOKESTOPPING ITEMS

- A. Under Division 22, provide and pay for all firestopping materials, assemblies, and labor to provide complete firestopping and smokestopping.
- B. Provide firestopping of penetrations at each fire-rated floor, wall, or roof assembly of the following components:
 - 1. Insulated pipe provided by Division 22
 - 2. Uninsulated pipe provided by Division 22
 - 3. Other penetrations provided by Division 22

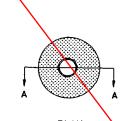
Attachment(s): Example Detail Sheet

END OF SECTION 22 84 00





500+GW-92 Wall Penetration 1, 2 Hr. Rating



1 layer of 5/8" **UL Classified** Gypsum Wallboard for 1 Hr. Rating or 2 layers of 5/8"

Max. 1" Corrugated Stainless Steel Tubing (PVC Coated)

for 2 Hr. Rating 1/2" depth Metacaulk® 1000 Steel Sleeve/ Mineral Wool Wire Mesh **Backing Material**

SECTION A-A

EXAMPLE

SYSTEM CONFIGURATION INFORMATION															
PRODUCT(S)		PENETRATING ITEM(S)		HOLE ANNULAR SPACING		ADDITIONAL INSTALLATION MATERIALS AND AIDS				ASTM E 814 RATING					
FILL MAT'L	MIN. THICK.	OTHER	TYPE	SIZE	INSULATION	MAX.	MIN.	MAX.	WIRE MESH	STEEL SLEEVE	OTHER	TYPE	DEPTH	Т	F
500+	1/2" both sides	none	PVC Coated Corruagated Stainless Steel Tubing	up to	none	3"	1/4"	1 1/2"	No. 8 steel wire mesh	min. 20 gauge	none	minimun 4.0 pcf mineral wool	1	0	2

INSTALLATION INSTRUCTIONS

These instructions are for the installation of through-penetration fire stop system 500+GW-92 in minimum 4 1/2 inch thick steel or wood stud fire rated gypsum wallboard partitions as listed by Underwriters Laboratories Inc. Refer to above drawings and System Configuration Information for component details.

Step Procedure

- 1 Cut hole in wall in required size to accommodate pipe penetrations and allowable annular spacing. Do not exceed maximum specified hole diameter.
- Install 1 inch PVC Coated Corrugated Stainless Steel Tubing. Support pipe rigidly on both sides of wall. 2
- Install specified wire mesh or minimum 20 gauge steel sleeve cut to size, formed to hole shape centered inside wall 3 around tubing and allowed to spring back snugly against periphery of hole.
- Install backing material by tightly packing annular space in between and around tubes with specified mineral wool 4 flush with wall. Recess mineral wool 1/2" on both sides of wall.
- 5 Apply a 1/2" depth of Biostop™ 500+ into annular space around tubing on both sides of wall. Tool surface to a smooth defect-free finish.

JOBNAME:

ARCHITECT:

CONTRACTOR:

CUSTOMER:

REPRESENTATIVE:

CUSTOMER ORDER NO:

REPRESENTATIVE ORDER NO:

RECTORSEAL

2601 SPENWICK HOUSTON, TEXAS 77055

REVISION NUMBER: 121499

SHEET NUMBER:

OF

SECTION 23 00 00 - HVAC GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general administrative and procedural requirements for Division 23, Heating, Ventilating and Air Conditioning Work.

1.2 DIVISION 23 - DESCRIPTION

- A. The technical specifications of this Contract are arranged for the convenience of the Owner and Contractor into Divisions of work. The work of Division 23, HVAC, is further described in Specification Sections of the 23 00 00 Series and on Contract Drawings of the 'M' Series.
- B. The organization of this work into Divisions shall not relieve the Prime Contractor from providing all of the work shown on the complete set of Drawings or specified in the complete set of Specifications, whether or not the individual subcontractors correctly identify their respective responsibilities.

1.3 OTHER DIVISION SPECIFICATIONS APPLICABLE TO THIS WORK

- A. The Work of Section 22 05 00 Plumbing Basic Materials and Methods applies to the Work of this Section.
- B. All General Construction work shall be performed in accordance with the provisions of the appropriate Division 1 through Division 19 Section. All electrical work shall be performed in accordance with appropriate Division 26 Sections.

1.4 WORK INCLUDED

- A. The work of this Division shall include providing all materials, labor, services, permits and related work to furnish a complete, operating, tested, functioning, documented HVAC System including all work shown, specified, or required for proper system operation including but not limited to the following:
- B. Provide Basic Materials and Methods. (Section 23 05 00)
- C. Provide inserts for any mechanical items to be supported from slab above. No drilling or fastening to the tunnel ceiling slab shall be allowed. Provide a submittal and layout drawing of proposed inserts.
- D. Provide Submittals.

- E. Provide Hangers & Supports for Mechanical Piping & Equipment. (Section 23 05 29)
- F. Provide HVAC insulation. (Section 23 07 00)
- G. Provide Hydronic Heating System and Equipment. (Section 23 21 13)
- H. Provide demolition and removal of existing ductwork and HVAC materials, and removal of all debris from site and proper disposal of same.
- I. Provide maintenance of system in good condition until final acceptance.
- J. Provide openings in existing and new construction as required for the work of this Division.
- K. Provide Owner's Operation Instruction.
- L. Provide Operation and Maintenance Manuals.
- M. Provide Warranty.
- N. Provide "As-Built" Drawings.
- O. General Seismic Criteria: Mechanical and Electrical systems are exempt from seismic bracing requirements in this building.

1.5 ALTERNATES

A. Provide a lump sum price for snowmelt system as shown on the Mechanical Drawings.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide products as specified in Division 23.

PART 3 - EXECUTION

3.1 SPECIAL CHARACTER OF THE WAR MEMORIAL

A. While this building is not currently listed on the National Registry of Historical Places, it is a building with significant historical significance and character. Many details and facets of the Memorial are irreplaceable. One of the primary intents of this project is to both preserve and restore the historical character and fabric of the Memorial.

B. To this end, it is of utmost concern that all work be performed with care. This includes protection of all existing surfaces and finishes including, but not limited to, all decorative stonework and engraved tablets, and protection of existing copper wall-mounted lanterns. Where shown, all electrical work at the main First Floor Memorial Level shall be concealed. Any exposed work requires explicit and specific permission of the Owner and/or Architect and Engineer.

3.2 INSTALLATION OF THE WORK

A. Conform to Division 23 Specifications for installation and execution of work.

END OF SECTION 23 00 00

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SECTION 23 05 00 - HVAC BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide Mechanical Basic Materials and Methods.
- B. Provide Access Doors.
- C. Provide Balancing Valves.
- D. Provide Dielectric Pipe Fittings/Unions.
- E. Provide Escutcheons.
- F. Provide Fire Wall Sealant.
- G. Provide Gaskets.
- H. Provide Gauges.
- I. Provide Gauge Shut off Valves.
- J. Provide Hangers, Riser Clamps, Attachments and Rods.
- K. Provide Hydronic Specialties.
- L. Provide Identification Systems.
- M. Provide Pipe, Fittings and Pipe Insulation.
- N. Provide Sleeves.
- O. Provide Strainers.
- P. Provide Valves.
- Q. Provide Piping Layout Coordination.
- R. Provide Equipment Foundations.
- S. Provide Miscellaneous Painting.

- T. Provide Equipment and Installation.
- U. Provide Noise and Vibration Free Installation.
- V. Provide Adjustment and Initial Lubrication.
- W. Provide Maintenance of systems in good condition until final acceptance.
- X. Provide Permits and Inspections.
- Y. Provide Submittals.
- Z. Provide Operation and Maintenance Manuals.

1.2 SUBMITTALS AND OPERATION & MAINTENANCE MANUAL/PARTS DATA

- A. Provide Submittals, O&M and Parts Data for the following:
 - 1. Access doors.
 - 2. Balancing valve.
 - 3. Dielectric pipe fitting/union.
 - 4. Escutcheons.
 - 5. Fire wall sealant.
 - 6. Gauges Media below 150°F.
 - 7. Gauges Media above 150°F.
 - 8. Gauge shutoff valves.
 - 9. Hangers, riser clamps, attachments, and rods.
 - 10. Floor supports.
 - 11. Wall hangers.
 - 12. Air vents.
 - 13. Flexible connectors.
 - 14. Equipment labels.
 - 15. Piping markers.
 - 16. Valve tags (provide sample).
 - 17. Insulation.
 - 18. Pipe and fittings.
 - 19. Solder.
 - 20. Pipe thread sealant.
 - 21. Sleeves.
 - 22. Strainers.
 - 23. Valves.

1.3 PERMITS AND INSPECTIONS

A. Division 23 shall be responsible to apply for, obtain and meet the requirements of all permits and inspections required by authorities having jurisdiction for the work of Division 23. Division 23 shall pay all fees associated with these permits and inspections.

1.4 LAWS AND REGULATIONS

A. Division 23 shall conform to all Federal, State, County, and Municipal Laws, Ordinances and Regulations. Comply with the Occupational Safety and Health Act (OSHA).

1.5 CONTRACTOR EXAMINATION OF THE SITE

A. It shall be the responsibility of each prospective Contractor to visit the project site and to examine existing conditions. The Contractor shall be responsible to include under this Division all effort, materials, supplies, temporary installations, and other work to relocate, remove or modify existing work as required to complete the work of this Division.

1.6 PLANS AND SPECIFICATIONS

- A. It shall be the responsibility of the Contractor to examine the complete project documents including Plans and Specifications thoroughly prior to bid and to notify the Architect/Engineer of any uncertainties or apparent omission, conflicts, or discrepancies between the Plans and Specifications. In any case of a conflict between the Plans and Specifications or between two Specification sections it shall be assumed that the larger capacity or quantity, or higher quality, shall govern until a determination can be made by the Architect/Engineer.
- B. Plans and Specifications are of abbreviated form. Omitted words or phrases shall be inferred.
- C. Plans and Specifications are complementary. Provide all work which is either shown or specified or both.
- D. Where provided on the Drawings, typical details shall be assumed to be applied to each installation of the equipment whether or not specifically identified at each point in the Plans.
- E. The Division 23 Contractor shall assume that all work on the Mechanical Drawings is included in his work unless specifically noted otherwise.

1.7 DEFINITIONS

Where used in the Plans and Specifications the following words and corresponding definitions shall apply:

- A. Provide Contractor shall supply, install, start-up, and maintain until final acceptance.
- B. Furnish Submit, receive approval, purchase, and turn over. Do not include the costs to install if furnish only is indicated. Include one (1) year guarantee on material furnished.
- C. New Work occurring as part of this Project, usually employed on a drawing to distinguish from existing work. All work shown on the Drawings shall be assumed to be new unless specifically identified as existing.
- D. Exist Existing work.
- E. Shown Shown on the Plans.
- F. Specified Specified on the Technical Specifications.
- G. HV The Contractor performing the Division 23 Heating and Ventilation work. In the Plans and Specifications, the words "By Div 23", "By HV" "By HVAC" or "By H&V" shall be considered synonymous.
- H. Elect or EC the Contractor performing the Division 26 work. In the Plans and Specifications, the words "By Div 26", "By EC" and "By Elect" shall be considered synonymous.
- I. Plumb, Plumbing or Plg The Contractor performing the Division 22 Plumbing work. In the Plans and Specifications, the words "By Div 22", "By Plumb" or "By Plumbing" or "By Plg" shall be considered synonymous.
- J. FP The Contractor performing the Division 21 Fire Protection. In the Plans and Specifications, the words "By Div 21" or "By FP" shall be considered synonymous.

1.8 RELATED WORK NOT INCLUDED

A. Electrical connections by Electrical Contractor which are specifically shown in their Contract are the work of Division 26. The Division 26 Contractor is responsible only for the electrical connections included under Division 26 and the Electrical Drawings. Division 23 Contractor shall provide all other electrical work necessary for satisfactory operation of equipment furnished under Division 23.

1.9 REGULATIONS GOVERNING ASBESTOS

A. The Owner has reported that he has investigated the project site for asbestos containing materials and has scheduled remediation activities if required. This does not guarantee that the site is 100% asbestos free.

B. If any material which appears to possibly contain asbestos is encountered, the Contractor shall notify the GC/Construction Manager and immediately take steps to suspend work in the area and isolate the area from the workers and the public.

PART 2 - PRODUCTS

2.1 ACCESS DOORS

A. Access doors shall be as specified by Architect and locations coordinated with GC.

2.2 BALANCING VALVE

- A. Description: Y pattern, globe style balance valve with handwheel positioning, and vernier or numeric position readout. 100% positive leakproof shutoff. Hidden memory stop.
- B. Threaded or soldered bronze body Sizes ½" 2".
- C. Sizing table: Provide valves sized according to the table below to provide a pressure drop of 2 ft wg in full open position:

GPM Flow	<u>Size</u>	<u>Connection</u>
0 - 4.1	1/2"	Sweat or Thread
4.1 - 6.0	3/4"	Sweat or Thread
6.1 - 8.2	1"	Sweat or Thread
8.3 - 20	11/4"	Sweat or Thread
20.1 - 29	1½"	Sweat or Thread
29.1 - 40	2"	Sweat or Thread

D. Manufacturer: Tour Anderson.

2.3 DIELECTRIC PIPE FITTINGS/UNIONS

- A. Construction: Fittings and unions to be rated at 250 psi at 180°F and be designed to meet the requirements of ANSI B16.39, including hydrostatic strength, tensile strength, and air pressure testing. All pipe threads to be in accordance with ANSI B2.1 and solder joints to meet national plumbing standards.
- B. Make: Watts No. 3001-3008 and 3110-3200, or equal by Epco, Eclipse.

2.4 ESCUTCHEONS

A. Cast Brass: Rough finish escutcheons shall be of cast brass construction, solid type with set screw. CS&B No. 13 or equal by Grinnell, Elcen.

B. Chrome Plated: Chrome plated escutcheons shall be of cast brass construction with polished chrome plated finish, split type with springs, CS&B Cadwell No. 40, or equal by Grinnell, Elcen.

2.5 GAUGES, MEDIA TEMPERATURE BELOW 150°F

- A. General: Provide pressure gauges of materials, capacities, and ranges indicated, designed, and constructed for use in media with temperatures below 150°F.
- B. Type: General use, 1% accuracy, ASME B40.1 grade A, phosphor bronze bourdon type, bottom connection.
- C. Case: Drawn steel or brass, glass lens. Unless otherwise shown on the plans, gauges shall be 4½" diameter.
- D. Connector: Brass with 1/4" male NPT.
- E. Scale: White coated aluminum, with permanently etched markings.
- F. Range: As specified on the Plans.
- G. Manufacturer: For temperatures up to 150°F Ashcroft Model 45-1279-A5-02L or equal by Weksler, Weiss, Trerice.

2.6 GAUGES, HIGH TEMPERATURE

- A. General: Provide pressure gauges of materials, capacities and ranges indicated, designed, and constructed for use in all media above 150°F.
- B. Type: General use, 1% accuracy, ASME B40.1 grade 1A, AISI 316 stainless steel bourdon type, bottom connection.
- C. Case: Stainless steel, 4½" diameter.
- D. Connector: Steel with ¼" male N.P.T. Provide protective syphon when used for steam service.
- E. Scale: White coated aluminum with permanently etched markings.
- F. Range: As specified on the Plans.
- G. Manufacturer: Ashcroft Model 1010 or equal by Weksler, Weiss, Trerice.

2.7 GAUGE SHUT-OFF VALVES

A. General: Provide pressure gauge shut-off valves between pressure gauges and tees on piping systems. Shut-off valve shall be a bronze body ball valve with chrome plated steel ball. Valve shall have ½" NPT ends.

2.8 HANGERS, RISER CLAMPS, ATTACHMENTS AND RODS

A. Hangers:

- 1. Regular: Adjustable clevis type, black steel construction, Carpenter and Paterson Fig. 100. Type 1, PHD Fig. 451, or equal by M-Co.
- 2. With Insulation Shield: Adjustable clevis type, black steel construction, galvanized steel saddle welded to lower strap, Carpenter and Paterson Fig. 100SH. Type 1 plus Type 40, PHD Fig. 170, or equal by M-Co.
- 3. Provide hot-dipped galvanized construction.

B. Riser Clamps:

- 1. Riser clamps shall be of steel construction, two-piece type, Carpenter and Paterson Fig 126. Type 42, PHD Fig 550, or equal by M-Co.
- 2. Provide hot-dipped galvanized construction.

C. Attachments:

- 1. C-Clamps: Clamps shall be of steel construction with locking nut Carpenter and Paterson Fig. 47 clamp. Type 23, PHD Fig 250, or equal by M-Co.
- 2. Provide hot-dipped galvanized construction.
- D. Beam Clamps: Beam clamp shall be of malleable iron construction, Carpenter and Paterson Fig. 15. Center Beam Type 21, or equal by M-Co, PHD.

E. Hanger Rod:

1. Hanger rod shall be steel, full threaded type, Carpenter and Paterson Fig. 94 or machine thread eye rod, Fig. 33, or equal by M-Co. Rods shall be hot-dipped galvanized or stainless steel construction.

2. Rods:

<u> Pipe Sizes</u>	Rod Diameter
Up to 2"	3/8"
2½" to 3"	1/2"
4" and 5"	5/8"
6"	3/4"
8" to 12"	7/8"

F. Floor Supports:

1. Threaded rod extended up from the floor shall not be used to hang piping and equipment.

G. Wall Hangers:

 Unistrut type wall brackets shall not be used. Provide prefabricated or shop fabricated angle iron wall brackets of sturdy design and hot-dipped galvanized. Submit shop drawing.

2.9 IDENTIFICATION SYSTEMS

A. Equipment Labels:

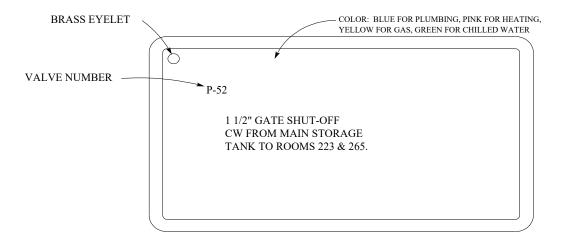
- 1. Small: Labels shall be adhesive backed plastic tape with embossed letters in contrasting color. Tape shall be 3%" wide.
- 2. Large: Labels shall be adhesive backed plastic tape with embossed letters in contrasting color. Tape shall be 3/4" wide.
- 3. Make: Seton Name Plate Company.

B. Piping Markers:

- 1. Pipe markers shall be adhesive type indicating pipe contents and sizes on a colored background conforming to American National Standards Institute (ANSI) Standard A13.1.
 - a. Hot water yellow with black lettering.
 - b. Cold water green with white lettering.
 - c. Steam yellow with black lettering.
 - d. Condensate yellow with black lettering.
- 2. Make: Seton Name Plate Company Setmark, or equal by Dover, Brady.

C. Valve Tags:

- 1. Tags: Tags shall be $1\frac{3}{4}$ " x $3\frac{1}{4}$ " laminated with two 0.020" thick plastic sheets with matte finish and with a brass eyelet in the corner. Typed information shall include appropriate alphanumeric code (prefixed with the letter "H" for heating etc.), system designation, the fluid in the pipe, and size and function of the valve.
- 2. Tags may be fabricated by Contractor or by any local sign or trophy shop. Also available at Dover Enterprises, Syracuse, NY, phone: (315) 446-1550 or approved equal by Seton Name Plate Company or others.



2.10 PIPE

- A. Copper Pipe:
 - 1. Type:
 - a. Type L, ASTM B 88.
 - b. Type ACR, ASTM B 280.
 - 2. Fittings: Wrought or cast solder type pressure fittings.
 - 3. Make: Anaconda or equal by Mueller, Revere.
 - 4. Unions:
 - a. Description: Cast brass with solder ends. Working pressure: 200 psi W.O.G.
 - b. Make: Nibco or equal by Mueller, Revere.
 - 5. Solder and Flux:
 - a. Solder shall be in solid wire form of Type II 95-5 tin antimony solder conforming to ASTM B-32, Grade 5A. Flux shall be zinc chloride or a mixture or zinc and ammonium chlorides. Solders containing lead shall not be used. 96.5 3.5 and 95-5 tin/silver solders may be used.

b. Makes: Silverbrite or equal.

6. Steel Pipe:

- a. Schedule 40 weight, seamless black finish, ASTM A-53.
 - i. 37½° beveled ends for welding.
 - ii. Threaded ends.
- b. Schedule 80 weight, seamless black finish, ASTM A-53.
- c. Electric Resistance Welded (ERW) pipe may be substituted only for hydronic heating and cooling systems.
- d. Schedule 40 weight, seamless, black finish, ASTM A-106 (high temperature) for steam lines above 50 psig.
- e. All steel pipe shall be of United States or Canadian manufacture and shall be stamped with the country of origin.

7. Fittings:

- a. Welded Fittings: factory forged, seamless construction, butt weld type, 37½° beveled ends. Where branch connections are two sizes or more smaller than main size, use of "Weldolets", "Threadolets" or "Sockolets" is acceptable, if welded per manufacturer's instruction. Mitered elbows, "shaped" nipples, and job fabricated reductions not acceptable unless specifically called for.
- b. All weld fittings are to be of North American manufacture and shall be marked with country of origin.

8. Miscellaneous Piping Material/Products:

- a. Welding Materials: except as otherwise indicated, provide welding materials to comply with installation requirements.
 - i. Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for Welding Materials.
- b. Gaskets for flanged joints: ANSI B16.20 raised-face for steel flanges, unless otherwise indicated.
- c. All gaskets to be made with non-asbestos material.
- d. Bolts: hex head machine bolts and nuts.
 - i. Condensate: Carbon Steel, ASTM A307-Grade B bolts, ASTM A 563-Grade nuts.

- ii. Steam, Hot Water, Chilled Water: Carbon alloy steel SAE 429-Grade 5
- Pipe Thread Sealant: Loctite 567 PST or Loctite 592 PST. e.

2.11 **SLEEVES**

- A. Sheet Metal Sleeves: 10 gauge, galvanized sheet metal, round tube closed with welded longitudinal joint.
- B. Steel Sleeves: Schedule 40 galvanized, welded steel pipe, ASTM A53, Grade A.
- C. Sleeves are to be tack welded in each quadrant and caulked.

2.12 **STRAINER**

A. Bronze strainer, Stainless steel mesh, Spirax/Sarco Model TBT, Keckley Style "E" or approved equal, with sweat tubing connections. Provide bronze strainer and plug.

2.13 **BALL VALVES**

A. For all water services, low pressure steam, low pressure condensate and all other normal noncorrosive services, ball valves shall be as follows:

1. Body: Bronze.

2. Body Style: Standard Port, Two-Piece.

3. Trim: 316 Stainless Steel Ball and Stem.

4. Reinforced Teflon (RTFE), 15% glass filled double seal. Seat:

5. Seat Working P/T Rating: 300psig @ 250°F Minimum. 6. Body Working P/T Rating: 300 psig @ 300°F Minimum.

7. WOG Rating: 300 psig Minimum. 8. Saturated Steam Rating: 150 psig Minimum. 9.

Lever Handle. Actuator:

10. Models approved by Cornell Facilities Engineering. Coordinate with Facilities Engineering if other models are preferred. Valve Type V-1, HVAC service:

70-140, 70-240. Apollo (Conbraco): a.

Nibco: b. T-580-70-66, S-580-70-66. Watts: B6000-SS, B6001-SS. C.

B. Hose end ball valve bronze ball valve with hose end thread, vacuum breaker and cap. Make: Apollo 78-200 series with dust cover and chain, with Watts 8A vacuum breaker.

C. Check Valves:

- 1. Bronze body, Class 125 swing check valve:
 - a. Stockham Model B-309 with solder ends.
 - b. Stockham Model B-319 with threaded ends.

2.14 NEW PRODUCTS, SINGLE MANUFACTURER

A. All equipment, materials and products furnished shall be new unless specifically shown to be reused. All materials shall be new and of the best quality of their respective kinds. The work when completed will be accepted in an undamaged and prefect condition only. Where equipment, materials and products are used for the same purpose, they shall be provided by the same manufacturer.

2.15 QUALITY ASSURANCE

A. All equipment, materials and products shall conform to the applicable ANSI, ASA, NFPA, UL, AGA and/or ARI standard. All electrical equipment shall be UL or ETL Listed.

2.16 WARRANTY

A. Provide one (1) year manufacturer's warranty on all equipment, materials, and products. Where shown or specified, provide manufacturer's extended warranty.

2.17 SUBSTITUTIONS FOR SPECIFIED EQUIPMENT, MATERIALS AND PRODUCTS

- A. Design Equipment The design of this Project is based upon the use of the specified equipment materials and products. The Plans are prepared on the basis of the arrangement, size, capacity, and characteristics of the design equipment.
- B. Specified Alternate Equipment In the event the Contractor elects to use equipment named as an alternate manufacturer herein, the Contractor shall verify that the equipment is of the same capacity, arrangement, size and characteristics as the design equipment and shall make all incidental changes in his work and coordinate and pay for any changes in work made necessary by deviations from the design capacity, arrangement, size and characteristics of the alternate manufacturer's equipment.
- C. Substitutions of Unspecified Equipment, Products and Materials Unspecified equipment, products and materials may be added to the List of Specified Alternate Equipment, Products and Materials at the request of any bidder by written application at least five (5) days prior to the bid date.

- D. Addition of an unspecified equipment product of material to the List of Alternate Manufacturers will occur at the determination of the Engineer if there is sufficient time to review the proposed substitution prior to bid date and to issue addenda to all Contractors. In no case will substitutions be approved to individual bidders. Substitution requests will not be acted upon within the last five (5) days prior to bid date.
- E. Addition of unspecified equipment, products and materials to the List of Alternate Manufacturers does not relieve the Contractor from his obligation described in subparagraph B to verify that the equipment is of the same arrangement, capacity, size, and characteristics and to pay for any modifications required in his and other Contractors' work made necessary by the use of this equipment.
- F. By submission of his bid for this Project, the Contractor acknowledges the authority and prerogative of the Engineer and Owner to evaluate proposed substitutions as to suitability for the Project and the Contractor agrees to abide by the Engineer's decision if unspecified equipment, products, and material are disallowed by the Engineer.

2.18 DELIVERY, STORAGE AND PROTECTION

- A. All materials shall be delivered to the site in their original, unopened labeled containers.
- B. All materials shall be stored in a clean, dry area as required by the Owner.
- C. All materials shall be properly protected from weather, damage, and theft. The contractor shall be responsible for the proper care and protection of all materials, equipment, etc., on site.

PART 3 - EXECUTION

3.1 QUALITY OF WORK

- A. All work shall be executed in accord with recognized standards of workmanship. All work shall be installed in a neat and orderly manner. If, in the judgment of the Engineer, the workmanship is not acceptable, the work in question is to be removed and reinstalled in a manner satisfactory to the Engineer.
- B. Furnish at site during construction, a competent and experienced foreman. He/she shall have complete charge of all field work of this Contract. He/she shall be authorized to act for the Contractor in his/her absence and to represent the Contractor with the Engineer or Owner. The Project foreman shall not be changed during the Project except for single day occurrences for personal needs. It is essential that the same foreman be provided for the duration of the Project to maintain continuity on the job site. The Owner shall view any departure from this requirement by the Contractor as an indication of the Contractor's unwillingness to meet the needs of the Owner.

- C. The project foreman shall be present at site whenever any Contractor or subcontractor employees are working at the site. In the event of absence by the project foreman, the Prime Contractor shall designate an Assistant Foreman and advise the Owner and Engineer of the designated individual's name. The Assistant Foreman shall have been working on the site for a minimum of five (5) working days prior to being designated acting foreman and shall be designated at least two (2) working days prior to becoming acting foreman.
- D. All personnel employed by or subcontracted by the Contractor shall at all times be suitably clothed and shall conduct themselves in a professional manner. Shirts shall be worn at all times. Any employee found to have been making gestures or harassing remarks to the staff, students or general public shall be disciplined by the Contractor and removed from the site.
- E. No radios or other portable sound equipment shall be played on the site.

3.2 SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

- A. The Contractor shall be solely responsible for compliance with all applicable safety and health regulations including, but not limited to, U.S. Department of Labor Safety and Health Regulations for Construction. Construction employees are required to comply with the most stringent rule or standard in the event of dual or concurrent State and Federal jurisdiction. Detailed information on this subject may be obtained from the Office of Information Services, Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C. 20210.
- B. No obstructions are to be placed on or around fire hydrants or fire department connections that could make them inaccessible or inoperative for firefighting purposes.
- C. All temporary construction sheds, trailers, and flammable liquid storage areas belonging to Contractors shall be so placed on the construction site to minimize any danger to Owner's property and the public. Construction trailers and sheds shall require the pre-approval of the Owner.
- D. Conduct of the work shall be such that pestilence does not occur. To prevent influx of rats, vermin and other pestilence, the Contractor shall retain an approved exterminating firm until such time that the danger of pestilence has passed as approved by the Engineer. Contractor shall remove all garbage and trash from the site daily.

3.3 FIRE SAFETY

A. Fire Watch: Provide a fire watch wherever welding, brazing, cutting, or other processes involving an open flame or potential for generating sparks is used. Fire watch shall consist of a person with a 10 pound carbon dioxide fire extinguisher. While on fire watch, the person so assigned shall have no other duties or assignments.

B. Fire Blanket: In addition to providing a fire watch, have available an approved fire blanket to cover any combustible materials in the immediate area.

3.4 INSPECTIONS

A. The Engineer or Owner may visit the site at intervals appropriate to the stage of construction according to the General Conditions. The periodic observation or inspection of the general project progress shall not be construed as supervision of actual construction, nor make the Engineer or Owner responsible for providing a safe place for performance of work by the Contractors or Contractor's employees or those of suppliers of Contractors or for access, visits, use, work, travel, or occupancy by any person.

3.5 MARKING OF SHOP DRAWINGS

- A. The Engineer shall return copies of the Shop Drawings marked as follows:
 - 1. "Reviewed for General Compliance Only No Exception Taken" Drawings bearing this comment have been found to be generally in conformance with the intent of the Plans and Specifications.
 - 2. "Reviewed for General Compliance Only Make Noted Corrections" Drawings bearing this comment have been found to be generally in conformance with the intent of the Plans and Specifications, with the exception of the noted items. A resubmittal to the Engineer is not required and it is understood the Contractor will make the noted corrections.
 - 3. "Reviewed for General Compliance Only Revise and Resubmit" Drawings bearing this comment have been found to contain a substantial departure from the Plans and Specifications. The Contractor must make a new corrected submittal.
 - 4. "Reviewed for General Compliance Only Rejected" Drawings bearing this comment depict materials, equipment or supplies which are not judged by the Engineer to meet the requirements of the Plans and Specifications. The Contractor shall provide a new submittal on alternative equipment.
 - 5. "Reviewed for General Compliance Only Not Reviewed; Returned" Submittals bearing this comment have not been reviewed and are returned to the Contractor.
 - 6. "Reviewed for General Compliance Only Additional Submittal Required" Submittals bearing this comment have been found to be generally in conformance with the intent of the Plans and Specifications; however, more information is required, and a resubmittal is required.

B. Samples:

 The Contractor shall, when required, submit to the Engineer for review, typical samples of materials, equipment, and products. The Samples shall be properly identified by tag and shall be submitted sufficiently in advance of the time when they are to be incorporated into the work so that rejection thereof will not cause delay.

3.6 MANUFACTURER'S DIRECTIONS

A. In the case where any manufactured article, material, or equipment is specified, then the Contractor must install, apply, connect, erect, use, clean and condition it is strict accord with the manufacturer's directions.

3.7 SLEEVES, INSERTS AND OPENINGS

A. Provide sleeves for all piping systems. Set all sleeves and inserts in place ahead of new construction. Cooperate with other trades. Contractor shall correct all omitted or improperly located sleeves without additional compensation.

3.8 SUPPORTS AND HANGERS

A. Supports: Investigate thoroughly, Plans and Shop Drawings related to work, to determine how equipment and piping are to be supported, mounted, or suspended. Provide extra steel, bolts, inserts, pipe stand brackets, or any other items required for proper support. Provide supporting accessories where required, whether or not shown on the drawings. Where directed, furnish drawings showing supports, etc., for approval.

3.9 NOISE AND VIBRATION

A. Install all equipment to be free of transmission of noise and vibration to occupied spaces. Arrange isolated equipment so that it does not contact members of the building structure, ceiling grids, piping, conduits, or ductwork.

3.10 OPERATION AND MAINTENANCE INFORMATION

- A. Prepare copies of an Operation and Maintenance Manual and submit to the Engineer for approval. The number of copies of the Operation and Maintenance Manual shall be one (1) electronic and two (2) hard copies. A digital version of the O&M Manual may be submitted for review by the Engineer for approval prior to submitting the hard copies. Digital copy shall follow same format as described below.
- B. The Operation and Maintenance Manual shall be bound in a 3-ring binder. The binder shall be a view binder with clear vinyl panels on cover and spine, as available at Office Max or other office supply stores. On the spine of the manual mark the project number, the name of the building, the name of the project, the words "O&M Manual" and the trade (plumbing, HVAC, electric, etc.), in letters ½" to ½" high. On the cover provide similar information. It is the intent of this paragraph to require O&M Manuals to be identifiable while stored in a bookshelf. Stick-on labels are not acceptable. Contractor names on spine of binders are not acceptable.

- C. The first page of the O&M Manual shall be a cover sheet listing the Contractor, Contractor's address, contact person, telephone and fax number and the same information for major subcontractors. Identify the name and contact person of the Engineer, Architect, and project manager.
- D. The second page of the O&M Manual shall be a typed guarantee from the contractor with a one (1) year guarantee stated as commencing on the date of final acceptance. Identify this date.
- E. The third page of the O&M manual shall be an index sheet listing the type of equipment (e.g., "switchgear"). The vendor or distributor (e.g., "Elect Sales Co Inc."), the contact person (e.g., "John Smith") and the phone and fax number. This information shall be provided for each source of supply or subcontractor used on the contract.
- F. The remaining pages in the Manual shall include tabs for sections. Each section shall be a specification section of type of equipment installed under the contract. It shall include information on each replaceable part, valve, and appurtenance and on each item capable of requiring lubrication, maintenance, or adjustment.
- G. Each tab section shall include the following:
 - 1. Original approved Shop Drawing.
 - 2. Manufacturer's O&M information.
 - 3. Parts list.
- H. The Operation and Maintenance information for each item shall include a copy of the accepted Shop Drawing, plus all manufacturer's printed installation, operation, and maintenance instructions. Photocopies of manufacturer's information are not acceptable. Only original manufacturers catalog and O&M information is acceptable. Delete information not specific to this project and highlight by arrows the specific parts furnished under the project.
- I. In each manual, provide spare parts lists and directories for all equipment.
- J. In each manual provide a photocopy of all test reports, electrical, plumbing, or other inspections, fire system test reports and any other data test or certification data.
- K. Compilation of Shop Drawings only is not considered an adequate Operation and Maintenance Manual and will be returned to the Contractor for re-submission.
- L. The Contractor shall include a completed copy of the O&M Manual checklist which follows this section as the last page of the O&M Manual.

3.11 INSTRUCTION OF OWNER'S DESIGNATED REPRESENTATIVE

- A. After submission and acceptance of the Operating and Maintenance information and prior to final acceptance of the Project, provide a scheduled instruction period for the Owner's designated representative. Instruction period shall be sufficient to cover the contents of the Operating and Maintenance portfolio, a walk-through of the Project and a review of all systems.
- B. At the conclusion of the instruction period, provide approved copies of the accepted Operation and Maintenance Manual to the Owner's representative and obtain a signed receipt.

3.12 GUARANTEE

- A. Prior to application for final payment, the Contractor shall provide a written guarantee covering all portions of the work of this Division. The guarantee shall include all work and materials for a period of one (1) year from the date of final acceptance. The guarantee shall provide for the repair or replacement of any defective equipment, materials, products, or work at no cost to the Owner.
- B. Items or work which are repaired or replaced under this guarantee shall be covered under an extended guarantee by the Contractor so that the replaced products or work shall have performed satisfactorily without repair or replacement for a period of one (1) year.
- C. The failure of any manufacturer to provide a one (1) year warranty, or the failure of any manufacturer or vendor to honor a warranty shall not relieve the Contractor from his obligation to provide a complete parts and labor guarantee on all work provided under his Contract for a period of one (1) year.
- D. Supplemental Guarantees Supplemental Guarantees and extended warranties may be included under this Contract as part of specific specification sections.

3.13 GUARANTEE PERIOD

- A. During the guarantee periods, the Owner may respond to emergency situations. Emergency situations for the purposes of this section are those situations determined to be potentially harmful to the surrounding personnel, equipment, or environment. In cases where work is performed by the Owner's employees, the Contractor will be charged for all labor and material needed to complete emergency repairs, if the repairs are determined to be the result of faulty material or workmanship. The performance of these repairs by the Owner shall not void any Contractor guarantee.
- B. The act of the Owner in responding to any emergency situation shall not relieve the Contractor from the obligation of responding to the emergency and from correcting any problems as part of the original Project cost.

C. The Owner shall begin preventive maintenance programs immediately following final inspections. Preventive maintenance activities will not relieve Contractor from any equipment warranties.

3.14 AS-BUILT DRAWINGS

- A. The Contractor shall be required to prepare and submit a set of Division 23 "As-Built" Drawings as the portions of work are completed and prior to application for final payment.
- B. The "As-Built" Drawings shall include a full set of the 'As-Bid' or 'Conformed' Contract Drawings for Division 23 and include Contractor's signed stamp on each drawing.
- C. The submitted Drawings shall be in the form of full size As-Bid or approved fire protection shop drawings first plus additional drawings and attachments following. The Drawings shall be clean, original paper copies of the Contract Drawings, marked up in red pencil or pen with the Contractor's markups. For Floor Plans drawn at less than 1/4" scale, the field drawings shall be expanded to 1/4" scale to provide room for mark ups.
- D. The Contractor shall maintain a dedicated set of Construction Drawings at a protected location at the job site for the continuous documentation for these As-Builts. The Contractor shall record the actual installed locations of equipment, ductwork, diffusers/grilles, piping, valves, etc. Record any and all variations from the original Construction Drawings or approved fire protection shop drawings in neat, legible, hand drawn lines and text. Attach copies of Contractor's field sketches and note where they pertain.
- E. Confirm that all information provided to the Contractor in the Form of Request for Information (RFI) responses, accepted Requests for Proposal (RFPs), Change Orders and Supplemental Instructions (SIs) are properly conveyed on the Drawings. Show the actual changes made, do not just paste a copy of the RFI, RFP, ASI, or CO unless that document includes a full scale drawing which accurately represents the work actually installed.
- F. Confirm that the room names and numbers shown on the As-Builts are the actual room numbers and names posted on the rooms at the time of turn over.
- G. Confirm that mechanical equipment schedules accurately depict any changes made during construction.
- H. For work which becomes concealed as part of the project, keep an accurate record, and show on "As-Built" Drawings the actual installed location of any concealed work such as underground services, piping, and ductwork, etc. Provide location on Record Drawings for outside services by indicating actual dimensions from fixed reference points which will be available after completion of construction. "Tie" two (2) dimensions from different reference points to confirm locations of concealed work.

- I. For projects extending more than three (3) months, provide the original "As-Built" to the Engineer as the work is completed on sections of the project and obtain a receipt from the Engineer. The Contractor shall be responsible for the safe keeping and maintenance of the "As-Built" Drawings throughout construction, and for maintenance of one (1) photocopy at the Contractor's office for a period of not less than three (3) years following final acceptance.
- J. Provide the original copies of the "As-Built" Drawings to the Architect or Engineer in accordance with the provisions of the General Conditions and Division 1. Unless reproducible "As-Built" Drawings are required under the General Condition and Division 1, provide the original paper copy of "As-Built" Drawings to the Engineer.

3.15 EXAMINATION OF ACTUAL CONDITIONS

- A. Before ordering any material or doing any work, the Contractor shall verify all measurements at the site and shall be responsible for the contingencies which may be encountered. No extra compensation will be allowed on account of a difference between actual dimensions and measurements at the site and those indicated on the drawings. Any difference which may be found shall be submitted to the Engineer for consideration before proceeding with the work.
- B. Contractor shall work accurately to benchmarks and to proper elevations and dimensions established by the Contractor. Contractor shall check conditions and details of the work in relation to the progress of the work.
- C. The Contractor shall lay out the work, establishing heights and grades for all piping work included in these specifications in strict accordance with the intent of the drawings, the physical conditions of the Project and the finished site grades. He shall be responsible for the accuracy of the work and that the work meets all physical conditions of the Project and the requirements of these specifications.
- D. Prefabrication of piping, conduit, etc. may be performed only at the risk of the Contractor. Changes to prefabricated piping required by actual site conditions shall be made by the Contractor without extra compensation from the Owner.
- E. Due to the scale of drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. which may be required. Make all such changes in piping, location of equipment, etc., to accommodate work to obstacles encountered, at no increase in compensation. If requested, submit at least five (5) copies of drawings detailing all major deviations or changes. All changes must be approved before installing.
- F. Plans show general arrangement of piping and connections. Install work substantially as indicated. Verify exact locations and elevations on job.
- G. Thoroughly coordinate work with that of other Contractors.

- H. Should either Engineer's details, field conditions, a change in equipment or Shop Drawing information necessitate an important rearrangement, report same to Engineers and obtain approval before proceeding.
- I. No compensation shall be awarded for extra work because above precautions have not been followed. In event of conflicts, Engineer's decision is final. Contractor shall be fully responsible for unauthorized changes.

3.16 BARRIERS

- A. The Contractor shall furnish, erect, and maintain barricades, fences, railings, enclosures, guard lights, danger signals, warnings, cribbing, shoring and other such precautions necessary to protect all installations and structures in the area of the work, to ensure the safety of the public and to avoid damage or injury to any and all persons and property. Warning lights shall be of blinker type, battery or electrically operated.
 - 1. The Contractor shall be solely and without exception, responsible for safety on the project site.
 - 2. All barricade and security measures shall be implemented before work starts.

3.17 PROTECTION

- A. The Contractor shall provide adequate protection to the work, his workmen, the General Public, and private property.
- B. The Contractor shall use all means and precautions necessary to ensure on-site safety during construction. All OSHA construction requirements covering a project of this type shall be required of the Contractor.
- C. All fencing and security measures must be implemented before work starts.
- D. The Contractor shall use all means and precautions to ensure the safety of the occupants of the buildings during construction. Occupied portions of the buildings shall have a minimum of two exits available at all times.

3.18 LAYING OUT WORK

- A. The Plans are in part diagrammatic. Contractor shall verify rough-in dimensions with fixture Shop Drawings and with the Architectural Plans. Conform to dimensions shown on the Plans in preference to scaling from the mechanical drawings. Provide all fittings and appurtenances required for proper system operation.
- B. Contractor shall allow for thickness of finishes when roughing in his work. He shall not rough without obtaining accepted shop drawings for the actual equipment to be installed.

- C. Due to the scale of drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc., which may be required. Make all such changes in piping, ductwork, conduit system, location of equipment, etc., to accommodate work to obstacles encountered, at no increase in compensation. If requested, submit at least five (5) copies of drawings detailing all major deviations or changes. All changes must be approved before installing.
- D. Plans show general arrangement of piping and connections. Install work substantially as indicated. Verify exact locations and elevations on job. Before installing work, consult other Plans, details, and Contractors to determine headroom and work interferences. Examine Architectural Plans for exact location of equipment, fixtures, and outlets. Where not definitely located, obtain information from Architect.
- E. Thoroughly coordinate work with that of other Contractors. Raise piping and drip where necessary. Vent all air pockets in water piping, even though not so indicated. Determine exact route and/or location of each pipe before fabrication and installation. Furnish in writing to Architect, any information necessary to permit work of other trades to be installed properly and without delay. Maintain maximum head room. If work cannot be installed at least 7'-0" above the floor (in mechanical spaces or basement and higher in finished spaces dependent on ceiling height), consult with the Engineers and obtain approval before proceeding. If directed by Architect or Engineers, prepare composite drawings and sections (scale not less than ½" = 1"), clearly showing installation of work in relation to work of other trades.
- F. Should Architect's details, field conditions, change in equipment or Shop Drawing information necessitate an important rearrangement, report same to Engineers and obtain approval before proceeding.
- G. Install piping, etc. to avoid interferences with removal of coils, filters, belt guards or any operating part of all systems, or operation of overhead or swinging doors. Maintain easy and safe access to valves, controllers, motor starters, and other equipment requiring frequent operation. Maintain opening of access doors, switch boxes, motor starters, panel boards, etc. Maintain a clear walking space.
- H. No compensation awarded for extra work because above precautions have not been followed. In event of conflicts, Engineer's decision is final. Contractor is fully responsible for unauthorized change.

3.19 MISCELLANEOUS PAINTING

A. Paint all hangers and exposed or unpainted or ungalvanized iron work in the HVAC Systems with two (2) brush coats of black rust preventative paint.

3.20 EQUIPMENT INSTALLATION

- A. It is required of each equipment manufacturer, through the Contractor, to carefully check Plans and Specifications as some affect their particular equipment. Report to Engineers, any discrepancies or contradictions as applied to their particular equipment which prevents proper functioning, servicing, etc., before or at the time when shop drawings are submitted. Furnish manufacturer's printed installation instructions for each piece of equipment. Thoroughly instruct Contractors' personnel on job, exactly how their equipment shall be installed, connected, lubricated, started up, operated, etc., so that all factory instructions are rigidly followed.
- B. Install, test, start and operate all equipment only as instructed by manufacturer and in presence of manufacturer's representative, as directed. Follow instructions of manufacturer as noted above. Provide mock-up installation of certain typical equipment, if required, such as fixtures, chair carriers, countersinks, etc., as directed and obtain Architect's and Engineer's approval before proceeding with actual installation of same.
- C. Contractor shall provide as recommended by manufacturer all necessary incidental valves, fittings, piping, wiring, etc., not supplied by manufacturer or other Contractors, for proper apparatus operation. Contractor shall provide accurate information to other Contractors for required services to equipment, such as water supply and waste connections, masonry openings, wiring requirements, etc. Such information shall be complete and correct for each particular job.
- D. If required by Engineers, Contractor shall submit satisfactory evidence that equipment, systems, etc., have been installed strictly in accordance with manufacturer's recommendations, have been properly aligned, are properly adjusted, have been properly tested, lubricated, balanced, etc.
- E. As soon as installed, lubricate, and leave in good working order, all motors, bearings, etc., in accordance with manufacturer's instructions.
- F. Lubrication Chart Provide 8½" x 11" lubrication chart, typed in capital letters, mounted in wood frame under clear plastic. Hang where directed. HVAC Contractor shall provide chart listing all motors. Other Contractors supply information on motors furnished by them.
- G. List following information:
 - 1. Name and location of equipment.
 - 2. Type of lubrication recommended by manufacturer.
 - 3. Lubrication period recommended by manufacturer.

3.21 EQUIPMENT CHECKOUT AND TESTING

A. Notify Engineers when installation(s) is/are ready for testing, as specified with ample time in advance. Provide all metered and unmetered services, tools, equipment, and manpower necessary to perform tests.

- B. Perform all equipment testing as specified as recommended by manufacturer and directed by Engineers. Demonstrate that all operating and safety devices are in proper working order.
- C. Perform necessary operating and pressure testing for all piping and equipment which shall be buried underground, before backfilling; installed in or under slabs, before pouring; buried in building walls, before being buried and installed above furred ceilings before ceiling installation.

3.22 ACCESS DOORS

A. Provide where indicated and where required for access to all equipment.

3.23 ESCUTCHEONS

- A. Every un-insulated pipe penetrating a wall, ceiling or floor surface exposed to view shall be provided with an escutcheon.
- B. Units in unfinished spaces (boiler rooms, etc.) shall be of the rough finish type.
- C. Units in finished spaces shall be of the chrome plated type.
- D. Units shall be of sufficient diameter to cover sleeves and where used with extended sleeves shall be of sufficient depth to fit over the sleeve and reach the finish surface snugly.

3.24 GAUGES

- A. General: All units shall be positioned for easy viewing.
- B. Gauges:
 - 1. Pressure gauges shall be located not less than 5 pipe diameters downstream from any fittings or valves.
 - 2. All pressure gauges shall be provided with gauge cocks.
 - 3. Pressure gauges measuring mediums subject to rapidly changing pressures shall be provided with dampening devices.
- C. Unless specifically detailed otherwise, all equipment shall be installed in strict accordance with the manufacturer's written installation instructions.

3.25 HANGERS AND SUPPORTS

A. All components shall be selected for a minimum safety factor of 5.

- B. Units shall be capable of supporting pipe under all operating conditions and shall allow free expansion and contraction of piping.
- C. All rigid hanger assemblies shall provide for vertical movement after installation by means of threaded adjustment.
- D. Piping systems subject to shock loads shall be supported by unit's incorporation shock-absorbing devices of approved design.
- E. Hanger rods shall be subjected to tensile loads only. Where axial or lateral movement is anticipated, suitable linkages shall be provided.
- F. Units shall be designed and installed so that pipe movement will not cause them to become disengaged.
- G. Units shall be spaced to permit drainage and so that there will be limited sag between hangers. Spacing shall also be such as will prevent excessive bending stresses from concentrated loads between supports.
- H. Units in contact with copper pipe shall be copper clad.
- I. Support units from the building structural system, NOT from metal roof decks.
- J. Units supporting insulated pipe carrying liquids or gasses at temperatures ABOVE OR BELOW AMBIENT shall be furnished with pipe covering protection saddles sized in accordance with the associated pipe and the specified insulation thickness. See 2.4B.
- K. Insulation shields shall be galvanized steel, formed to fit the adjoining insulation, extending through a 180° arc and shall conform to the following table:

PIPE SIZE	GAUGE	LENGTH
½" to 2½"	18	8″

- L. Welded attachments shall be of materials comparable to the pipe.
- M. All units, including pipe attachments, structural attachments, hanger rods, bracing, all necessary accessories and their installation shall be in accordance with NFPA 13 Installation of Sprinkler Systems, latest issue.
- N. Maximum horizontal support intervals shall be as follows:
 - 1. Steel pipe 1¹/₄" and smaller: 8'-0".
 - 2. Steel pipe $1\frac{1}{2}$ " and larger: 10'-0".

- 3. Copper tubing $1\frac{1}{2}$ " and smaller: 5'-0".
- 4. Copper tubing 2": 8'-0".
- 5. Cast-iron pipe, support at each bell, 5'-0".
- 6. No-hub c.i. pipe: At each joint for 3" pipe at each side of each joint for 4" and over pipe.

3.26 IDENTIFICATION SYSTEMS (General Installation Requirements)

A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, and install identification after completion of covering and painting.

B. Equipment:

- 1. General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:
 - a. Meters, gauges, thermometers, and similar units.
 - b. Fuel-burning units including water heaters.
 - c. Pumps and similar motor-driven units.
 - d. Storage tanks and pressure vessels.
 - e. Strainers, filters, humidifiers, water treatment systems and similar equipment.
- 2. Lettering Size: Minimum ¼" high lettering for name of unit, where viewing distance is less than 2'-0", ½" high for distances up to 6'-0", and proportionately larger lettering for greater distances. Provide secondary lettering ½" to ¾" of size of principal lettering.
- 3. Test of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Piping:

- 1. After piping has been painted or insulated, apply pipe labels as specified above.
- 2. Space labels on 15' centers in mechanical rooms. Space at 25' centers elsewhere, and at each side of partitions and interior walls. Also, at each branch and riser take off and adjacent to each valve (except at fixtures and equipment).

D. Valves Identification:

- General: Provide valve tag on every valve, cock, and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience hose bibs, and shut-off valves at plumbing fixtures, and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.
- 2. Provide a valve tag chart, framed, and securely fastened to the wall, using anchors and fasteners, where directed by the Owner.
- 3. Submit list of valve tags, including wording, for approval BEFORE ordering.

3.27 PIPE SCHEDULE

Service	Size	Pipe	Fittings	Joints
Hydronic Heating, Chilled	3" and smaller	Type "L" Copper	Wrought Copper Pressure Fitting	95/5 No-Lead Solder
Water Cooling	4" and larger	Schedule 40 Steel	Butt-Welded	Welded

3.28 SEALING SLEEVES

- A. All openings in floors and all openings in full height walls shall be firestopped in a manner equal to or superior to the surrounding construction.
- B. All penetrations in fire rated walls or floor assemblies shall be fitted with 3M brand fire barrier penetration sealing systems 7902/7904, CP-25 caulk or 303 putty and installed in accordance with instructions provided.

3.29 SLEEVE INSTALLATION

- A. Where drilling through floors and walls has been allowed, sleeves may be installed after drilling.
- B. Where sleeves have been omitted or improperly located, pay for cutting and patching as required to make corrections.

C. Install as follows:

- 1. Sleeves through walls, partitions and ceilings shall terminate flush with exterior surfaces.
- 2. In any Mechanical Room whose floor does not rest upon a slab on grade, sleeves shall extend to 4" above the finished floor.
- 3. Sleeves through finished floors shall be terminated 1/4" above the finished floor.
- 4. Use sheet metal sleeves for pipe 6" and larger. Use Schedule 40 steel pipe sleeves for pipe smaller than 6".

5. Mechanical Contractor shall identify and plug all abandoned openings in an acceptable

3.30 SLEEVE SIZES

- A. Insulated pipe shall pass through sleeves of sufficient size to pass both pipe and insulation. Generally, this will mean the interior of the sleeve shall be at least 2" larger than the exterior diameter of the pipe passing through it.
- B. Bare pipe shall pass through sleeves whose interior diameter will be that of a pipe two sizes larger than that of the pipe passing through it.

3.31 STRAINERS

A. Install Y-type strainers full size of pipeline shown on the drawings, in accordance with manufacturer's installation instructions. Install pipe nipple, cap and shutoff valve in strainer blow-down connection, full size of connection. Locate strainer in pipe ahead of steam trap serving steam main drips and ahead of all control valves.

3.32 VALVES

- A. Install valves where required for proper operation of piping system. Locate valves so as to be accessible.
- B. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward or horizontal plane unless approved by the Owner and Engineer.
- C. Select and install valves with ends to match piping system requirements.
- D. Select and install valves with renewable seats, except where otherwise indicated.
- E. Install swing check valves in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.
- F. Install drain valves on strainer blow off connection where indicated on Drawings.

3.33 VALVE SCHEDULE

Service	Size	Туре	
	⅓" thru 2½"	Conventional Port	Two Piece Bronze Body with 316 Stainless Steel Ball and Stem
Hydronic Heating, Chilled Water and Glycol Piping	3" and Larger	Butterfly Valve	
	Indoors at Heating/Cooling Terminal Units	Single Piece, Stainless Ball, Union End	
	Drain & Air Bleed Valves	Hose End Ball Valve	

O&M Manual Checklist	, •	Date_	
	(Include completed copy of this	s Checklist in O&M Man	ual when submitted)
Project		Trade	
•			
Project Name			
•			
Submitted as an electro	onic file per Section 01 78 23		YES / NO
Composite electronic P	DF file		YES / NO
Minimum readable text	t size		YES / NO
Title page "Recognize 1	Γext" turned on for all scanned do	ocuments	YES / NO
<u>O&M Manual:</u>			
Cover Sheet listing:			
D '11' N			
Building Name			
ORM Manual Table of	Contents: Hyperlinked book may	ikad information with lin	ks to oach CSI Mastor
Format Specification Se	Contents: Hyperlinked book-mar		ks to each CSI Master
Format Specification Se	ection in manual YES / N	<u>10</u>	
O&M Manual Contact	l ict·		
Octivi Mariaar Cornact			
<u>Contractor</u>		Each Major Subcontrac	ctor
Contractor Name		Contractor Name	
Contractor's Address		Contractor's Address	
Contact person		Contact person	
Tel. & Fax #'s		Tel. & Fax #'s	
Ton octun		ren er an v	
<u>Project Manager</u>			
Name			
<u>Engineer</u>		<u>Architect</u>	
Name		Name	
Company Name		Company Name	
Contact person		Contact person	

O&M Manual - Remaining Pages:			Checklist Page 2
<u>0&M N</u>	Manual Project Guarantee & Warranties:		
	guarantee from Contractor with 1 year guarantee date of final acceptance by the University.	e stated as commencing <u>Date must be identified</u>	
OII tile	date of final acceptance by the offiversity.	Date must be identified	
Hyperli	nks to any special warranties included in Equipm	ent Specifications	YES / NO
1.	Organized by CSI Specification Section number.		YES / NO
2.	Each CSI Specification Section included.		YES / NO
3.	Includes final submittal, updated to contain A/E	remarks.	YES / NO
4.	Includes any special Contractor or manufactures	•	YES / NO
5.	Includes the Installation, Operation and Mainte		
	manuals for each piece of equipment, up to dat	e for the	
	version of equipment supplied.		YES / NO
6.	Includes IOM data for accessory data.		YES / NO
7.	Includes test reports for each piece of equipment	nt.	YES / NO
Scan of	f spare parts list.		
Scan of	f all test reports (i.e., fire alarm).		
Scan of	fall inspections (i.e., plumbing, electrical).		
Scan of	fall certification data.		
Scan of	facility lubrication chart.		
Scan of	f facility valve chart.		
Scan co	opy of complete temperature control and operatitions.	ng 	
Comple	eted copy of checklist last page of O&M Manual.		

END OF SECTION 23 05 00

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SECTION 23 05 29 - HANGERS & SUPPORTS FOR MECHANICAL PIPING & EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections, apply to the work of this Section.

1.2 WORK INCLUDED

- A. This section shall describe the hangers and supports for the mechanical piping and equipment.
- B. For this project, all hangers and supports shall be hot-dipped galvanized or stainless steel construction.
- C. See Specification 23 00 00, Part 1.4B. Hangers shall not be drilled in or attached to slab above unless inserts are installed pre-pour.

PART 2 - PRODUCTS

2.1 HANGERS, RISER CLAMPS, ATTACHMENTS AND RODS

A. Hangers:

- 1. Regular: Adjustable clevis type, black steel construction, Carpenter and Paterson Fig. 100. Type 1, PHD Fig. 451, or equal by M-Co.
- 2. With Insulation Shield: Adjustable clevis type, black steel construction, galvanized steel saddle welded to lower strap, Carpenter and Paterson Fig. 100SH. Type 1 plus Type 40, PHD Fig. 170, or equal by M-Co.

B. Roller Type Supports:

- 1. Roller type support hangers shall be used for all piping subjected to axial movement (i.e., steam and condensate). These supports shall be braced so that movement occurs in roller rather than support rods. Pipe saddles shall be provided for all roller type supports.
- 2. Pipe Covering Protection Saddles shall be steel construction and thickness shall match insulation thickness. Carpenter & Paterson or equal.
- 3. Roller type support hangers shall be steel hangers with cast-iron rollers as manufactured by Carpenter & Paterson or equal.

C. Riser Clamps:

1. Riser clamps shall be of steel construction, two-piece type, Carpenter and Paterson Fig 126. Type 42, PHD Fig 550, or equal by M-Co.

D. Attachments:

- 1. C-Clamps: Clamps shall be of steel construction with locking nut, Carpenter and Paterson Fig. 47 clamp. Type 23, PHD Fig 250, or equal by M-Co.
- 2. Beam Clamps: Beam clamp shall be of malleable iron construction, Carpenter and Paterson Fig. 15. Center Beam Type 21, or equal by M-Co, PHD.

E. Hanger Rod:

1. Hanger rod shall be steel, full threaded type, Carpenter and Paterson Fig. 94 or machine thread eye rod, Fig. 33, or equal by M-Co.

2. Rods:

<u>Pipe Sizes</u>	Rod Diameter
Up to 1"	1/4"
1½" to 3"	3/8"
4" to 6"	1/2"
8"	5/8"
8" to 12"	⁷ /8"
10"	3/4"
12"	⁷ /8"
14"	1"
16"	11/8"
18"	11/4"
20"	1½"
24"	13/4"

F. Floor Supports:

1. Floor support hanger devices shall not be used.

G. Wall Hangers:

- 1. Angle iron or unistrut type wall brackets shall not be used.
- H. Hanger Shields:

- 1. Shall be provided for all hangers on steam, condensate, domestic water, process water, softened water, refrigerant, and fiberglass piping. Shields are not required on uninsulated steel, stainless steel, or copper piping.
- 2. Shields shall be galvanized steel sleeves, covering a minimum 180° of the pipe circumference and a minimum of 12" in length.

PART 3 - EXECUTION

3.1 HANGERS AND SUPPORTS

- A. All components shall be selected for a minimum safety factor of 5.
- B. Units shall be capable of supporting pipe under all operating conditions and shall allow free expansion and contraction of piping.
- C. All rigid hanger assemblies shall provide for vertical movement after installation by means of threaded adjustment.
- D. Piping systems subject to shock loads shall be supported by units incorporating shock-absorbing devices of approved design.
- E. Hanger rods shall be subjected to tensile loads only. Where axial or lateral movement is anticipated, suitable linkages shall be provided.
- F. Units shall be designed and installed so that pipe movement will not cause them to become disengaged.
- G. Units shall be spaced to permit drainage and so that there will be limited sag between hangers. Spacing shall also be such that it will prevent excessive bending stresses from concentrated loads between supports.
- H. Units in contact with copper pipe shall be copper clad.
- I. Support units from the building structural system, NOT from metal roof decks.
- J. Units supporting insulated pipe carrying liquids or gasses at temperatures ABOVE OR BELOW AMBIENT shall be furnished with pipe covering protection saddles sized in accordance with the associated pipe and the specified insulation thickness as scheduled on the Drawings.
- K. Insulation shields shall be galvanized steel, formed to fit the adjoining insulation, extending through a 180° arc and shall conform with the following table:

PIPE SIZE	<u>GAUGE</u>	<u>LENGTH</u>
½" to 2½"	18	8"
3" and larger	18	12"

- L. Welded attachments shall be of materials comparable to the pipe.
- M. All units, including pipe attachments, structural attachments, hanger rods, bracing, all necessary accessories and their installation shall be in accordance with NFPA 13 Installation of Sprinkler Systems, latest issue.
- N. Maximum horizontal support intervals shall be as follows:
 - 1. Steel pipe 1¼" and smaller: 8'-0".
 - 2. Steel pipe $1\frac{1}{2}$ " and larger: 10'-0".
 - 3. Copper tubing 1½" and smaller: 5'-0".
 - 4. Copper tubing 2": 8'-0".
 - 5. Cast-iron pipe, support at each bell, 5'-0".
 - 6. No-hub c.i. pipe: At each joint for 3" pipe at each side of each joint for 4" and over pipe.

END OF SECTION 23 05 29

SECTION 23 07 00 - HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. The Contract Drawings and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections apply to the work of this Section.
- B. The Work of Section 23 05 00 HVAC Basic Materials and Methods applies to the Work of this Section.

1.2 WORK INCLUDED

A. Furnish and install all HVAC insulation materials for the complete HVAC duct and piping systems as required for proper system operation.

1.3 SUBMITTALS

A. Provide submittals indicating insulation type and thickness to be used on all types of ducts and piping.

PART 2 - PRODUCTS

2.1 INSULATION

A. Pipe Insulation:

- 1. Preformed fiberglass pipe covering with composite insulation jacket and adhesive, U.L. fire and smoke ratings not exceeding 25 flame spread and 50 smoke developed. Factory and butt strips smoothly secured with pressure sealing adhesive. Owens-Corning fiberglass 25 ASJ, Manville APT or approved equal in CSG.
- 2. See Mechanical Schedule sheet for appropriate insulation thickness.
- 3. Exposed piping in bathrooms and custodial closets shall be PVC jacketed.

B. Valves, Fittings and Flanges:

- 1. Water Piping and Condensate: Zeston pre-molded one piece PVC insulated fittings and covers and Z tape seams and joints.
- 2. Refrigerant Section Piping: 25/50 Armaflex mitered sections of insulation cemented with factory recommended adhesive and covered with aluminum jacketing.

C. Ductwork Insulation:

- 1. Ductwork Insulation (Wrap): One pound per cubic foot density fiberglass duct wrap, thickness as scheduled on the plans, with facing composed of aluminum foil reinforced with fiberglass yarn and laminated to fire resistant Kraft. K value at 75°F, mean temperature to be .25 or less. Moisture absorption less than 1% by volume, moisture vapor transmission 0.02 perms. Flame spread 25 or less, smoke developed 50 or less. Manville 800 Series Spin Glas, Owens Corning Type 150 FRK duct wrap, Certaineed standard duct wrap FSK or equal.
- 2. Ductboard Insulation: Fiberglass ductboard with fire resistant foil-Scrim-Kraft facing. K value at 75°F=0.23, R value=6.5. Flamespread 25 or less, smoke developed 50 or less.

 Johns Manville Mat-faced Micro-Aire Type 800 or equal in Owens Corning.
- 3. Flame spread/smoke develop Flame spread rating of 25 or less, smoke-developed rating of 50 or less, as tested by ASTM E84-84A method of test for "Surface Burning Characteristics of Building Materials".
- 4. Thermal Conductivity ASTM C-177, C-158:
 - a. 75°F 0.27 "K" value.
 - b. 90°F 0.276 "K" value.
 - c. Water vapor permeability ASTM E-96, 0.17 perm-in.
 - d. Adhesive: air drying contact adhesive, 25/50 flame spread/smoke develop rating.
 - e. Make: Armstrong "Armaflex II sheet and roll insulation" with Armaflex "520 Adhesive".

PART 3 - EXECUTION

3.1 INSULATION

A. General:

- 1. Do not begin covering until work has been tested, approved and permission given to proceed.
- 2. Installation procedures shall be in accordance with the manufacturer's written instructions unless otherwise indicated.
- 3. All surfaces shall be clean and dry. Surfaces shall be free of loose scale, dirt oil, water, weld, spotter, burns, and rust before installation.
- Covering shall be continuous. The covering shall be neatly terminated at each end of unions with plastic material troweled on a bevel, but unions shall not be covered.
 Coverings shall be neatly finished at pipe anchors, fittings, etc.
- 5. At all points where existing lines are broken to cut in new connections, the insulation shall be repaired to its original condition.
- 6. Insulation is required on all piping unless otherwise indicated in the Contract Documents.

7. Pipes are to be individually insulated.

B. Insulation, General:

- 1. Butt side and ends tightly together.
- 2. Adhere self-sealing lap to dust free jacket surface.
- 3. Use 3" wide butt strips of jacket material at joints, secure with vapor barrier adhesive, BF 85-75 and staples. DO NOT use staples in exposed locations.
- 4. All joints shall be sealed, and staples buttered to maintain vapor barrier integrity of below ambient piping systems.

C. Supply and Return Hot Water Piping:

1. Insulate all mains, branches, fittings, flanges, and valves including those in ceiling spaces, pipe chases or spaces. Terminate insulation at the fixture supply stops. Insulate equipment connections to the equipment stop.

D. Installation of Piping Insulation:

- 1. Apply to pipes with side and end joints butted tightly per manufacturer's directions.
- 2. Where joints in insulation occur, and at hangers, take extra precautions to seal the vapor barrier with adhesive BF 95-44 so that no moisture penetration will occur. Notify Engineer when insulation is complete so he may make inspection before walls are closed in or ceilings applied.
- 3. Where fiberglass insulation is exposed in an occupied room, apply pre-sized glass cloth vapor barrier jacket in same manner using same type of adhesive (or use ASJ/SSL).
- 4. Repair all breaks in the jacket with 4" wide strip of vapor barrier jackets (FRGC or SSL as required) applied smoothly and securely. When applying adhesive at temperature below 75°F, use staples with an additional brush coat of adhesive over the exterior of the staples.
- 5. Adhere 4" wide strips of jacket material smoothly and securely over all end joints with vapor barrier adhesive as above to insure a continuous vapor barrier.
- 6. Apply insulation on all cold surfaces where vapor barrier jackets are used with a continuous, unbroken vapor seal. Insulate and vapor seal hangers, supports, anchors, etc., that are secured directly to cold surfaces to prevent condensation.

E. Support of Insulated Pipe Lines:

- 1. Scope: Install inserts at each hanger or support for all lines for sizes 1½" and up, or 16 gauge electro-galvanized carbon steel shields may be used in lieu of inserts. Install supporting devices on insulated lines with hangers with insulation shields.
- 2. Inserts:

- a. Inserts between the pipe and pipe hangers shall consist of rigid pipe insulation of equal thickness to the adjoining fiberglass insulation and shall be provided with vapor barrier where required.
- b. Insulation inserts shall be not less than the following lengths:
 - i. $1\frac{1}{2}$ " to $2\frac{1}{2}$ " pipe size, use 6" length.
 - ii. 3" to 6" pipe size, use 9" length.
- F. Supporting Devices: Use cork stoppers, short lengths of wood dowels, or wood blocks of the same thickness as insulation. Curve the support device surfaces to match the curve of the metal shield. Metal shields shall be provided with the hanger.
- G. Adhesives, Mastic, and Coatings:
 - 1. Apply adhesives, mastic, and coatings of allowable VOC contents per the manufacturer's recommended coverage per gallon.
- H. Exposed Risers and Run Outs:
 - 1. Finish all risers and run outs in occupied rooms with ASJ.
- I. Protection and Replacement:
 - 1. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
 - 2. Protection: Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.
- J. Ductwork Insulation:
 - 1. Install in strict accordance with manufacturer's instructions.
 - 2. Seal and leak test ductwork before insulation. Before applying duct wrap, sheet metal duct shall be clean, dry, and tightly sealed at all joints and seams.
 - 3. Apply insulation with sections tightly butted and so that 2" flap completely overlaps facing and insulation. Staple seams a minimum of 6" on center with outward clinching staples. Then seal the joint with pressure sensitive tape designed for use with the duct insulation.
 - 4. On all ductwork 24" wide or wider, install <u>spot welded</u> stick clips on bottom of duct. Adhesive adhered stick clips or clinched pins will not be accepted. Stick clips shall be placed approximately 18" on center. The protruding ends of fasteners shall be cut off flush after the clips are installed and then sealed with pressure sensitive tape designed for use with the duct insulation.

5. Adjacent sections of duct wrap insulation shall be snugly butted with the circumferential 2" tape flap overlapping and secured with outward clinching staples a minimum of 6" on center. Apply pressure sensitive tape designed for use with the duct insulation over the joint.

K. Adhesive, Mastic and Coatings:

1. Apply adhesives, mastic and coatings specified at the manufacturer's recommended coverage per gallon.

L. Protection and Replacement:

- 1. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- 2. Protection: Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 23 07 00

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SECTION 23 21 13 - HYDRONIC HEATING SYSTEM AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide a complete, operating, tested, functioning, documented, Hydronic Heating System for the Project including all work shown, specified, or required for proper system operation. Include extensions of existing systems.
- B. Maintain this System in good condition until final acceptance.

1.2 RELATED WORK BY OTHER DIVISIONS

A. Electrical work by Electrical Contractor Division 26. The Electrical Contractor is responsible only for the electrical circuiting and connection work indicated on the Electrical Drawings.

PART 2 - PRODUCTS

2.1 HYDRONIC HEATING SYSTEM MATERIALS AND EQUIPMENT

- A. See Specification Section 23 05 00 for piping, valves, and fittings.
- B. See respective Division 23 sections for equipment.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTALLATION DETAILS

A. Install in strict accordance with the manufacturer's printed installation instructions and details. Obtain confirmation of any verbal manufacturer's instructions in writing.

3.2 PIPE FITTINGS AND SPECIALTIES

- A. Long-term trouble free operation of the hydronic heating system depends on careful installation and start-up of the hydronic piping system. Arrange piping so that all piping pitches to vented high points. Configure system so that there is a minimum of these high points.
- B. Run piping, true parallel, and plumb to wall, as direct as feasible, not smaller than and substantially as shown on Plans. Do not run within 6" of finished floors, across windows or with less than head clearance in finished rooms without written approval. Bent pipe, unnecessary joints, short lengths, reducing bushings and close nipples are not permitted. Ream, file and remove all burrs from pipe before installation.

- C. Take runouts off top of main for equipment above the mains. Take runouts off the side or bottom of main for all equipment below main unless specified on Drawing. Provide at least one (1) swing joint to include two (2) elbows and a piece of pipe at least 12" long at each connection to main.
- D. Provide shut-off valves in supply and return main branches, and as otherwise noted.
- E. Provide anchors, bends, swings, etc., where shown and as required to take care of pipe expansion.
- F. Use eccentric reducers, flat on top for hydronic systems.
- G. Run all piping as high as possible or as otherwise noted on Plans. Grade all horizontal piping just off level (without sags, humps, or air pockets) up in direction flow so that same will just drain and vent. Provide manual drains with 3/4" hose valve at all low points. Provide manual vents at all high points.
- H. Conceal piping wherever possible. Install such piping in time so as not to cause delay of other trades.
- I. Support with clamps and rods from above. Use individual hangers.
- J. Support intervals as scheduled in Section 23 05 00.
- K. Expansion swings: Make adequate allowance throughout for expansion and contraction of piping by means of adequate elbow swings or expansion loops where necessary.
- L. Valves: Provide where indicated. Locate valves for easy access and install valve stems above horizontal. Ball valve stems may be located in any orientation but arrange so handle can operate fully.
- M. Unions: Provide where indicated and at all connections to each piece of equipment with the union between shut-off and equipment. Do not conceal.
- N. Escutcheons: Provide where pipes pass through finished construction.
- O. Concealed Piping: All piping in finished rooms shall be concealed unless otherwise noted. Install all piping in time to prevent delay to work of other trades and to allow ample time for tests and approval; do not cover before approval is obtained.

- P. Piping Test: Test all hydronic heating system piping with 100 psig hydrostatic pressure. Pressure must hold steady for two (2) hours without pumping. Exclude compression tanks, boiler, and relief valve from test. Engineer shall provide the pressure gauge that is to be used for the test. The Contractor shall provide necessary pump, hoses and valves for filling, draining and air venting the piping system that is to be tested. Contractor shall perform a pre-test to confirm that there are no leaks, and that system holds pressure. Final tests shall be witnessed by the Engineer. Contractor shall provide isolation valve for test gauge, so system pressure does not need to be relieved in order to change or remove gauge.
- Q. Guarantee all piping to be free from objectionable noise or vibration and circulation through same to be free and easy at the normal operation pressure and under all loads.

3.3 INITIAL SYSTEM START-UP AND OPERATION

- A. Flush hydronic systems with clean water at full flow by using a hose with a double check (backflow preventing) valve assembly attached to the domestic water system.
- B. Flush lines with domestic water pressure to remove cutting oils, iron and copper shavings, flux, and other deposits. Observe the water as flushing proceeds to view the amount of suspended solids being removed by the process. Flush until water runs clear.
- C. MC is responsible for filling and bleeding the hydronic system. Upon completion of system startup, MC shall run the hydronic system continuously for two (2) weeks minimum, three (3) weeks maximum, to purge system of air and then recheck system charge. MC shall add fluid as needed. MC shall then run the hydronic system continuously for an additional two weeks (minimum), three (3) weeks maximum, and recheck system charge. If additional fluid in excess of 3% of initial system fill volume is required, MC shall repeat the cycle until fluid addition is less than 3% of initial system fill volume. Only at that time shall the MC then contact and schedule balancing of the hydronic system.
- D. Set system control for normal operation and proceed with water balance. Provide balance report.
- E. At the beginning of the heating and cooling seasons, provide a minimum of two 4-hour site visits for system checkout and air bleeding. Correct any flow problems and provide additional air vents as necessary.

3.4 WATER TREATMENT

- A. The Contractor shall flush and clean all portions of the hydronic systems.
- B. The Contractor shall provide services to assist the Owner's chemical treatment representative in applying chemical treatment.

3.5 ONE YEAR FINAL CHECKOUT

A. At the completion of the first year of system operation, perform final system checkout. Add additional air vents if chronic air binding has been observed.

END OF SECTION 23 21 13

SECTION 23 22 00 - PIPE FITTING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Steam Piping, Fittings and Specialties.

1.2 QUALITY ASSURANCE

A. Codes and Standards:

- 1. Welding: Qualify welding procedures, welders, and operators in accordance with ASME B31.1, or ASME B31.9, as applicable, for shop and project site welding of piping work.
- 2. Certify welding of piping work using Standard Procedure Specification by, and welders tested under supervision of, National Certified Pipe Welding Bureau (NCPWB).

1.3 SUBMITTALS

A. Submit welders' certificates.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All pipe and fittings shall be new and marked with manufacturer's name complying with applicable ASTM and ANSI Standards. All pipe and fittings shall be American made and marked with the country of origin.
- B. Special Notice Regarding Threaded Fittings: Due to multiple occurrences of problems with threaded cast and malleable iron fittings in 2007, the Engineer shall require American Manufacture of these fittings.

2.2 PIPING AND FITTINGS

A. Refer to Specification Section 23 05 00.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently leakproof piping systems, capable of performing indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16" maximum misalignment tolerance.

- B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls. Locate runs as shown or described by diagrams, details, and notation. Run piping in manner which does not obstruct usable space or bloc, access for servicing.
- C. All nipples between coupling and first valve off main line shall be 8" long (minimum) to clear insulation and valve handle.
- D. Provide drop points where indicated and detailed on the Drawings.
- E. All work shall be installed in a workmanlike manner as determined by the Owner and Engineer.
- F. All piping shall have burrs removed by reaming and shall be installed so as to permit free expansion and contraction without causing external stress to any fitting or connection. All horizontal condensate return lines shall, unless otherwise noted, be pitched in the direction of flow not less than one (1") in forty feet (40').
- G. Do not install valves, unions, and flanges in inaccessible locations.
- H. Accurately establish grade and elevation of all piping. Install piping without springing or forcing (except where specifically called for), making proper allowance for expansion and anchoring. Arrange piping with necessary offsets, unions, flanges, valves, to allow for easy removal and maintenance, as approved.
- I. All flanges to butterfly valves in steam lines are to be 150 lb. weld neck, raised-faced Schedule 40 bore.
- J. All trap lines, drains, vents, etc. to be Schedule 80 pipe.

3.2 PIPING SYSTEM JOINTS

- A. General: Provide joints of type indicated in each piping system.
- B. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joints compound on male threads at each joint and tighten joint to leave not more than 3 threads exposed. Joint compound must be approved for application.
 - 1. All screw joints shall be American Taper Pipe thread ASA B21-1945; all burrs or cuttings shall be removed. Pipe ends shall be reamed or filed out to size or bore and all chips and cuttings shall be removed. Pipe joint cement or dope shall be permitted only on external threads. All screw joints shall have at least one and one half (1½) threads and not more than three (3) threads exposed from the fitting. No piping shall have wrench marks; all screw connections shall be accomplished by application of wrenches to fitting hub.
- C. Weld pipe joints in accordance with recognized industry practice and as follows:

- 1. Weld pipe joints only when ambient temperature is above $0^{\circ}F$ ($-18^{\circ}C$). Between $0^{\circ}F$ and $32^{\circ}F$ preheat area 2" each side of weld to approximately $60^{\circ}F$ to $90^{\circ}F$ (warm to touch) before welding. Welded joints shall be either oxy-acetylene or electric butt welded.
- 2. Bevel pipe ends at a 37.5° angle where possible, smooth rough cuts, and clean to remove slag metal particles and dirt. No mitered branch welds will be permitted. Branch connections from mains shall be made with forged butt welding outlet fittings as manufactured by Bonney Forge or approved equal.
- 3. Use pipe clamps or tack-weld joints with 1" long welds; four (4) welds for pipe sizes to 10", eight (8) welds for pipe sizes 12" to 20".
- 4. Build up welds with stringer-bead pass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unused metal, cracks, oxidation, blowholes, and non-metallic inclusions.
- 5. Do not weld-out piping system imperfections by tack-welding procedures; fabricate to comply with requirements.
- 6. All welding shall be performed with a minimum of 250 amp welder.
- 7. Use full length pipe where possible; minimum distance between welds, 18" on straight runs.
- 8. Do not apply heat to rectify distorted pipe due to concentrated welding; replace all distorted pipe. One internal pass and one external pass minimum required on all slip-on flanges.
- 9. Where joints between sections of pipe and pipe fittings are to be welded, changes direction and intersections of lines shall be made with welded fittings. Mitering will not be permitted. Welding fittings shall be installed on all welded lines. Backing rings will not permitted.
- 10. Before assigning any welder to work covered by this specification, provide the Engineer with the name of pipe welders to be employed in the work, together with certification, prescribed by the National Certified Pipe Welding Bureau. If requested by the Owner, the Contractor shall submit identifying stenciled test coupons made by any operator in question. The Contractor shall require the welder to retake the test when, in the opinion of the Owner, the work of the welders creates a reasonable doubt as to his or her proficiency. Previous tests and new tests where required shall have been conducted by a reputable testing laboratory or agency using proper procedures for such certification. Any re-testing shall be done at no expense to the Owner. Re-certification shall be made to the Engineer only after the welder has taken and passed the required retest.
- 11. All welding shall be done in accordance with the recommendations of the American Welding Society, and the "Standard Manual on Pipe Welding" of the Heating, Piping, and Air Conditioning Contractor National Association. All welding shall be done by welders experienced in this type of work and all work to be performed to the complete satisfaction of the Owner.
- D. Flanged Joints: Flanged joints shall be tightened so the gasket is uniformly compressed.
 - 1. Flanges shall not be distorted.
 - 2. Flange bolts shall be installed with ends projecting 1/8" to 3/8" beyond the face of nut after tightening.
 - 3. Connection flanges shall be in proper alignment and no external force shall be used to bring them together. Bolts and gaskets shall be furnished by the Contractor.

- 4. In general, flanged joints shall be made up with through bolts of the required size. Stud or cap screws shall be used only where shown or required.
- 5. Contractor to select length of manufactured bolts for lug type butterfly valves so that a space (¼" minimum, ¾" maximum) remains between the ends of the bolts when the bolts are completely tightened.
- 6. All bolt and nut facings shall be lubricated with a "never seize" compound. All bolts shall be tightened up diagonally hand tight.
- 7. Conform to valve manufacturer's printed instructions regarding tightening sequence and torques.
- 8. Torque up bolts diagonally to maximum of 25% of the final torque valve; repeat to a maximum of 50% of final torque value.
- 9. Continue re-torquing diagonally several times until the final value is obtained.
- 10. A torque wrench shall be used in tightening all bolts.
- 11. All flange joints shall be properly aligned to fit-up and no piping flanges shall be sprung into place. Flanges shall be bolted together with machine bolts and hex nuts with sufficient bolt length to protrude two (2) threads through the nut in final assembly. All flange joints shall be made tight by application of gasket cut for full diameter between bolts to provide placement of gasket correctly.

3.3 PIPE LINE SIZING

- A. Pipe sizes indicated on Contract Drawings are to be maintained. Pipe size changes made only as directed by Engineer.
- B. Where discrepancy in size occurs, the larger size shall prevail, unless otherwise directed by the Engineer.

3.4 PIPE INSTALLATION

- A. Once a joint has been disassembled, the threads shall be re-cleaned, and new joint compound applied.
- B. All flanges shall be fitted true and square to the axis of the pipe.
- C. Changes in direction of pipelines shall be made by using straight pipe and fitting.
- D. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- E. Remove scale and dirt, inside and outside, before assembly.
- F. Remove welding slag or foreign materials from pipe and fitting materials.

3.5 CLEANING, FLUSHING, INSPECTING

A. General: Clean exterior surfaces of installed piping systems of superfluous materials and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with the required tests. Inspect each run of each system for completion of joints, supports and accessory items.

1. Inspect pressure piping in accordance with procedures of ANSI B31.

END OF SECTION 23 22 00

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SECTION 23 31 00 - HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide a complete, operating, tested, functioning, documented ductwork system including all work shown, specified, or required for proper system operation.
- B. Galvanized steel ductwork for supply air, return air, outside air and general building exhaust air.
- C. Aluminum ductwork for toilet and shower exhaust air.
- D. Duct Shop Drawings and Coordination Drawings.
- E. Splitter, Cable, and Manual Dampers.
- F. Ductwork accessories to include duct hardware, duct access doors and turning vanes.

1.2 REFERENCES

- A. Applicable provisions of the following Codes and Trade Standard Publications shall apply to the work of this Section, and are hereby incorporated into, and made a part of the Contract Documents.
- B. Material standards shall be as specified or detailed hereinafter and as follows:
 - 1. NFPA 90A Installation of Air Conditioning and Ventilating Systems.
 - 2. NFPA 90B Installation of Warm Air Heating and Air Conditioning Systems.
 - 3. SMACNA (LEAK) HVAC Air Duct Leakage Test Manual.
 - 4. SMACNA (DCS) HVAC Duct Construction Standards Metal and Flexible.
 - 5. UL 181 Factory-Made Air Ducts and Connectors.
 - 6. ASTM A 653/A 653M Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.

1.3 SUBMITTALS

- A. See Division 1 for Additional Requirements.
- B. Product Data: Provide data for duct materials, duct connectors and all accessories. Include sound attenuator test data in accordance with ASTM E477.

- C. The Sheet Metal Contractor shall submit duct fabrication standards and methods of installation, in compliance with SMACNA and these Specifications, for review and approval by the Engineer, clearly indicating the combination of metal gauges and reinforcement intended for use for each pressure classification. Duct fabrication shall not be allowed until a satisfactory review of this Standard has been performed and fabrication drawings have been reviewed and coordinated. MERELY SUBMITTING COPIES OF THE SMACNA PRESSURE CLASS TABLES DOES NOT COMPLY WITH THIS REQUIREMENT.
- D. Test Reports: Indicated pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA-HVAC Air Duct Leakage Test Manual.
- E. Manufacturer's Installation Instructions: Indicate special procedures for glass fiber ducts.
- F. Manufacturer's Certificate: Certify that installation of glass fiber ductwork meets or exceeds recommended fabrication and installation requirements.
- G. Project Record Documents: Record actual locations of ducts, duct fittings and all accessories. Record changes in fitting location and type. Show additional fittings used.
- H. Diffusers and grilles submittals shall indicate airflow rate (cfm), throw length to 50 fpm, blow pattern and NC values for each individual diffuser or grille.

1.4 QUALITY ASSURANCE

- A. All ducts and fittings shall be manufactured by a sheet metal fabrication company whose primary business experience is the manufacture of commercial and industrial quality ducts and fittings.
- B. Sheet Metal Contractor shall have adequate experience of building ductwork of the types required for this Project as well as successful experience with projects of similar scope. Bids from sheet metal shops which do not meet the specified requirements shall not be acceptable.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants, including throughout the full curing time.

PART 2 - PRODUCTS

2.1 GALVANIZED STEEL DUCTWORK

- A. Galvanized steel duct fabricated from quality zinc coated galvanized sheet steel, of lockforming quality.
- B. Shop fabricated according to the current edition of the SMACNA HVAC duct construction standards for 2" w.g. duct pressures.
- C. Shop fabricated joints shall be sealed with Hardcast Alumagrip sealant.

2.2 SPLITTER AND MANUAL DAMPERS

A. Shop fabricated splitter and manual dampers. Dampers shall have locking quadrant arms and end bearing plates. Provide extended quadrant locks where insulated ductwork is used.

2.3 REMOTE CABLE OPERATED DAMPERS

A. Remote cable operated volume dampers shall be Young Regulator Powden Cable Control Dampers with Model 270-896P tamper-proof wall-mounted actuator.

2.4 ALUMINUM DUCTWORK

- A. Aluminum ductwork fabricated from quality sheet aluminum of lockforming quality and temperature.
- B. Shop fabricated according to the current SMACNA HVAC duct construction standards for 2" w.g.
- C. Shop fabricated joints shall be sealed with Hardcast Alumagrip sealant.

2.5 TURNING VANES

- A. Shop fabricated or factory fabricated turning vanes. Vanes shall be welded to vane runner.
- B. Special continuous vane elbows shall be shop fabricated according to the dimensions and details shown on the plans for discharge elbows.

2.6 DUCT ACCESS DOORS

A. Provide an access door for all control dampers, fire dampers, smoke dampers and combination fire/smoke dampers.

- B. Ultra-low leakage access door, 24 ga. Double wall galvanized with 1" insulation flat oval design.
- C. Leakage Performance: 0.101 cfm/ft² @ 8" S.P.
- D. Make: Manufactured Air Products, Model ADFO or Nailor Model 0800.

2.7 DUCT FLEXIBLE CONNECTION

- A. Provide flexible CONNECTION of 4" minimum fabric width:
 - 1. Between ductwork and the inlets and outlets of all fans **except** those listed below. For the fans listed below, provide a flexible <u>inlet</u> connector and a rigid/sealed outlet connection.
 - a. Hazardous exhausts.
 - 2. Equipment equipped with fans.
 - 3. All ductwork that crosses building expansion joints, as identified on the Architectural and Structural Drawings.
- B. The connections shall be placed as close to the equipment as practical except at fan suction connections and the clear gap at rest shall be not less than 3". At fan suction connections, locate flexible duct connection at least 3 duct diameters away from fan inlet connection.
- C. There shall be no tension of the fabric under static or dynamic loads.
- D. All fabric for flexible duct connections to equipment shall be a minimum of 22 oz. Glass fabric, double coated with neoprene, fire retardant, waterproof, airtight, and approved UL, similar to Ventfabrics or Ventglass.
- E. Exterior flexible connection shall be insulated type similar to Duro Dyne.
- F. Flexible connections shall be fabricated from approved flameproofed fabric conforming to NFPA 90A. Asbestos shall not be acceptable.
- G. Flexible connections shall be installed further upstream from fan powered equipment (in the main duct size) to prevent obstruction of the fan inlet due to suction of the fabric into the airstream.
- H. Ductwork shall be increased in size where the flexible connections are located to prevent fully drawn in connections from blocking any duct area. Submit detail for review.

2.8 DIFFUSERS AND GRILLES

A. Diffusers and grilles as scheduled on the Plans with minimum performance noted.

2.9 DUCT SHOP DRAWINGS

A. Duct Coordination Shop Drawings shall be provided for this project. Shop Drawings shall be %" scale. Engineer shall provide %" scale base plan produced from contract drawing. Sheet metal contractor shall field verify and dimensions and create new %" plan using Engineer's plan and Contractor's field verification data.

2.10 SPIRAL DUCT

A. Materials:

- 1. Unless otherwise specified, all duct and fittings shall be a minimum G-60 galvanized sheet metal in accordance with ASTM A653 and A924 specifications. Gauges are to be in accordance with current SMACNA standards (Reference 1.1.3).
- 2. When shown, underground ductwork shall be polyvinyl-chloride (PVC)-coated, G-60 galvanized steel spiral duct and factory-fabricated fittings shall be provided. PVC gauges shall be identical to those set for galvanized steel. PVC coating shall be 4 mil (0.004) on the interior and exterior surfaces. PVC-coated duct and fittings shall not be used in systems where temperatures exceed 200°F.
- B. Construction: Spiral duct shall be round spiral lock seam construction, of gauges in accordance with SMACNA guidelines. Duct shall be continuous unjoined lengths.
- C. Fittings shall be fabricated standing seam sealed fittings. Elbows shall be gored with 1.5 bend radius. Diverging flow fittings shall be constructed with a radiused entrance to branch taps. All taps shall be made with factory fabricated fittings. All fittings on lined insulated duct shall be lined and insulated.
- D. Access doors shall be bolted access doors.
- E. All joints on exposed ductwork shall be slip coupling type or flanged coupling type as selected by the Architect.

2.11 DUCT ACCESS PLATES

A. Fixed removable screwed plates with gasket.

2.12 DUCT SEALER

A. Premium quality indoor/outdoor heavy duty pressure sensitive duct joint sealer "Gray Matter" butyl adhesive/sealant. 30 mil modified butyl adhesive/sealant, peel strength 10 lbs. per linear inch. 445 psi tensile strength with 60% elongation, 24 hour full bonding time.

- B. Service temperature: -20°F to 220°F.
- C. Application temperature: 35°F to 11°F.
- D. Mold and mildew resistant.
- E. SMACNA pressure Classes ½, 1, 2, 3, 4, 6 and 10" w.g.
- F. Seal Classes SMACNA A, B, C.
- G. Manufacturer: Carlisle, "Hardcast Alumagrip".

PART 3 - EXECUTION

3.1 SEALING

A. Seal all ductwork as it is being assembled. Seal all joints - longitudinal and transverse. Seal all joints with equipment with flex connectors. Seal with Hardcast Alumagrip sealant.

3.2 DUCT HANGER AND SUPPORTS

- A. Provide suitable angle iron/strap hangers and supports inside the mechanical shafts, mechanical rooms and in ceilings of the buildings, and on the roof(s) as shown on the Drawings (Architectural/HVAC). This work shall be performed as required by job conditions as instructed by the Architect in the field to support all air distribution ductwork and devices in both horizontal and vertical planes.
- B. When hanging and supporting the ductwork, the following shall be complied with:
 - 1. Except as otherwise note, ductwork up to 42" in greatest dimension shall be hung by using sheet metal bands secured as a minimum at (2) locations to the vertical sides of the ductwork and at (1) location under the duct. All support systems shall be compatible with the building structure and roofing system as approved by the Architect.
 - 2. Where ductwork major axis dimension is larger than 42", ductwork shall be hung by using threaded rods of not less than %" soft steel secured to angle iron trapeze support frame around ductwork with threaded nuts for securement and adjustment.

- 3. Ductwork shall be securely attached to the building construction. The hanger design and spacing shall be governed by the major duct dimension and shall be in accordance with SMACNA Duct Manual, except as modified hereinbefore. Vertical ductwork shall be supported at each floor level in an approved manner using angles or channels attached to the ducts. The installation, when complete and under operating conditions, shall be free from chatter or vibration. If necessary to achieve this, additional supports and/or bracing shall be furnished without extra cost to the Owner. Supports and bars and similar items shall be primed and painted structural steel. Touch up with aluminum paint any surfaces where galvanizing is destroyed on indoor ductwork, zinc primer on exposed ductwork with a final coat of aluminum paint.
- 4. The Sheet Metal Contractor shall provide all supplemental steel required to support the ductwork in shafts, mechanical rooms or on the floor where structural steel is not properly positioned. Beam clamps shall be double sided.
- 5. The maximum hanger spacing shall be 10"-0" on centers and additionally on each side of an elbow or change-in-direction fitting.

3.3 SHEETMETAL TESTING

A. General:

- All ductwork that is required to be tested shall be tested on regular intervals as the job proceeds and shall be completed prior to enclosure in shafts, above ceilings or behind walls.
- 2. Ductwork testing shall be performed by the Balancing Contractor. The Sheet Metal Contractor shall provide sealed/capped duct sections for the Balancer to test. Coordinate the phasing of testing with the Balancing Contractor.
- 3. The Sheet Metal Contractor shall keep an up-to-date log of the ductwork tested for review by the Architect. The Sheet Metal Contractor shall notify all other Contractors when the duct sections are ready to be tested and when testing is completed and accepted to permit enclosure of ducts.
- 4. The Sheet Metal Contractor shall furnish and install all blank off plates, blind flanges, safing, etc., necessary to isolate each section of duct being tested for leakage.
- 5. The Balancing Contractor shall submit for review all proposed testing procedures, sample report, and equipment to the Engineer prior to proceeding. Additionally, the Sheet Metal Contractor shall notify the Engineer when testing is to occur so that the test can be witnessed at the Engineer's option.
- 6. All test equipment shall be calibrated per ANSI Standards prior to testing. The fan shall have a filtered inlet to prevent construction dust from being blown into the new duct system. Certified test reports shall be submitted to the Architect prior to commencement of the testing.
- 7. Testing Procedure:

- a. The testing procedure shall be in accordance with SMACNA "HVAC Air duct Leakage Test Manual".
- b. Ductwork shall be considered seal Class 'A' and leakage Class '6' for rectangular metal systems.
- c. Ductwork shall be tested at 1" positive pressure. Therefore, allowable leakage shall be 12 cfm per 100 square feet of sheetmetal surface area.
- d. Measure the surface area of the test section and multiply by 12 cfm divided by 100 square feet to calculate the allowable leakage.

3.4 PAINTING

A. All exposed ductwork in finished rooms except mechanical rooms shall be painted one (1) coat primer, one (1) coat finish of color selected by Architect.

3.5 DUCTWORK PROTECTION DURING CONSTRUCTION

- A. As required as part of best practices, provide temporary polyethylene film seal end cap for HVAC openings to prevent contamination of the HVAC ductwork interior prior to start-up of the HVAC system.
- B. On duct sizes 6" in diameter to 14" in diameter or 16-47 linear inches for square or rectangular ducts, the polyethylene film seal shall be capable of extending at least 8" beyond the opening of the duct and shall be attached to the duct by means of an elastic band sewn around the circumference of the film seal. The polyethylene film shall be a minimum of 2 mil (0.002") thickness and the elastic band shall be a minimum of 1/4" thick.
- C. On duct sizes 14" in diameter to 38" in diameter or 48-119 linear inches for square or rectangular ducts, the polyethylene film seal shall be capable of extending at least 12" beyond the opening of the duct and shall be attached to the duct by means of an elastic band sewn around the circumference of the film seal. The polyethylene film shall be a minimum of 2.5 mil (0.0025") thickness and the elastic band shall be a minimum of 3%" thick.
- D. Make: Ductcap Products Inc.

3.6 NEW DUCT CLEANING

- A. Clean dust and debris from interior and exterior of all ducts using wet rags and vacuums.
- B. Cover open ends of ductwork when installation does not proceed for more than one day. This requirement shall apply to each individual run of duct, such that no duct section shall remain open or unconnected for more than 8 hours.

END OF SECTION 23 31 00

SECTION 23 34 00 - HVAC FANS

PART 1 - GENERAL

1.1 SUMMARY

- A. The Contract Drawings and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections apply to the work of this Section.
- B. The Work of Section 23 00 00 HVAC Mechanical Basic Materials and Methods and Section 23 05
 01 Mechanical Coordination Drawing Requirements apply to the Work of this Section.

1.2 WORK INCLUDED

A. Provide fans including all accessories shown, specified, or required for proper system operation.

1.3 SUBMITTALS

- A. Provide submittals on the following:
 - 1. HVAC fans.
 - 2. Fan motors.
 - 3. Performance at specified conditions.
 - 4. Dimensional data.
 - 5. Vibration isolators.
- B. Fan submittals shall include selection data indicating airflow rate (cfm), static pressure, brake horsepower, amperage draw, fan speed and dimensional data.

PART 2 - PRODUCTS

2.1 DIRECT DRIVEN MIXED FLOW CENTRIFUGAL INLINE FAN

A. General Description:

- 1. Round, Low noise, mixed flow centrifugal exhaust/supply fan.
- 2. Mounting at any angle.
- 3. Easily removed from duct for service.
- 4. Normal operating temperature up to 140°F.
- 5. Permanently sealed self-lubricating ball type bearing.
- 6. Applications: intake, exhaust, return, or make-up air systems.
- 7. Suitable for and provided with 5 step transformer speed control.

8. Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number.

B. Housing:

- 1. Heavy gauge galvanized steel.
- 2. Externally mounted electrical terminal box.

C. Motor:

- 1. Motorized impeller-enclosed external rotor type. Single phase split capacitor type.
- 2. Permanently sealed self-lubricating ball bearings.
- 3. Automatic thermal overload protection.
- 4. Continuous Duty.
- 5. Designed for service factor for long maintenance free operation over maximum load conditions.

D. Wheel:

- 1. Mixed flow centrifugal type with well-designed inlet venturi for maximum performance.
- 2. Statically and Dynamically Balanced impeller.
- 3. High impact polypropylene impeller.

E. Performance:

- 1. Capacity and static pressure as scheduled on the Drawings.
- Air Flow performance shall be based on tests conducted in accordance with AMCA Standard 211 and licensed to bear the AMCA Certified Ratings label.
- F. Inlet Acoustic performance at typical application point:
 - 1. Airflow 1,000 cfm @ 1.25", 525 watts, 1611 rpm.
 - 2. Octive band sound <u>power</u> level, A weighted:

63 hz: 58 125 hx: 75 250 hz: 75 500 hz: 76 1,000 hz: 72 2,000 hz: 72 4,000 hz: 66 8,000 hz: 57 Total: 81

G. Electrical Safety:

1. UL or ETL tested and listed for electrical safety.

H. Warranty:

1. Provide full three (3) year replacement warranty.

I. Manufacturer and Model:

1. Fantech Inc, FKD series Lenexa, KS or approved equal. Model and performance as listed on the Drawings.

2.2 DIRECT DRIVEN BACKWARD INCLINED CENTRIFUGAL INLINE FANS

A. General Description:

- 1. Round, centrifugal, direct driven, low noise fan for moderate size applications.
- 2. Normal operating temperature up to 140°F.
- 3. Applications: intake, exhaust, return, or make-up air systems.
- 4. Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number.

B. Motor:

- 1. Motorized impeller shall be an external rotor type, class B insulation, enclosed with split capacitor.
- 2. Motor shall be a permanently sealed self-lubricating ball bearing type.
- 3. Motor shall be equipped with automatic reset thermal overload protection.
- 4. Motor shall be acceptable for continuous duty.

C. Wheel:

- 1. Non-overloading, backward inclined centrifugal wheel.
- 2. Molded, high impact Polypropylene construction.
- 3. Statically and dynamically balanced as one integral unit to provide vibration free performance.

D. Performance:

- 1. Capacity and static pressure as scheduled on the Drawings.
- 2. Air Flow performance shall be based on tests conducted in accordance with AMCA Standard 211 and licensed to bear the AMCA Certified Ratings label.

E. Electrical Safety:

1. UL or ETL tested and listed for electrical safety.

F. Warranty:

1. Provide full three (3) year Warranty.

G. Manufacturer and Model:

1. Fantech Inc, Lenexa, KS or approved equal. Model and performance as listed on the Drawings.

PART 3 - EXECUTION

3.1 EXHAUST FANS

- A. Install flexible connection on ductwork connections at fans to reduce vibration. Provide blocking back draft damper where indicated. Interlock blocking damper with fan power. Damper shall be closed when fan is off and open when fan is in operation.
- B. Install fan per manufacturer's instructions. Support from overhead structure. Provide rubber in shear isolators and support structure. Intent is to minimize contact vibration to student rooms located below.
- C. Bump start fan to verify proper rotation.
- D. Provide vibration free installation.

END OF SECTION 23 34 00

SECTION 23 83 20 - SNOWMELTING SYSTEMS

PART 1 - GENERAL

1.1 GENERAL

A. Snowmelt systems are used in select areas to eliminate the need for salting ramps and stairs and to provide increased safety for pedestrians.

1.2 DESIGN CRITERIA

A. Snowmelt systems shall be designed based on the latest edition of "ASHRAE HVAC Applications", Chapter 51. Snowmelt systems serving horizontal sidewalks shall be designed with a minimum heat flux of 125 BTU/sqft. Systems serving stairs and ramps shall be designed with a minimum heat flux of 300 BTU/sqft.

1.3 SLAB/SUB-BASE DESIGN

A. Snowmelt may be applied to concrete sidewalks, stairs with granite caps, or paver areas. Insulation shall be provided under all areas to be melted. The insulation and sub-base shall be installed so that the there is no degradation of R-Value due to moisture. The insulation material selected shall have a published and tested R-Value. Drainage of the melted surface shall be handled via surface slope and trench drains at boundaries between heated and unheated areas.

PART 2 - PRODUCTS

2.1 CONTROLS

A. Controls for the snowmelt system shall be a direct digital control system connected to the campus energy management system. A minimum of three temperature sensors shall be provided in slabs and one snow/moisture sensor shall be provided. The slab temperature sensors shall be the Tekmar 072 sensor, and the snow sensor shall be the Tekmar 090 sensor, provided by Division 25. The snow sensor shall be located outside of the main walking path to avoid salt and debris from foot traffic. Additional temperatures sensors shall also be provided in areas where the local condition of the slab or materials may affect the temperature readings.

PART 3 - EXECUTION

3.1 CONTROL SEQUENCE OF OPERATION

A. General:

- 1. The snow melt systems are used to provide heating in winter for clearing sidewalks.
- 2. All setpoints shall be adjustable.
- 3. The snow melt system consists of a three-way valve, moisture/temperature sensors and dual lead/lag pumps.
- 4. Snowmelt pumps shall be controlled through the energy management and control system (EMCS).

B. Pump Start / Stop:

1. Hard-wired (HOA) at the pump controller (ECM, 3-phase) or RIB relay (single-phase).

C. The Software HOA:

1. A user software interface, may be used to put the pump in "HAND", commanding it ON until modified (all safeties take priority) and the pump will be commanded OFF if software HOA is set to "OFF". (Hardware HOA must be in "Auto" position, where applicable).

D. The Logic:

1. The pump is started by the Programmed routines, as long as the software HOA is set to AUTO.

E. Operational Mode:

- 1. When the outside air temperature is 35°F or below, the lead pump shall be started and run continuously. Once started, the pump will run for a minimum of ten minutes.
- 2. If the outside air temperature is above 35°F, then the pump shall be OFF. The pump will be OFF for a minimum of ten minutes.

F. Safeties:

1. If the glycol supply temperature exceeds Glycol Hi Limit SP (150°F), the pump shall be disabled, and an alarm shall be generated.

3.2 LEAD/LAG PUMP CONTROL

- A. On systems consisting of multiple pumps, each pump shall be designated as the "Lead" pump for a period of 168 hours (adjustable). After 168 hours (adjustable), the "Lag" pump will be indexed to the "Lead" position and run, and the "Lead" pump will be indexed to the "lag" position and be off. The changeover of the pump lead should only occur between 8:00 a.m. and 12:00 p.m. on a weekday.
- B. The lead pump shall operate continuously with the lag pump in stand-by mode. If the lead pump fails, the lag pump will be commanded ON. The lead pump output will stay ON and an alarm will be generated.

3.3 LOOP HEATING VALVE

- A. When the lead pump is energized, the control valve shall be modulated to heat the glycol HW supply to the glycol HW supply setpoint.
- B. If the pump is OFF, the control valve shall be closed.
- C. The glycol supply temperature to the snow melt system shall never be allowed to exceed Glycol Hi Limit SP.

3.4 SLAB SENSOR CONTROL

- A. The slab sensors shall be compared continuously. If a sensor is out of range, an alarm shall be generated (20°F above or below the remaining two sensors).
- B. The slab control temperature shall be calculated as the maximum, minimum or average (selectable) in the range of sensors.

3.5 SLAB TEMPERATURE CONTROL

A. Idle Mode:

1. When the lead pump is energized and there is no moisture detected on the sidewalk surface, the control system shall maintain the slab at the slab idle setpoint. The initial idle setpoint is 35°F.

B. Melting Mode:

1. If the snow sensor detects moisture, the slab setpoint shall increase to the slab melting setpoint. If no moisture is detected for a period of two hours (adjustable), the system shall revert back to the idle mode. The initial melting setpoint is 50°F.

C. Manual Mode:

1. The graphic shall include a manual ON mode; the manual ON mode shall place the system in melting mode for a minimum of 24 hours (adjustable). At the end of the manual mode, the system shall revert back to automatic.

3.6 GLYCOL SUPPLY TEMPERATURE CONTROL

- A. The initial glycol supply temperature setpoint shall be determined according to the slab temperature:
 - 1. As the slab temperature ranges from (slab setpoint $+5^{\circ}F$) to (slab setpoint $-5^{\circ}F$), the glycol temperature setpoints shall range from Glycol Low End to the minimum of slab temperature $+70^{\circ}F$ or Glycol High End.
 - 2. The initial values for Glycol High End and Glycol Low End are 140°F and 60°F, respectively.
- B. The final glycol supply temperature setpoint shall be determined by the minimum of the initial glycol supply setpoint or the glycol return temperature + Max Delta T. The initial value for Max Delta T is 25°F (This will limit the potential for thermal shock in the slab).

3.7 ALARM SUMMARY

A. Pump OFF Alarm:

1. If the pump is commanded ON and status is not received in 30 seconds (adjustable), an alarm will be generated at the operator's workstation.

B. Pump ON Alarm:

1. If the pump is commanded OFF and status is on for more than 30 seconds (adjustable), then an alarm will be generated at the operator's workstation.

C. Slab Sensor Alarm:

1. If any slab sensor is more than 20°F above or below the other sensors in the system, then an alarm shall be generated.

D. Glycol High Temperature Alarm:

1. If the glycol supply temperature exceeds Glycol High Limit Setpoint (150°F), the pump shall be disabled, and an alarm shall be generated.

END OF SECTION 23 83 20

SECTION 26 00 00 - ELECTRICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections apply to the work of this Division.

1.2 SUMMARY

A. This Section includes general administrative and procedural requirements for Division 26, Electrical work.

1.3 DIVISION 26 - DESCRIPTION

- A. The technical specifications of this Contract are arranged for the convenience of the Owner and Contractor into Divisions of work. The work of Division 26, Electrical, is further described in Specification Sections of the 26 00 00 Series and on Contract Drawings of the 'E' Series.
- B. The organization of this work into Divisions shall not relieve the Prime Contractor from providing all of the work shown on the complete set of drawings or specified in the complete set of Specifications, whether or not the individual subcontractors correctly identify their respective responsibilities.

1.4 OTHER DIVISION SPECIFICATIONS APPLICABLE TO THIS WORK

A. To the extent that the work of this Division or Contract includes the work of other trades, the Contractor for this Division shall adhere to the requirements of other specification sections. All General Construction work shall be performed in accordance with the provisions of the appropriate Division 2 through Division 33 Section. All mechanical work shall be performed in accordance with appropriate Division 23 Sections.

1.5 WORK INCLUDED

The work of this Division shall include providing all materials, labor, services, permits and related work to furnish a complete, operating, tested, functioning, documented electrical system, including all work shown, specified, or required for proper system operation including but not limited to the following:

A. Provide demolition and removal of existing circuits, devices, and fixtures, where shown, removal of all debris from site and proper disposal of same.

- B. Provide Electrical Basic Materials and Methods. (Section 26 05 00)
- C. Provide Temporary Construction Electrical Services. (Section 26 05 15)
- D. Provide Firestopping and Smokestopping. (Section 26 84 00)
- E. Provide Convenience Outlets, Circuiting and Equipment Power Supplies.
- F. Provide Temporary Services to Facilitate Demolition and Construction.
- G. Extend Existing Emergency Lighting System as shown.
- H. Provide Relocations of Equipment and Lighting Fixtures where shown.
- I. Provide Sleeves and Inserts.
- J. Provide Equipment and Conductor Identification.
- K. Provide Testing of Equipment and Conductors.
- L. Provide Certificate of Compliance and Fees for Permits and Inspections.
- M. Provide Openings in Existing and New Construction as required for the work of this Division.
- N. Provide Maintenance of System in Good Condition until Final Acceptance.
- O. Provide Submittals and Shop Drawings.
- P. Provide Owner's Operation Instruction.
- Q. Provide Operation and Maintenance Manuals one (1) electronic and two (2) hard copies.
- R. Provide One (1) Year Warranty.
- S. Provide "As-Built" Drawings.
- 1.6 ALLOWANCES/ALTERNATES
 - A. Refer to Division 1 for description of Allowances/Alternates.

1.7 PLANS AND SPECIFICATIONS

- A. It shall be the responsibility of the Contractor to thoroughly examine the complete project documents including Plans and Specifications prior to bid and to notify the Engineer of any uncertainties or apparent omission, conflicts, or discrepancies between the Plans and Specifications. In any case of a conflict between the Plans and Specifications or between two (2) Specification sections, it shall be assumed that the larger capacity or quantity shall govern until a determination can be made by the Engineer.
- B. Plans and Specifications are of abbreviated form. Omitted words or phrases shall be inferred.
- C. Plans and Specifications are complementary. Provide all work which is either shown or specified or both.

1.8 LAWS AND REGULATIONS

A. Division 26 shall conform with all Federal, State, County, and Municipal Laws, Ordinances and Regulations. Comply with the Occupational Safety and Health Act (OSHA).

1.9 DEFINITIONS

Where used in the Plans and Specifications the following words and corresponding definitions shall apply:

- A. Provide Contractor shall supply, install, start-up and maintain until final acceptance.
- B. Furnish Submit, receive approval, purchase, and turn over. Do not include the costs to install if furnish only is indicated. Include one (1) year guarantee on material furnished.
- C. Install Receive at site or at Contractor's warehouse; protect; transport to site; protect; transport or rig to final location; mount or fasten in final location; furnish and connect all required hangers, devices, supports and appurtenances to enable proper operation; startup and maintain until final acceptance.
- D. New or Proposed Work occurring as part of this Project, usually employed on a Drawing to distinguish from existing work. All work shown on the Drawings shall be assumed to be new unless specifically identified as existing.
- E. Exist Existing work.
- F. Existing Work, buildings, equipment, and materials which were existing at the project site at the time of commencement of the project or which was installed by other projects prior to the work of this project.

- G. Shown Shown on the Plans.
- H. Specified Specified on the Technical Specifications.
- I. HV The Contractor performing the Division 23 Heating Ventilating work. In the Plans and Specifications, the words "By HV" or "By H&V" shall be considered synonymous.
- J. Elect or EC The Contractor performing the Division 26 work. In the Plans and Specifications, the words "By Div 26", "By EC" and "By Elect" shall be considered synonymous.
- K. Plumb, Plumbing or Plg The Contractor performing the Division 22 Plumbing work. In the Plans and Specifications, the words "by Plumb" or "by Plumbing" or "by PLG" shall be considered synonymous.
- L. FP The Contractor performing the Division 21 Fire Protection work.

PART 2 - PRODUCTS

2.1 GENERAL

A. Conform to Division 26 Specifications for products under this Division.

PART 3 - EXECUTION

3.1 SPECIAL CHARACTER OF THE WAR MEMORIAL

- A. While this building is not currently listed on the National Registry of Historical Places, it is a building with significant historical significance and character. Many details and facets of the Memorial are irreplaceable. One of the primary intents of this project is to both preserve and restore the historical character and fabric of the Memorial.
- B. To this end, it is of utmost concern that all work be performed with care. This includes protection of all existing surfaces and finishes including, but not limited to, all decorative stonework and engraved tablets, and protection of existing bronze wall-mounted lanterns. Where shown, all electrical work at the main First Floor Memorial Level shall be concealed. Any exposed work requires explicit and specific permission of the Owner and/or Architect and Engineer.
- C. All fasteners and materials in contact with existing surfaces shall be made from hot-dipped galvanized steel (NOT electro-plated), stainless steel (only permitted where installed above First Floor slab elevation), fiberglass or PVC. All raceways installed within existing walls shall be PVC.

3.2 GENERAL

A. Conform to Division 26 Specifications for installation and execution of work.

3.3 SUBMITTAL LIST

A. Within ten (10) days of receipt of award of subcontract, submit to the Architect, Engineer and Owner through the Construction Manager, a complete listing of proposed submittals, compiled by this Division Contractor based on the requirements of the Specifications as well as the work shown and scheduled on the Drawings.

END OF SECTION 26 00 00

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SECTION 26 05 00 - ELECTRICAL BASIC MATERIALS & METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Documents and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections apply to the Work of this Section.
- B. The Work of Section 26 05 00 Electrical Basic Materials & Methods and Section 26 05 01 Electrical Coordination Drawing Requirements apply to the Work of this Section.

1.2 WORK INCLUDED

- A. Provide Basic Materials and Methods as follows:
 - 1. Conduit.
 - 2. Conduit Fittings.
 - 3. Sleeves, Inserts and Openings.
 - 4. Support Systems.
 - 5. Surface Raceways.
 - 6. Wireways/Wire Troughs.
 - 7. Outlet, Junction and Pull Boxes.
 - 8. Conductors.
 - 9. Conductor Splicing Materials.
 - 10. Wiring Devices.
 - 11. Conductor Pulling Lubricant.
 - 12. Miscellaneous Painting.
 - 13. Waterproofing, Caulking and Sealing.
 - 14. Protection and Storage of Materials and the work.

1.3 SUBMITTALS

- A. Provide submittals, Shop Drawings and Coordination Drawings. Provide for the following:
 - 1. Raceways, cable trays, wireways, conduits, fittings, support systems.
 - 2. Junction boxes.
 - 3. Conductors.
 - 4. Conductor splicing material.
 - 5. Wiring devices, including but not limited to, receptacles and switches.
 - 6. Pulling lubricant.
 - 7. Sleeves, inserts and openings.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Conductors:

- 1. Conductors shall be annealed copper, 98 percent conductivity.
- 2. Grounding conductor shall have green color coded insulation.
- 3. Signal circuits shall be color coded using solid colors with contrasting tracer color lines.
- 4. Panel feeders shall be copper conductors unless otherwise shown.
- 5. Aluminum conductors shall not be acceptable.
- 6. All conductors shall be stranded.

B. Insulation:

- 1. 600 volts rating for building feeders and branch circuits.
- 2. 300 volts rating for signal systems operating at 50 volts or less.
- 3. #12 through #8 AWG: Dry locations, use type THWN.
- 4. #6 and larger in normally dry locations type THWN.
- 5. #12 AWG and larger: Under buildings, slab on grade, steam tunnels, crawlspaces, boiler rooms, pump house, kitchen, mechanical rooms, use type THWN.
- 6. Wiring within removable partitions: Use type UF where permitted by code.
- 7. Wiring to street lighting systems, snow melting systems, exterior signs, etc., use THWN, THHN or UF in conduit.

C. Cables:

- 1. Power cables shall be allowed only as called out on Drawings.
- 2. All cables shall be either a UL-listed 600V MC or AC.
- 3. All conductors shall comply with Part A and Part B of this Section.
- 4. Phase conductors within the cable shall be marked or colored for identification.
- 5. Cable shall be constructed with a galvanized steel interlocking armor. Aluminum shall not be allowed.
- 6. Connectors shall be similar to Flexible Metal Conduit (FMC).
- 7. Manufacturers: Southwire Duraclad or similar in General Cable.
- D. Make: Anaconda, General Cable, Rome Cable, Circle, General Electric, Essex, Okonite, Brand-Rex.

2.2 CONDUCTOR SPLICING MATERIALS

A. #10 AWG and Smaller (600V Class):

1. U.L. listed pressure connectors.

- 2. Ideal "Wingnuts", 3M "Scotchloks", solder and tape, Buchanan splice taps, or Sta-Kon joints.
- B. #8 AWG and Larger (600V Class):
 - 1. Bolted or crimped pressure connectors.
 - 2. Burndy, OZ, or AMP taped.
- C. Tape (600V Class):
 - 1. U.L. listed for 600 volt minimum.
 - 2. Scotch 33 or 80, or Plymouth, or Bishop.

2.3 CONDUCTOR PULLING LUBRICANT

- A. The cable lubricant shall meet the following performance Specifications:
 - 1. When subjected to a 100 lbs./ft. normal force, between (type) cable and (type) conduit, the lubricated cable system shall have a coefficient of kinetic friction less than 0.25 (pulling force greater than lbs./ft.).
 - 2. The lubricant shall be U.L. (or CSA) listed.
 - 3. When used on high voltage cable, the lubricant shall not affect the volume resistivity of any semi-conducting jacket or insulation shield present. The volume resistivity of the semi-conducting material shall at no time increase more than 100% when tested via the ICEA T-25-425 method, 90 degrees centigrade exposure, 7-day test, readings made at 23 degrees centigrade daily.
 - 4. The lubricant shall not affect the tensile/elongation properties of the cable jacket more than existing ICEA/NEMA aging specifications allow.
 - 5. The lubricant shall contain no waxes, greases, silicones, or polyalkylene glycol oils or waxes.
- B. Manufacturer: Polywater J. American Polywater Corporation, P.O. Box 53, Stillwater, Minnesota 55082.

2.4 CONDUIT

- A. Aluminum Rigid Conduit:
 - 1. Aluminum Rigid Conduit shall require silicone treated interior, with all aluminum accessories and approved aluminum lubricant for threaded connections.
- B. Flexible Metal Conduit:

- 1. Steel interlock type, galvanized, with galvanized steel fittings.
- 2. Complies with NEC Article 348 and U.L. standards for flexible conduit.
- 3. Make: Galflex or approved equal.

C. Electrical Metallic Tubing (EMT):

- 1. EMT shall be low carbon steel, with set screw type, concrete tight fittings.
- 2. Exterior shall be galvanized by electrolytic process and extra coat provided by bright dip in zinc chromate solution.
- 3. Interior shall be coated with baked planting process.
- 4. Make: Cerro, Republic, Allied Tube, Youngstown, Wheatland or approved equal.

D. Liquidtight Flexible Conduit:

- 1. Heavy galvanized steel core type.
- 2. Oil resistant thermoplastic cover, grey color.
- 3. Integral ground wire, sizes $\frac{3}{6}$ " to $\frac{1}{4}$ ".
- 4. For high/low temperature applications, use type H.C.
- 5. Use steel, gasketed, insulated throat, compression type liquidtight fittings.
- 6. Make: Anaconda, O.Z. Gedney, Ultratite or approved equal.

E. Rigid Non Metallic Conduit (PVC):

- 1. Heavy wall, 90°C temperature rated, polyvinyl chloride Schedule 40 conforming to NEMA Standards.
- 2. Approved standard manufacturer's fittings and supports as required.
- 3. Make: Carlon or approved equal.

F. Rigid Metallic Conduit (RGS):

- 1. Rigid galvanized steel, hot dipped threaded type.
- 2. Galvanized threaded malleable iron fittings.
- 3. Make: Cerro, Republic, Allied Tube, Youngstown, Wheatland or approved equal.

G. PVC Coated Rigid Metallic Conduit (PRGS):

- 1. Rigid galvanized steel, hot dipped, threaded with 40 mil min polyvinyl chloride exterior coating.
- 2. UL-listed, conforming to NEMA RN-1-1998.
- 3. Make: Korkap or approved equal.
- H. Aluminum flexible conduit and cast or plotted metal conduit shall not be used.

2.5 CONDUIT FITTINGS

A. EMT:

- 1. All fittings shall be U.L. listed steel or malleable iron.
- 2. Branch circuit conduits larger than 1" diameter and conduits containing feeders serving panelboards shall have grounding type bushings.
- 3. Set screw type fittings, concrete tight as manufactured by Neer, OZ Gedney, Bridgeport or equal.
- 4. Compression connectors, squeeze type Efcor or equal.

B. Flexible:

- 1. Fittings shall be UL listed steel or malleable iron.
- 2. Fittings for flexible steel conduits shall be squeeze type as manufactured by Thomas and Betts, Steel City or Appleton.

C. Liquidtight:

- 1. Fittings shall be malleable iron, tapered hub threads, with safe-edge ground cone and double bevel sealing ring.
- 2. Fittings for liquid tight flexible conduits shall be screw-in type manufactured by Thomas and Betts Company or Pittsburgh Standard Conduit Company.

D. Rigid Conduit:

- 1. Bushings for metal conduit terminations shall be the nylon insulated type throat, with grounding type locknut ahead of bushing.
- 2. Die cast zinc-alloy and pressure cast and indenter type fittings shall not be approved. Provide steel or malleable iron only.
- 3. Conduit hubs shall be as manufactured by Myers Electric Products, Inc., Raco, T&B, General Electric Company or equal.

E. PVC Coated Rigid Metallic Conduit:

- 1. All ferrous fittings shall be PVC coated, UL-listed and approved by conduit manufacturer for use with conduit.
- 2. A urethane coating shall be uniformly applied to the interior of all conduit fittings. All threads shall have a uniform urethane coating applied.
- F. Die cast, pressure cast, potted metal or similar type fittings shall not be used.

2.6 CONDUIT SUPPORT SYSTEMS

A. Trapeze Type Hangers:

- 1. Steel horizontal members and threaded hanger rods.
- 2. Rods shall not be less than ½" diameter.
- 3. Make: Kindorf G-953 Series, or equal in Unistrut or B-line complete with all necessary bolts, screws, angles, anchors, connection plates, straps, etc., as required to perform the necessary functions.

B. Conduit Clamps and Supports:

- 1. Steel hangers and threaded hex nuts.
- 2. Kindorf C-149 Series or equal in Unistrut or B-line complete with all necessary bolts, screws, angles, anchors, connection plates, straps, etc., as required to perform the necessary functions.

2.7 OUTLET, JUNCTION AND PULLBOXES

A. Type:

- 1. Unless otherwise noted on the Drawings, boxes shall be NEMA rated as follows:
 - a. Where installed indoors and intended primarily for protection against access to hazardous parts, boxes shall be NEMA 1 rated.
 - b. Where installed indoors or outdoors and intended for protection against access to hazardous parts, as well as protection against ingress of falling water (rain, sleet, snow), boxes shall be NEMA 3R rated.
 - c. Where installed indoors or outdoors and intended for protection against access to hazardous to hazardous parts, as well as protection against ingress of falling water and direct spray, boxes shall be NEMA 4 rated.
 - d. Where the requirements of Item 'd' are met, as well as protection against corrosion, boxes shall be NEMA 4X rated.

B. Construction:

- 1. Galvanized, stamped steel shall be provided when recessed in construction or exposed on walls and ceilings in dry areas.
- 2. Deep conduit style with hubs, or Myers hubs for exposed work in damp area or wet location or for weatherproof type outlets.
- 3. Large pullboxes shall require 14 gauge galvanized steel, fold, and weld construction; with 14 gauge galvanized and gasketed steel cover secured in place by galvanized sheet metal screws on maximum 10 inch centers. All cut edges to be free of burrs.

- 4. Provide cast iron, gasketed, watertight boxes where installed in earth, surface mounted outdoors, where threaded connection is needed.
- C. Size: Provide as required for number and size of conduit and conductors. Coordinate depth to suit wall depth and construction. Use special forms and designs as required for outlet facilities.
- D. Covers: Provide design and style to suit outlet box and electric facility. Provide for all unused or non-designated boxes. NEMA 1, 12, 3R, rating for area environment and use "while-in-use" watertight cover with gasket for exterior boxes.

E. While-in-Use Covers:

- 1. Provide size, design, and alignment to suit outlet box.
- 2. Provide for all boxes designated on prints and all other required locations as per NEC 406.8 (B).
- 3. Provide with clear-polycarbonate shield.
- 4. Make: P&S WIUC10 for single gang and WIUC20 for double gang. Equivalent in Hubbell is acceptable.
- F. Junction and pullboxes used for fire alarm shall be painted red. Covers shall also be painted red.
- G. Fixture Studs: Use %" studs and securely fastened to support fixtures.
- H. Make: Appleton, Crouse-Hinds, O.Z. Gedney, National, Steel City, Raco, Pyle-National.

2.8 SLEEVES, INSERTS AND OPENINGS

- A. "Link-seal" assembly as manufactured by Thunderline (see Execution for locations).
- B. Schedule 40 steel pipe, packed with fire barrier wool and caulk (see Execution for locations).
- C. Fire barrier wool and caulk. No sleeve necessary (see Execution for locations).
- D. Where three (3) hour fire rating is required, use split collar fire seal with sleeve.
- E. Where penetrating through a floor, the sleeve shall be waterproof as well as fireproof. Submit through floor sleeve system.

2.9 SURFACE RACEWAYS

A. Surface Raceways:

- 1. Provide enameled steel, code sized for quantity of wires indicated; use manufacturer's standard fittings.
- 2. Where pre-wired plug-in strips are shown on Drawings, use assemblies with 20 amperes grounding type receptacle with outlet on 12 inches centers.
- 3. Provide pre-punched snap-on covers to suit outlet spacing.
- 4. Combination assemblies for communication and power shall contain integral dividers.
- 5. Telephone, computer, cable openings shall have bushed openings, with split stainless plate.
- 6. Provide all couplings, device plates, blank end fittings, entrance and wall box connectors, elbows, breakers, wire clips, etc., to make a complete job.
- 7. Make: Wiremold "Plugmold 2000" Series for plug-in service. Wiremold 500 or 700 for raceway application.
- 8. Color: All wiremold products shall match wall finish. Contractor shall order in grey finish and paint to match wall finish. Ivory colored (v-series) wiremold cannot be painted properly due to its scuffcoat finish.

B. Pre-Wired Surface Raceway:

- 1. Raceway shall be a two (2) piece design with a base and a snap-on cover. The snap shall be configured such that conductor damage will not inadvertently occur during assembly. Pre-assembled wiring harness of #12 AWG copper shall be provided in single circuit and tow circuit configuration as required. (See Plans) Receptacles shall be duplex type.
- 2. The system shall include all necessary fittings; various elbow types, adapter, end cap, tees and splice cover. All shall be made of rigid PVC material to match color of raceway. Entire assembly shall be office white.
- 3. Manufactured by Wiremold Company or approved equal.

2.10 WIRE WAYS AND WIRE TROUGH

- A. Use hinged cover type wire way with provisions for full lay-in along the entire length of run.
- B. Wire way shall be steel, enclosed with gray enamel finish.
- C. Use JK sectional NEMA dust resistant, oil tight type where subjected to moisture, in pump rooms, mechanical, electric and fan rooms, exterior wall, shops, maintenance shop and similar locations.
- D. Knockouts along runs.
- E. Provide all elbows, tees, pullboxes, fittings, hangers, reducers, supports, etc., to meet installation requirements.
- F. Size as shown on Drawings or code size where not noted.

G. Make: Square D "Square Duct" or equal by Hoffman, General Electric, Meco.

2.11 WIRING DEVICES

A. Receptacle, Surge Protection Device:

- 1. Copper-alloy contacts, thermal protection in three modes (L-G, L-N, N-G) absorbing 340 joules per mode of energy absorption and 24,000 amp maximum surge capability, three (3) thermal fuses and two (2) overcurrent protection fuses, autoground clip.
- 2. High impact resistant thermoplastic for all exposed molded parts, wrap around face-locking strap, epoxy compound encapsulating the internal components.
- 3. UL-listed 1449 3rd Edition, Type 3 SPD, 20 amp circuit rating.
- 4. Visual LED surge status indicator to alert user to surge suppression circuit condition. Visual indicator will be illuminated (GREEN) when power is on, and surge suppression circuit is fully functional. Visual indicator will not be flashing red upon loss of surge suppression protection. Audible alarm will sound when there is a loss of surge suppression protection. Audible alarm able to be turned on/off.
- 5. Extra heavy duty use surge protection device receptacle, NEMA 5-20R.
- 6. Make: Pass & Seymour #PT 5362SP with plugtail connector PTRA6STR.

B. Receptacle, GFCI:

- 1. Heavy-duty brass mounting strap.
- 2. High impact resistant, thermoplastic construction for receptacle face and back body.
- 3. UL-listed, 20 amp circuit rating NEMA Type 5-20R with stranded right angle plugtail connector.
- 4. Trip indicator light (red lamp) and "safelock protection" which denies power if there is a ground fault or if GFCI fails.
- 5. Extra heavy-duty use specification grade receptacles with stranded right angle plugtail connector.
- 6. Make: Pass & Seymour GFCI Receptacle PT2097 with plugtail connector PTRA6STR.

C. Receptacle, Duplex:

- 1. Grounding type with brass integral ground system and auto ground clip, brass line contacts, brass mounting strap and brass plugtail contacts.
- 2. High strength nylon construction for receptacle face and back body.
- 3. UL-listed, 20 amp circuit rating, NEMA Type 5-20R.
- 4. Extra heavy-duty use specification grade receptacles with stranded right angle plugtail connector.
- 5. Make: Pass & Seymour Duplex Receptacle PT5362A with plugtail connector PTRA6STR.

2.12 WALL PLATES

- A. Provide thermoplastic wall plates molded of rugged, practically indestructible, self-extinguishing nylon. Wall plates shall be preferred for use in high-abuse applications.
- B. Standard colors available in ivory, white, brown, gray, black, red, and light almond. Color to be selected by Architect, except where specifically shown.
- C. Nominal thickness, 0.070".
- D. Make: Pass & Seymour Trademaster Thermoplastic Wall Plates "TP" Series.

2.13 CEILING PLATES

- A. Round ceiling plate, white finish, steel, to cover existing cast-in-place ceiling boxes.
- B. Mulberry Model 40430 or equal.

2.14 NEW PRODUCTS, SINGLE MANUFACTURER

A. All equipment, materials and products furnished shall be new unless specifically shown to be reused. All materials shall be new and of the best quality of their respective kinds. The work when completed will be accepted in an undamaged and perfect condition only. Where equipment, materials and products are used for the same purpose, they shall be provided by the same manufacturer.

2.15 QUALITY ASSURANCE

A. All equipment, materials and products shall conform to the applicable ANSI, ASA, NFPA, UL, AGA and/or ARI standard. All electrical equipment shall be UL or ETL Listed.

2.16 WARRANTY

A. Provide one (1) year manufacturer's warranty on all equipment, materials, and products. Where shown or specified, provide manufacturer's extended warranty.

2.17 SUBSTITUTIONS FOR SPECIFIED EQUIPMENT, MATERIALS AND PRODUCTS

A. Conditions: The Contractor's substitution request will be received and considered by the Architect/Engineer when one or more of the following conditions are satisfied, as determined by the Architect/Engineer; otherwise, requests will be returned without action except to record noncompliance with these requirements:

- 1. Extensive revisions to Contract Documents are not required.
- 2. Proposed changes are in keeping with the general intent of Contract Documents.
- 3. The request is timely, fully documented and properly submitted.
- 4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
- 5. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
- 6. The specified product or method of construction cannot receive necessary approval by a governing authority and the requested substitution can be approved.
- 7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect/Engineer for redesigning and evaluation services, increased cost of other construction by the Owner of separate Contractors, and similar considerations.
- 8. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.
- 9. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.
- B. The Contractor's submittal and Architect/Engineer's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contractor Documents, does not constitute an acceptance or valid request for substitution, nor does it constitute approval.
- C. Specified Alternate Equipment In the event the Contractor elects to use equipment named as an alternate manufacturer herein, the Contractor shall verify that the equipment is of the same capacity, arrangement, size and characteristics as the design equipment and shall make all incidental changes in his work and coordinate and pay for any changes in work made necessary by deviations from the design capacity, arrangement, size and characteristics of the alternate manufacturer's equipment.
- D. Substitutions of Unspecified Equipment, Products and Materials Unspecified equipment, products and materials may be added to the List of Specified Alternate Equipment, Products and Materials at the request of any bidder by written application at least five (5) days prior to the bid date.

- Addition of an unspecified equipment, products and material to the List of Alternate
 Manufacturers will occur at the determination of the Engineer if there is sufficient time to
 review the proposed substitution prior to bid date and to issue addenda to all
 Contractors. In no case will substitutions be approved to individual bidders. Substitution
 requests will not be acted upon within the last five (5) days prior to bid date.
- 2. Addition of unspecified equipment, products and materials to the List of Alternate Manufacturers does not relieve the Contractor from his obligation described in subparagraph 'B' to verify that the equipment is of the same arrangement, capacity, size, and characteristics and to pay for any modifications required in his and other Contractors' work made necessary by the use of this equipment.
- 3. By submission of his bid for this Project, the Contractor acknowledges the authority and prerogative of the Engineer and Owner to evaluate proposed substitutions as to suitability for the Project and the Contractor agrees to abide by the Engineer's decision if unspecified equipment, products, and material are disallowed by the Engineer.

PART 3 - EXECUTION

3.1 LAYING OUT WORK

- A. Contractor shall allow for thickness of finishes when roughing in his work. He shall not rough without obtaining accepted Shop Drawings for the actual equipment to be installed.
- B. Plans show general arrangement of conduit and connections. Install work substantially as indicated. Verify exact locations and elevations on job. Before installing work, consult other plans, details, and Contractors to determine headroom and work interferences. Examine Electrical plans for exact location of equipment, fixtures, and outlets. Where not definitely located, obtain information from Engineer.
- C. Thoroughly coordinate work with that of other Contractors. Furnish in writing to Engineer, any information necessary to permit work of trades to be installed properly and without delay. Maintain maximum head room. If electrical work cannot be installed at least 7'-0" above the floor (in mechanical spaces or basement and higher in finished spaces dependent on ceiling height), consult with the Engineers and obtain approval before proceeding. If directed by Engineers, prepare composite Drawings and sections (scale not less than ¼"=1"), clearly showing installation of work in relation to work of other trades.
- D. Should Engineer's details, field conditions, change in equipment or Shop Drawing information necessitate an important re-arrangement, report same to Engineers and obtain approval before proceeding.

- E. Install conduit to avoid interferences with removal of coils, filters, belt guards or any operating part of all systems, or operation of overhead or swinging doors. Maintain easy and safe access to valves, controllers, motor starters and other equipment requiring frequent operation. Maintain opening of access doors, switch boxes, motor starters, panel boards, etc. Maintain a clear walking space.
- F. No compensation awarded for extra work because above precautions have not been followed. In event of conflicts, Engineer's decision is final. Contractor fully responsible for unauthorized changes.

3.2 EQUIPMENT FOUNDATIONS

- A. Provide equipment foundations for all Electrical equipment. Use 3,000 psi concrete. Submit detail sketches giving size and height for approval, if requested. Chamfer edges, trowel smooth. Securely bond to floor by roughening and coating with cement grout. Set anchor bolts in sleeves before pouring. After anchoring, fill equipment bases with this grout according to manufacturer's printed instructions. Carefully align shafts and set plumbing before grouting. Re-align shafts after grout has set.
- B. Provide coatings for curing.

3.3 EQUIPMENT INSTALLATION

- A. It is required of each equipment manufacturer, through the Contractor, to carefully check Plans and Specifications as same affect their particular equipment. Report to Engineers, any discrepancies or contradictions as applied to their particular equipment which prevents proper functioning, servicing, etc., before or at the time when Shop Drawings are submitted. Furnish manufacturer's printed installation instructions for each piece of equipment. Thoroughly instruct Contractors' personnel on job, exactly how their equipment shall be installed, connected, lubricated, started up, operated, etc., so that all factory instructions are rigidly followed.
- B. Install, test, start and operate all equipment only as instructed by manufacturer and in presence of manufacturer's representative, as directed. Follow instructions of manufacturer as noted above. Provide mock-up installation of certain typical equipment, if required, such as fixtures, chair carriers, countersinks, etc., as directed, and obtain Architect's and Engineer's approval before proceeding with actual installation of same.
- C. Contractor shall provide as recommended by manufacturer, all necessary incidental valves, fittings, piping, wiring, etc., not supplied by manufacturer or other Contractors, for proper apparatus operation. Contractor shall provide accurate information to other Contractors for required services to equipment, such as water supply and waste connections, masonry openings, wiring requirements, etc. Such information shall be complete and correct for particular job.

D. If required by Engineers, Contractor shall submit satisfactory evidence that equipment, systems, etc., have been installed strictly in accordance with manufacturer's recommendations, have been properly aligned, are properly adjusted, have been properly tested, lubricated, balanced, etc.

3.4 NOISE AND VIBRATION

- A. Install all equipment to be free of transmission of noise and vibration to occupied spaces. Arrange isolated equipment so that it does not contact members of the building structure, ceiling grids, piping, conduits, or ductwork.
- B. Provide replacement at no cost to the Owner of any pump, motor, motor starter, or lighting fixture, transformer, UPS system, other equipment which in the opinion of the Engineers produces excessive vibration or noise.

3.5 ADJUSTING AND INITIAL LUBRICATION

- A. As soon as installed, lubricate, and leave in good working order, all motors, bearings, etc., in accordance with manufacturer's instructions.
- B. Lubrication Chart Provide 8½" x 11" lubrication chart, typed in capital letters, mounted in wood frame under clear plastic. Hang were directed. Heating Contractor shall provide chart listing all motors. Other Contractors supply information on motors furnished by them.
- C. List following information:
 - 1. Name and location of equipment.
 - 2. Type of lubrication recommended by manufacturer.
 - 3. Lubrication period recommended by manufacturer.

3.6 EQUIPMENT CHECKOUT AND TESTING

- A. Notify Engineer when installation(s) is/are ready for testing, as specified with ample time in advance. Provide all metered and unmetered services, tools, equipment, and manpower necessary to perform tests.
- B. Perform all equipment testing as specified as recommended by manufacturer and directed by Engineers. Demonstrate that all operating and safety devices are in proper working order.
- C. Perform necessary operating and pressure testing for all piping and equipment which shall be buried underground, before backfilling; installed in or under slabs, before pouring; buried in building walls, before being buried.

3.7 CONDUCTORS

- A. All wire and cable shall be installed in an approved raceway.
- B. Provide wire and cable in conduit for all feeders, motor circuits, lighting circuits, receptacle circuits, equipment circuits, etc., as shown on Drawings.
- C. Coil slack wire at outlets, inside the outlet boxes and seal the outlet opening with cardboard or fiber plug to prevent entrance of concrete plaster or paint. Provide separate neutrals for all single phase circuits.
- D. Tag all feeders, subfeeders, special system wiring and control wiring in each pullbox and gutter space, denoting points of origin and termination of wires.
- E. Install a maximum of 3 phase and one (1) neutral conductor in any one (1) feeder or branch circuit conduit unless otherwise directed by Engineer.
- F. Provide supports for conductors in vertical raceways in accordance with NEC, Article 300.19.
- G. Flexible conduit used as connection to any equipment shall contain separate green grounding wire run back to ground bus of serving panel board.
- H. Provide #12 AWG minimum size for branch circuit and emergency system wiring, #14 AWG minimum size for signal circuits.
- I. All wires #12 and larger and wiring to motor or other fixed equipment shall be stranded type.
- J. Provide #10 minimum size for branch circuit run which exceed 100 feet; unless otherwise directed.
- K. Panel feeders and Branch circuits for 3 phase motors and equipment rated for 3 phase, 120/208 volts, shall have color coded insulation; black-phase "A", red-phase "B", blue-phase "C" with white neutral conductor. Colored tape at each terminal of all power feeders (black insulation) will be accepted in lieu of colored insulation as described above.
- L. Panel feeders and Branch circuits for 3 phase motors and equipment rated for 3 phase 277/480 volts shall have color coded insulation; brown phase "A", orange phase "B", yellow phase "C", with gray neutral conductor. Colored tape at each terminal of all power feeders (black insulation) will be accepted in lieu of colored insulation as described above.
- M. The neutral wire shall be identified throughout the system. Feeders shall be identified at the source and at all boxes with panel make and phase (A,B,C).

- N. Included in the work covered under this section is the cutting or drilling of entrance holes into enclosures, equipment terminal boxes and outlet boxes for entrance of cable not in conduit, as well as the work of cutting and drilling of holes in miscellaneous plates located in the path of cable runs. Entrance holes for cable shall be installed around cable, as part of the work of installing cable, sealing bushings, Crouse-Hinds type: "CGB" or Owner approved equal, or conduit bushings where these alone are permissible. The work shall also include the work of packing or sealing at conduit bushings after cables are pulled, using unoiled Oakum and JM Dux-seal or Owner approved equal.
- O. Cables shall be formed to avoid sharp bends or edges of conduit bushings upon entering or leaving conduit terminations, and insulated wiring to approximately six (6) inch intervals between conduit and terminals. Where outlet box, cabinet, cubicle, switchgear, or other terminal points for cable are equipped with cable or wiring trays, troughs or gutters. Contractor shall pull sufficient length of each cable to permit neat arrangement of all entering cables, with leads formed and cabled or clamped as each conductor is brought to its terminal connection. No tangle box work will be accepted.
- P. Where reasonably practicable, the minimum radius to which an insulated conductor is bent, whether permanently or temporarily during installation, shall be ten (10) times the diameter over the outer covering.
- Q. Making terminal connections shall be included as part of the work, except as specifically noted. At points where the conductor and cable insulation will be terminated, terminations shall be made in a neat, workmanlike and approved manner by men specialized in this class of work, particular attention being given to higher voltage terminations, shielded conductor terminations and coaxial cable terminations. Terminations shall be made by the Contractor for each type of wire or cable in accordance with instructions issued by the Owner. Spare cables shall be trimmed, taped, and bundled neatly within the cabinet so their presence will not interfere with connected terminations. They shall be trimmed to a length such that they can be made up and connected to the farthest terminal block within the cabinet.
- R. Before any cable terminal connections are made, conductors shall be rung out. Connections shall be made according to wiring diagrams. Polarity or phasing shall be checked before final connections are made, and corrections of polarity, phasing or rotation shall be made without additional cost to the Owner.
- S. Control cable terminations shall be made in accordance with wiring diagrams, using wire numbers established by the Owner for the various control circuits. It is the intent that the Contractor shall terminate the cables which he installs, except as specifically noted.

- T. When control cables are to be fanned out and cabled together with cord, Contractor shall make connections to terminal blocks, and test equipment for proper operation before cables are corded together. If there is any question as to proper connection, the Contractor shall make temporary connection with sufficient length of cable so that cable can be switched to another terminal, without splicing cable.
- U. After pulling and splicing but before making cable terminal connections, the Contractor shall expose ends, clear each conductor, and make the required Megger test on all circuits except lighting circuits. Contractor shall test cables for motors, power, and control, with a Megger insulation testing instrument (Associated Research, Inc., Megohmmeter) before equipment is energized. In the event insulation is deficient, repeat Megger testing shall be accomplished after corrective measures have been applied. Extreme care shall be exercised in meggering so as not to put excessive voltage on instrumentation and electronic equipment and thereby damage such devices.
- V. The Contractor shall megger all power feed cables for 10 to 15 seconds, at 4000 volts on apparatus rated 2500 volts, 1000 volts on apparatus rated 550 volts to 2500 volts and 500 volts on apparatus rated less than 500 volts. The cable shall be meggered first on the reel before pulling and then again on a cable-by-cable basis after being cut and pulled.
- W. A check shall be made of all external and internal wiring for loose connections, cable sizing and proper terminations per the elementary and connection Drawings listed and attached with Specification.
- X. All wiring systems shall be thoroughly checked before placing the system in service, for grounds, short circuits, and conformity to wiring diagrams.

3.8 CONDUCTOR SPLICING MATERIALS

- A. Splices and connections for lighting and receptacles shall be made in accessible outlets, pullboxes or junction boxes.
- B. Insulate all splices, taps and connections for lighting and receptacles with U.L. labeled gauge plastic tape or molded composition caps.

C. Splices shall not be made except where called for by the Drawings, or where specifically permitted by the Owner. Where splices are permitted, they shall be made in a neat, workmanlike and approved manner by those specialized in this class of work, close attention being paid to all splices with particular attention to splices on higher voltages. Splices shall be made by the Contractor for each type of wire or cable in accordance with instruction issued by Cable Manufacturers and the Owner. Before splicing, insulated cables shall have conductor insulation stepped and bound or penciled for recommended distances back from splices to provide a long leakage path. After splicing, insulation equal to that on the spliced conductors shall be applied at each splice. In baring conductors for splices, care shall be taken to avoid nicking strands.

3.9 CONDUCTOR CIRCUITING

A. Lighting, Receptacles and Special Circuits:

- 1. Lighting circuits: provide lighting arrangement as shown or 15 amperes maximum per circuit where not otherwise shown.
- 2. Receptacle circuits: provide five (5) convenience outlets maximum per circuit unless otherwise shown or specified.
- Special receptacle circuits: provide as indicated on Drawings and as specified under special items of equipment and provide separate green conductor for grounding receptacles to panel ground bus.
- 4. Exits and emergency lighting circuits: install in separate conduit system and circuit to emergency panel, as shown on Drawings.
- 5. Fire alarm and detection circuits: install in separate conduit system.

B. Communications:

- 1. Provide all conduit, wireway, wire terminations, etc., necessary to provide for functions specified:
 - a. All wiring shall be installed in conduit unless specified otherwise.
 - b. Cross-sectional area of all telephone and television cabling installed in a conduit shall not exceed percentage of the cross-sectional area of the conduit as scheduled.
 - c. Cross-sectional area of all computer cabling installed in a conduit shall not exceed 20% of the cross-sectional area of the conduit.
 - d. Provide a separate circuit power supply for each system.
 - e. Refer to Division 27 for additional requirements.

C. Power and Control Circuits:

1. General Requirements:

- a. Provide all power wiring. Install in conduit and make all connections to disconnect switches, motor controllers, motor and other items of electrical equipment shown on Drawing details and schedules.
- b. Provide control wiring only as shown on electric equipment schedule and plan details. Install in conduit and make connections to motors, motor controllers, control devices, etc., including the mounting of all control devices furnished by others.
- c. Verify exact location and rating of all motors, controllers, control devices, etc., with other Contractors before roughing.
- d. Power and control wiring may be combined in common conduit by increasing conductor or conduit sizes as required by Code.
- e. Provide minimum working clearances as required by NEC Article 110.16 and as shown on the Drawings.

2. Wiring Diagrams:

- a. Any wiring diagrams shown on Drawings for hookup of equipment furnished by others, are approximate and are for bidding purposes only.
- b. Obtain wiring diagrams, certified correct for the job, from respective Contractor for all equipment and systems furnished by them.
- c. Install all work in accordance with certified wiring diagrams.

3. Control Devices:

a. Do not accept control devices from other Contractors unless they are properly tagged and furnished with circuiting information.

3.10 CONDUITS

A. General:

- 1. Securely support conduit from building construction, separately from outlets and boxes which are secured to the building. Supports shall be spaced at intervals of eight (8) feet maximum or as required by NEC Code.
- 2. Conduit runs shall be concealed unless otherwise specified. Do not expose in finished room unless specifically permitted.
- 3. Conduit runs shall be exposed in electrical, mechanical and fan rooms.
- 4. Conduit runs shall be installed neatly and parallel to ceilings, walls, and floors.
- 5. All conduits and fittings on exposed work shall be secured by means of metal clips on back plates.
- 6. Avoid installation adjacent to hot surfaces. Raceways shall be spaced from heat sources as follows:

- a. Steam: no conduit within 12 inches of outside surface of insulation.
- b. Hot water piping: six (6) inches minimum from outside surface of insulation.
- 7. Provide one (1) pull box or junction box per three (3) 90° bends in any one (1) conduit run.
- 8. Plug openings until wire is installed and ream conduit joints and ends before installation. Wires shall not be pulled until conduit system is completed in all details.
- 9. Conduits feeding panelboards; pull boxes:
 - a. Terminations at each pullbox, panelboard and switch board shall have double locknut (one (1) inside and one (1) outside).
 - b. Provide a minimum of two (2) 1 inch conduit stubs from each flush mounted panelboard to an accessible ceiling space above the panel, in an adjacent area or at the ceiling line.
- 10. Conduit terminating in gasketed enclosures shall be terminated with conduit hubs or Myers hubs.
- 11. Avoid installing conduits in water or where excessive moisture exists. For conduits terminating to boxes in wet areas, use Myers hub fittings.

B. Aluminum Conduit:

- 1. Use in dry locations for concealed or exposed work.
- 2. Do not install in direct contact with concrete or earth.
- 3. Provide expansion joints in runs at maximum 120 feet intervals in the run.

C. EMT:

1. Use in dry locations for concealed or exposed work.

D. Liquidtight Conduit:

- 1. Use for terminating connection for motors, compressors, air conditioners, sound equipment and dry type transformers.
- 2. Provide proper fittings with insulated throats. Provide green wire ground.
- 3. Use Liquidtight conduit and fittings in outdoor locations and in pump rooms, garages, elevator pits and other locations subjected to moisture.
- 4. Use for all motor transformer terminations and other equipment where vibration is present.

E. Flexible Metal Conduit:

- 1. Install as terminating connection for motors, compressors, air conditioners, sound equipment and dry type transformers in dry areas as shown or scheduled.
- 2. Install green wire ground in all flexible conduit.

F. RGS:

- 1. Use in dry locations for concealed or exposed work where shown.
- 2. Use in or under concrete pours.
- 3. Use where exposed to weather.
- 4. Where run in earth and below slab on grade, encase conduit in $1\frac{1}{2}$ " concrete envelope unless otherwise noted.
- 5. Use where noted on Drawings.

G. PVC/PRGS:

1. Use for underground ductbank systems, street lighting, and where direct burial in earth (concrete encased) is noted unless modified elsewhere in these specifications.

3.11 CABLE LUBRICATION AND LUBRICANT

- A. The cable jacket and/or conduit walls shall be completely lubricated when cable is pulled into conduit. The lubricant shall be applied immediately before or during the pull.
- B. Minimum quantities of lubricant are as follows:
 - 1. 1 quart of lubricant per 100 feet of 1 inch conduit.
 - 2. 2 quarts of lubricant per 100 feet of 2 inch conduit.
 - 3. 3 quarts of lubricant per 100 feet of 3 inch conduit.
 - 4. 1 gallon of lubricant per 100 feet of 4 inch conduit.
- C. This quantity shall be increased as needed for difficult pulling situations (high temperatures, multiple bends, poorly placed conduit, etc.)
- D. Cable attachments for pulling shall be patent cable grips, or other devices subject to the Owner's approval. In using woven basket type grips on covered cable, care shall be taken to avoid damage to the cable and seal, which shall be marked up and maintained during cable installation. Difficult pulling is not anticipated; if unduly difficult pulling occurs, the Contractor shall check pull required and suspend further pulling until further procedure has been approved by the Owner. Maximum pull tension shall not exceed recommended value for the cable when measured by tension dynamometer.
- E. Cable pulling during low temperatures is subject to review by the Owner and shall be discontinued when, in the Owner's and Engineer's opinion, the cable may be damaged.

F. The Contractor shall keep records of all cables pulled, meggered and terminated. Exact lengths of cables installed shall be supplied to the Owner.

3.12 CONDUIT FITTINGS

A. EMT:

- 1. Provide EMT connector and nylon bushing at all EMT plain end terminations for power, CATV, communications and computer.
- 2. Use set screw type, concrete tight indoors, dry locations.
- 3. Use compression connectors, squeeze type in wet locations.

B. RGS:

- 1. Provide galvanized steel locknuts at each termination unless hubs are used.
- 2. Use sealing locknuts for all wet/damp areas.
- 3. Use grounding type locknuts for rigid terminations not equipped with grounding bushings.

3.13 CONDUIT HANGERS

A. General:

- Investigate thoroughly, Architectural and Shop Drawings related to work, to determine how equipment, fixtures, piping, ductwork, etc., are to be supported, mounted, or suspended. Provide extra steel, bolts, inserts, pipe stand brackets, or any other items required for proper support. Provide supporting accessories where required, whether or not shown on the Drawings. Where directed, furnish Drawings showing supports, etc., for approval.
- 2. Conduit hanger rods in areas where hot dipped galvanized conduit is installed shall be galvanized steel, sprayed with one (1) coat of Rustolium paint.
- 3. Size support member within load rating of member section and without visible deflection.
- 4. Mount conduit on top of support member unless space considerations prevent installation; use conduit clamps.
- Provide channels for racking up conduit, trapeze, suspensions, cable racks, panel racks, etc., as shown and as required and provide poured-in-place inserts for supporting channels.

B. Conduit Clamps:

1. Single conduits shall be supported by means of one-hole pipe clamps in combination with one-screw back plates to raise conduits from the surface.

C. Trapeze Hangers:

1. Multiple runs of conduits shall be supported by means of trapeze hangers, keeping conduits as high as possible with minimal beads and offsets in height.

3.14 ACCESS DOORS

A. Provide where indicated and where required for access to all equipment. Size 16"x 24" unless otherwise noted. It is to be noted that various type frames are required for specific wall and ceiling finishes. Any door having an area exceeding 324 square inches shall have two (2) camlocks. Employ and pay General Contractors for installation. Milcor or approved equal.

3.15 SURFACE RACEWAYS

A. Surface Raceways:

- 1. Blank cover raceways shall be provided where shown, or as approved in advance by the Engineer.
- 2. Secure to structure at five (5) feet intervals.
- 3. All surface boxes to be independently secured to structure.
- 4. Provide separate green grounding wire within each surface raceway and extend back to ground of serving panelboard.
- 5. Paint all raceways to match adjacent walls.

B. Pre-Wired and Multi-Component Raceway:

- 1. Install in strict accordance with manufacturer's instructions.
- 2. Raceway shall be cut to a smooth, even surface.
- 3. Connectors shall be installed at feed points in the base or in the end cap fitting.
- 4. Raceway base section shall be fastened to wall via drilled holes (screws not provided). Fasteners shall be installed 1" from end of each section, then approximately every 16".

3.16 WIRE WAYS AND WIRE TROUGHS

- A. Install so all covers can be easily removed.
- B. Install straight and level.
- C. Use only hangers designed for equipment, support to meet NEC.
- D. Punch openings where knockouts are not present.
- E. Do not exceed code fill, increase conductor size as required by NEC.

F. Do not use for large conductor or primary voltage pull of splice boxes.

3.17 RECEPTACLES

- A. All devices shall be mounted within a steel box.
- B. All receptacles shall be mounted with box aligned in a vertical direction with ground slot at bottom of receptacle. In those areas where vertical space is not available such as under fin radiation, cabinets and above backsplash, mount horizontally with ground slot at right.

3.18 WALL PLATES

- A. Submit samples as requested by Architect/Engineer.
- B. Provide special plates fabricated for devices shown ganged together at one (1) location and provide special engraving for switch plates covering special utility switches as shown on Drawings.
- C. Special finish plates will be required where so noted on Drawings or included in Specifications. Sample of finishes will be furnished to Architect/Engineer for approval when so requested.
- D. Provide blank matching cover plates for outlets not used.
- E. Cover plates for telephone, dimmer controls, etc., shall match device plates in each area.

3.19 OUTLET, JUNCTION AND PULLBOXES

- A. Flush recessed wherever possible and securely supported from building construction.
- B. Where outlet boxes are installed in exposed block walls, locate at corner of block. Locate conduit as required to meet block conditions. Coordinate with other Divisions.
- C. Identify junction boxes for particular service such as power, lighting, fire alarm, etc. Label with suitable tags or use stencil lettering.
- D. Locate where shown or required for outlet facilities and where shown or required for installing wire or cable. Make accessible after completion of construction; Electric Contractor shall be responsible for coordination with other divisions. Junction and pullboxes shall not be located in finished room unless specifically permitted.
- E. Mounting height of boxes shall be as scheduled.

3.20 PREVENTION OF CORROSION

- A. Protect all metallic materials against corrosion.
- B. Aluminum shall not be used in contact earth nor embedded in concrete. Where connected to dissimilar metal, protect by approved fittings and treatment.
- C. Hot dip galvanize all ferrous metal materials such as bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, washers and miscellaneous parts which are not made of corrosion-resistant steel. Use stainless steel fasteners in wet locations and out of doors.
- D. Galvanized in accordance with ASTM A-123 or A-153.
- E. Install and protect that which is factory galvanized. That which is modified in the field shall be cold galvanized on site.

3.21 PAINTING

A. General Requirements:

- 1. Painting shall be provided as outlined hereafter.
- 2. Clean all surfaces of moisture, rust, plaster, dirt, dust, and foreign matter before painting.
- 3. Apply full even coats as required to provide acceptable finish.
- 4. Apply finish coat just before final acceptance.
- 5. Protect all other surfaces with drop cloths, masking tape, etc.
- 6. Protect equipment and internal parts with masking tape.
- 7. Factory enamel-finished equipment not to be painted, EXCEPT when rusted or otherwise damaged; then paint as directed or if specifically called for hereinafter.
- 8. Appearance to be approved; repaint if required.
- B. Paint all work of this division in the following areas:
 - Boiler Room, Mechanical Equipment Rooms, Electrical Equipment Rooms, Penthouses,
 Fan Rooms, all work of this Contract exposed to the weather, and where specifically called for:
 - a. Bare pipes, conduit, supports, all supports, mounting boards/panels, metal jackets, etc., also paint equipment not supplied with factory finished surface:
 - i. First Coat: Pratt and Lambert "Effecto" primer unless equipment supplied with factory prime coat.
 - ii. Second Coat: Pratt and Lambert "Effecto" enamel.
 - iii. Color as selected by Engineer/Architect.

iv. Additional coats as required.

3.22 WATERPROOFING, CAULKING AND SEALING

A. Opening Through Roofs:

- 1. Provide with nonferrous flashing pieces, skirts, hoods, and collars as required to make all ducts, pipes, and conduit watertight, and installed as approved by Architect/Engineer.
- 2. Where curbs are required as part of this Division for rectangular openings in new roofs, flashing will be done by others unless specifically indicated otherwise.
- 3. For existing roofs, provide all flashing for roof curbs and all other roof openings.
- 4. Caulked and waterproofed, with additional material as required, seal airtight.

B. Opening Through Fire/Smoke Walls and Floors:

- 1. Install work per NFPA.
- 2. Provide sleeves for ducts and pipe anchor duct sleeves with angle iron.

3.23 TESTS

A. General:

- 1. Perform all operations required for the complete testing of all systems, equipment and related work as shown on Drawings or specified herein and in accordance with all applicable requirements of the Specifications.
- 2. Before final acceptance, all specified tests shall be completed to the satisfaction of the Engineer or his representative, who shall be sole judge of the acceptability of such tests and who may direct the performance of any such additional tests as he deems necessary in order to determine the acceptability of the systems, equipment, material, and workmanship. Any additional tests required by the Engineer will be made at no additional costs to Owner.
- 3. All protective equipment shall be actuated in a manner that clearly demonstrates their work ability and operation.
- 4. Demonstrate the ability of each and every piece of equipment to meet the design and operating requirements indicated on the Drawings.
- 5. The inspection and test by the Owner or Engineer of any articles or lots thereof, or failure to inspect and accept or reject any article or lots thereof, shall not relieve the Contractor from any responsibility regarding defects or other failure to meet the Specification requirements which may be discovered prior to final acceptance. Except as otherwise provided in the Specification, final acceptance shall be conclusive except as regards any latent defects, fraud, or such gross mistakes as amount to fraud.

6. Acceptance to the material and/or equipment and the waiving of test thereof, shall in no way relieve the Contractor of the responsibility for furnishing material and/or equipment meeting the requirements of these Specifications.

B. Test Reports:

- 1. Written test reports shall be signed by an authorized representative of the equipment manufacturer and shall be submitted to the Engineer prior to final payment. Provide test reports for the following:
 - a. Fire alarm system. Refer to Section 28 31 00.
 - b. Load test (phase balance).
- 2. Perform any and all other tests that may be required by local municipality, utility or other governing body, board or agency having jurisdiction.

3.24 SUBMITTALS/SHOP DRAWINGS

A. Submission for Engineer Review: The Owner and Engineer will accept either hard copies or electronic copies of submittals. Electronic copies are preferred:

1. Electronic Submittals:

- a. Prime Contractor shall submit one (1) electronic copy of each submittal to Engineer for review.
- b. The Engineer shall review and return the submittal in an electronic format to the Prime Contractor. All markups by the Engineer shall be in red print.
- c. The Prime Contractor shall be responsible to distribute the returned submittal to subcontractors, suppliers, vendors, etc.
- d. The Prime Contractor shall furnish color printouts of all electronic submittals for inclusion in the Operation and Maintenance Manuals.

2. Hard Copy Submittals:

- a. Prime Contractor shall transmit a minimum of eight (8) copies of each submittal; submit additional copies where required by the Prime Contractor.
- b. The Engineer will retain two (2) copies and the Owner will retain one (1) copy. The remaining balance will be returned to the Prime Contractor. Four (4) copies shall be retained by the Prime Contractor for inclusion in the Operation and Maintenance Manuals.
- c. The Prime Contractor shall be responsible to distribute the returned submittals to subcontractors, suppliers, vendors, etc.

- B. Post copies of all submittals at temporary field office.
- C. Quality and Legibility:
 - 1. Electronic Submittals:
 - a. Electronic submittals shall be digitally produced directly from the manufacturer. Scans of catalogs, faxes, etc., will not be accepted.
 - b. Contractor markings to electronic submittals must be made electronically.
 - c. Contractor cover sheets may be scanned and must meet the legibility requirements of hard copy submissions.
 - d. No exceptions shall be permitted.
 - 2. Hard Copy Submittals:
 - a. Shop Drawings and catalog material shall be manufacturer's original printed copies, photocopies or scans which are indistinguishable from the originals. Faxes or photocopies of faxes shall not be reviewed by the Engineer. Photocopies of colored brochure material, wherein the content of the copy does not match the content of the original, shall not be reviewed by the Engineer. The University has directed the Engineer in this regard. No exceptions shall be permitted.
- D. Submittals shall contain:
 - 1. The date of the submission and the dates of any previous submission.
 - 2. The project title and number.
 - Contract identification.
 - 4. The names of:
 - a. Contractor.
 - b. Supplier.
 - c. Manufacturer.
 - 5. Identification of the product, with the specification section number.
 - 6. Field dimensions clearly identified as such.
 - 7. Relation to adjacent or critical features of the work or materials.
 - 8. Applicable standard, such as ASTM or Federal Specification numbers.
 - 9. Safety Data Sheets (SDS).
 - 10. Identification of deviations from Contract Documents.
 - 11. Identification of revisions on resubmittals.
 - 12. A 5"x 3" blank space for Contractor and Engineer stamps.

E. Shop Drawings - Provide Shop Drawings for each product to be utilized on the project. Shop Drawings for equipment shall include detailed and dimensional literature and catalog data showing detailed compliance with the Contract Documents. Shop Drawings shall include a copy of the manufacturer's printed installation instructions for the equipment proposed. Shop Drawings for electrically energized equipment shall show all electrical characteristics and interconnection requirements.

F. Engineer's Action:

- 1. The Engineer shall return copies of the Shop Drawings marked as follows:
 - a. "Reviewed for General Compliance Only No Exception Taken" Drawings bearing this comment have been found to be generally in conformance with the intent of the Plans and Specifications.
 - b. "Reviewed for General Compliance Only Make Noted Corrections" Drawings bearing this comment have been found to be generally in conformance with the intent of the Plans and Specifications, with the exception of the noted items. A resubmittal to the Engineer is not required and it is understood the Contractor will make the noted corrections.
 - c. "Reviewed for General Compliance Only Revise and Resubmit" Drawings bearing this comment have been found to contain a substantial departure from the Plans and Specifications. The Contractor must make a new corrected submittal.
 - d. "Reviewed for General Compliance Only Rejected" Drawings bearing this comment depict materials, equipment or supplies which are not judged by the Engineer to meet the requirements of the Plans and Specifications. The Contractor shall provide a new submittal on alternative equipment.
 - e. "Reviewed for General Compliance Only Not Reviewed; Returned" Submittals bearing this comment have not been reviewed and are returned to the Contractor.
 - f. "Reviewed for General Compliance Only Additional Submittal Required" Submittals bearing this comment have been found to be generally in conformance with the intent of the Plans and Specifications; however, more information is required, and a resubmittal is required.

G. Samples:

1. The Contractor shall, when required, submit to the Engineer for review, typical samples of materials equipment and products. The Samples shall be properly identified by tag and shall be submitted sufficiently in advance of the time when they are to be incorporated into the work so that rejection thereof will not cause delay.

3.25 OPERATION AND MAINTENANCE INFORMATION

- A. Prepare copies of an Operation and Maintenance Manual and submit to the Engineer for approval. The number of copies of the Operation and Maintenance Manual shall be one (1) electronic and two (2) hard copies.
- B. The Operation and Maintenance Manual shall be bound in a 3-ring binder. The binder shall be a view binder with clear vinyl panels on cover and spine, as available at Office Max or other office supply stores. On the spine of the manual mark the project number, the name of the building, the name of the project, the words "O&M Manual" and the trade (plumbing, HVAC, electric, etc.), in letters ½" to ½" high. On the cover provide similar information. It is the intent of this paragraph to require O&M Manuals to be identifiable while stored in a bookshelf. Stick-on labels are not acceptable. Contractor names on spine of binders are not acceptable.
- C. The first page of the O&M Manual shall be a cover sheet listing the Contractor, Contractor's address, contact person, telephone and fax number, and the same information for major subcontractors. Identify the name and contact person of the Engineer, Architect, and project manager.
- D. The second page of the O&M Manual shall be a typed guarantee from the Contractor with a one (1) year guarantee stated as commencing on the date of final acceptance. Identify this date.
- E. The third page of the O&M manual shall be an index sheet listing the type of equipment (e.g., "switchgear"). The vendor or distributor (e.g., "Elect Sales Co Inc."), the contact person (e.g., "John Smith") and the phone and fax number. This information shall be provided for each source of supply or subcontractor used on the Contract.
- F. The remaining pages in the Manual shall include tabs for sections. Each section shall be a Specification section of type of equipment installed under the contract. It shall include information on each replaceable part, valve, and appurtenance and on each item capable of requiring lubrication, maintenance, or adjustment.
- G. Each tab section shall include the following:
 - 1. Original approved Shop Drawing.
 - 2. Manufacturer's O&M information.
 - 3. Parts list.
- H. The Operation and Maintenance information for each item shall include a copy of the accepted Shop Drawing, plus all manufacturer's printed installation, operation, and maintenance instructions. Photocopies of manufacturer's information are not acceptable. Only original manufacturer's catalog and O&M information is acceptable. Delete information not specific to this project and highlight by arrows the specific parts furnished under the project.

- I. In each manual, provide spare parts lists and directories for all equipment.
- J. In each manual provide a photocopy of all test reports, electrical, plumbing, or other inspections, fire system test reports and any other data test or certification data.
- K. Compilation of Shop Drawings only is not considered an adequate Operation and Maintenance Manual and will be returned to the Contractor for re-submission.
- L. The Contractor shall include a completed copy of the O&M Manual checklist which follows this section as the last page of the O&M Manual.

3.26 INSTRUCTION OF OWNER'S DESIGNATED REPRESENTATIVE

- A. After submission and acceptance of the Operating and Maintenance information and prior to final acceptance of the Project, provide a scheduled instruction period for the Owner's designated representative. Instruction period shall be sufficient to cover the contents of the Operating and Maintenance portfolio, a walk-through of the Project and a review of all systems.
- B. At the conclusion of the instruction period, provide approved copies of the accepted Operation and Maintenance Manual to the Owner's representative and obtain a signed receipt.

3.27 GUARANTEE

- A. Prior to application for final payment, the Contractor shall provide a written guarantee covering all portions of the work of this Division. The guarantee shall include all work and materials for a period of one (1) year from the date of final acceptance. The guarantee shall provide for the repair or replacement of any defective equipment, materials, products, or work at no cost to the Owner.
- B. Items or work which are repaired or replaced under this guarantee shall be covered under an extended guarantee by the Contractor so that the replaced products or work shall have performed satisfactorily without repair or replacement for a period of one (1) year.
- C. The failure of any manufacturer to provide a one (1) year warranty, or the failure of any manufacturer or vendor to honor a warranty shall not relieve the Contractor from his obligation to provide a complete parts and labor guarantee on all work provided under his Contract for a period of one (1) year.
- D. Supplemental Guarantees Supplemental Guarantees and extended warranties may be included under this Contract as part of specific specification sections.

3.28 GUARANTEE PERIOD

- A. During the guarantee periods, the Owner may respond to emergency situations. Emergency situations for the purposes of this section are those situations determined to be potentially harmful to the surrounding personnel, equipment, or environment. In cases where work is performed by the Owner's employees, the Contractor will be charged for all labor and material needed to complete emergency repairs, if the repairs are determined to be the result of faulty material or workmanship. The performance of these repairs by the Owner shall not void any Contractor guarantee.
- B. The act of the Owner in responding to any emergency situation shall not relieve the Contractor from the obligation of responding to the emergency and from correcting any problems as part of the original Project cost.
- C. The Owner shall begin preventive maintenance programs immediately following final inspections. Preventive maintenance activities will not relieve Contractor from any equipment warranties.

3.29 AS-BUILT DRAWINGS

- A. Maintain a dedicated set of Construction Drawings at a protected location at the Job Site for the recording of actual installed locations of piping, ductwork, equipment, and accessories. Record exact locations of underground piping and structures. Record any and all variations from the original Construction Drawings in neat, legible hand drawn lines and text. Attach copies of field sketches and Engineer's supplementary instructions where they occur.
- 3. Keep an accurate record and show on As-Built Drawings the actual installed location of any concealed work such as underground piping and under-slab piping, valves in crawl spaces, etc. Provide location on As-Built Drawings for outside services by indicating actual dimensions from fixed reference points which will be available after completion of construction. "Tie" two (2) dimensions from different reference points to confirm locations of concealed work. Indicate top and bottom elevations, and station number of any utilities crossed as part of this work.
- C. Drawings: Legibly mark to record actual construction:
 - 1. Depths of elements in relation to other existing facilities.
 - 2. Horizontal and vertical locations of utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Field changes of dimensions and detail.
 - 4. Changes made by Supplemental Instruction or by Change Order.
 - 5. Details not on original Contract Drawings.

D. Provide the original copy of the As-Built to the Engineer for review and reproduction by the Engineer. Provide the original copy to the Engineer for the Owner with one (1) photocopy for the Engineer's files. The Contractor shall retain a second photocopy to be retained by the Contractor. The Contractor shall be responsible for the safe keeping and maintenance of the As-Built throughout construction, and for maintenance of one (1) photocopy at the Contractor's office for a period of not less than one (1) year following final acceptance. The Contractor shall mark each Drawing his submittal "As-Built" with the date of submission, the name of the firm and the signature of the preparer.

3.30 EXAMINATION OF ACTUAL CONDITIONS

- A. Before ordering any material or doing any work, the Contractor shall verify all measurements at the site and shall be responsible for the contingencies which may be encountered. No extra compensation will be allowed on account of a difference between actual dimensions and measurements at the site and those indicated on the Drawings. Any difference which may be found shall be submitted to the Engineer for consideration before proceeding with the work.
- B. Contractor shall work accurately to benchmarks and to proper elevations and dimensions established by the Contractor. Contractor shall check conditions and details of the work in relation to the progress of the work.
- C. The Contractor shall lay out the work, establishing heights and grades for all piping work included in these Specifications in strict accordance with the intent of the Drawings, the physical conditions of the Project and the finished site grades. He shall be responsible for the accuracy of the work and that the work meets all physical conditions of the Project and the requirements of these Specifications.
- D. Prefabrication of piping, conduit, etc., may be performed only at the risk of the Contractor. Changes to prefabricated piping required by actual site conditions shall be made by the Contractor without extra compensation from the Owner.
- E. Due to the scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc., which may be required. Make all such changes in piping, location of equipment, etc., to accommodate work to obstacles encountered, at no increase in compensation. If requested, submit at least five (5) copies of Drawings detailing all major deviations or changes. All changes must be approved before installing.
- F. Plans show general arrangement of piping and connections. Install work substantially as indicated. Verify exact locations and elevations on job.
- G. Thoroughly coordinate work with that of other Contractors.

- H. Should either Engineer's details, field conditions, a change in equipment or Shop Drawing information necessitate an important rearrangement, report same to Engineers and obtain approval before proceeding.
- I. No compensation shall be awarded for extra work because above precautions have not been followed. In event of conflicts, Engineer's decision is final. Contractor shall be fully responsible for unauthorized changes.

O&M Manual Checklist	t	Date_	
	(Include completed copy of	this Checklist in O&M Man	ual when submitted)
Project		Trade	
,	•		
Project Name			
,			
Submitted as an electro	onic file per Section 01 78 23		YES / NO
	•		
Composite electronic P	DF file		YES / NO
Minimum readable tex	t size		YES / NO
Title page "Recognize 7	Text" turned on for all scanned	I documents	YES / NO
O&M Manual:			
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<u>Contractor</u>		Each Major Subcontra	ctor
Contractor Name		Contractor Name	
Contractor's Address		Contractor's Address	
Contact person		Contact person	
Tel. & Fax #'s		Tel. & Fax #'s	
<u>Project Manager</u>			
Name			
<u>Engineer</u>		<u>Architect</u>	
Name		Name	
Company Name		Company Name	
Contact person		Contact person	
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0&M N	Manual - Remaining Pages:		Checklist Page 2
0&M N	Manual Project Guarantee & Warranties:		
	guarantee from Contractor with 1 year guarantee date of final acceptance by the University.	stated as commencing Date must be identified	
Hyperli	nks to any special warranties included in Equipme	ent Specifications	YES / NO
 1. 2. 3. 4. 5. 6. 7. 	Organized by CSI Specification Section number. Each CSI Specification Section included. Includes final submittal, updated to contain A/E Includes any special Contractor or manufacturer Includes the Installation, Operation and Mainter manuals for each piece of equipment, up to date version of equipment supplied. Includes IOM data for accessory data. Includes test reports for each piece of equipment	warranty. nance (IOM) e for the	YES / NO
Scan of Scan of Scan of Scan of Scan co instruct	f spare parts list. f all test reports (i.e., fire alarm). f all inspections (i.e., plumbing, electrical). f all certification data. f facility lubrication chart. f facility valve chart. ppy of complete temperature control and operations. eted copy of checklist last page of O&M Manual.	 ng	

END OF SECTION 26 05 00

SECTION 26 05 15 - TEMPORARY CONSTRUCTION ELECTRICAL SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Drawings and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections apply to the work of this Section.
- B. The Work of Section 26 05 00 Electrical Basic Materials and Methods applies to the Work of this Section.
- C. The Work of Section 28 31 00 Fire Alarm System Improvements applies to the Work of this Section.

1.2 WORK INCLUDED

A. Provide temporary construction electrical service for the duration of the project.

1.3 RELATED WORK NOT INCLUDED

A. Other Division 26, 27 or 28 requirements may be requested by the Construction Manager and are not covered by this Section.

1.4 TEMPORARY ELECTRICAL SERVICE

- A. At the onset of demolition, coordinate with the General Contractor and provide a temporary electrical power supply for Contractor's use for illumination, hand tools and equipment. Provide temporary on site electrical generator whenever the building electrical service to an area is interrupted due to construction activities.
- B. Fasten to building in grout with drop-in anchors.
- C. Construction power will be distributed through the building using Contractor provided cable. It is allowed to connect to the existing power feeders at panelboards.
- D. Arrange all outages with the Owner with a minimum of two weeks' notice. Outages shall be coordinated with the Construction Manager.
- E. Drop-in anchors shall be removed and holes in grout filled when the temporary service is removed.

1.5 TEMPORARY LIGHTING

A. Provide a temporary lighting system suitable for use of all contractors during construction. Division 26 shall assume temporary lighting requirements extend only to the indoor portion of the project and the GC shall make arrangements for any outdoor lighting system requirements.

1.6 SUBMITTALS

- A. Provide detailed Plan for:
 - 1. Electrical service.
 - 2. Fire alarm.

PART 2 - PRODUCTS

2.1 ELECTRICAL SERVICE

A. Provide products conforming to Specification Section 26 05 00.

2.2 FIRE ALARM

A. Provide products conforming to Specification Section 28 31 00.

PART 3 - EXECUTION

3.1 TEMPORARY ELECTRICAL SERVICE

A. Conform installation to all requirements of the NEC.

END OF SECTION 26 05 15

SECTION 26 05 26 - GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Documents and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections apply to the Work of this Section.
- B. The Work of Section 26 05 00 Electrical Basic Materials and Methods applies to the Work of this Section.

1.2 WORK INCLUDED

- A. Provide a complete, operating, tested, functioning, documented grounding system including all work shown, specified, or required for proper system operation.
- B. All grounding and grounding circuitry shall equal or exceed the requirements of NEC, latest issue, Article 250.
- C. The raceway system which includes all metal conduit, wireways, pullboxes, junction boxes, bus ducts, built-up enclosures, 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.
- D. In addition to the raceway system ground, an additional green wire ground shall be run in each raceway, sized for the largest circuit in the raceway.

1.3 DEFINITIONS

- A. Earth: Interpreted as absolute ground, a theoretical location of zero electrical potential.
- B. Ground: Interpreted as a made conducting connection to earth by employing such devices as a driven metal rod, a buried metal plate, a metallic water pipe, etc., or any multiple or combination of these devices, and the conductors which may interconnect any of the foregoing.
- C. System ground: Interpreted as a low impedance made conducting ground plane or system, with a conducting connection to ground, established for the benefit of a particular electrical system or related systems.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. All exposed grounding conductors such as bars, straps, cables, flexible jumpers, braids, shunts, etc., shall be bare copper unless specifically noted or approved otherwise.
- B. Cable size shall be as required by NEC Code, Section 250, stranded, soft drawn or soft annealed, unless otherwise shown on plans or specified.
- C. Cable insulation type and color shall be as shown or as specified.
- D. Manufacturer to be same as specified in Section 26 05 00 Basic Materials and Methods.

2.2 GROUND RODS

- A. Rods shall be solid cylindrical, sectionalized as required and 3/4" minimum diameter, minimum 10 feet long.
- B. Material shall be solid copper or copperclad steel approved for use intended.
- C. Copperweld or approved equal.

2.3 CONNECTORS, CLAMPS, TERMINALS

- A. Mechanical connectors and clamps shall be silicon bronze.
- B. Solderless compression terminals shall be copper, long-barrel, two-bolt.
- C. Make: Anderson, Burndy, Penn-Union, T&B, approved for use intended.

2.4 SOLDER

A. Solder shall be prohibited for connections, except for high voltage cable metallic tape shields.

2.5 MOLDED FUSION WELDS

A. Process shall be "Cadweld", "Metalweld", or "Thermoweld".

2.6 HARDWARE

- A. All hardware shall be silicon bronze alloy.
 - 1. Make: "Durium" or "Everdur".

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Bare copper bars, cables, fittings, etc., shall not be installed in cinder fill nor shall be covered with soil containing cinders or other corrosive material.
- B. Cables shall be installed with enough slack to prevent breaking stresses.
- C. All grounding conductors subject to mechanical damage shall be protected by rigid steel conduit or other suitable steel guards and in all cases where so protected shall be permanently and effectively grounded to said enclosure at each end of its length.
- D. Where grounding conductors pass through floor slabs, walls, etc., and are not encased in metal conduit, they shall be sleeved in fiber, or approved non-metallic conduit.
- E. The length, number, spacing, and location of ground rods shall be as shown on the drawings and as specified hereinafter.
- F. The depth to which ground rods are driven shall be as shown on the drawings, or as specified, or to refusal.
- G. Connections to water pipes, including water meter or other similar device bypass connections, shall be made only after the surface of the pipe at the point of connection has been thoroughly cleaned and brightened and immediately prior to actually making the connection the contact surfaces are to be coated with Vaseline or "NO-OX-ID-A Special."
- All equipment ground bus, ground pads, frames, enclosures, etc., shall have surfaces at point of connection thoroughly cleaned and brightened just prior to actually making the connection.
 Touch-up damaged painted surfaces.
- I. Splices in wire or cable grounding conductors are prohibited.
- J. Where connections between ground rods and conductors are intended to be buried, the connection between shall be a molded exothermic fusion weld.

3.2 INSTALLATION, RACEWAY SYSTEMS

- A. All metal supports, cable trays, messenger cables, frames, brackets, races, etc., for any part of 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, the size of the bonding conductor in accordance with NEC Table 250.66.
- B. 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 where required by NEC.

- C. Conduit which runs to or from all 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 sized in accordance with NEC Table 250.122 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.
- D. Conduit expansion joints and telescoping sections of metal raceways shall be provided with bonding jumpers sized in accordance with NEC Table 250.122.
- E. Where flexible metallic conduit or liquid tight conduit is used, a bonding jumper shall be provided, sized in accordance with NEC Table 250.122.
- F. All non-metallic runs of conduit or raceway shall be provided with a system ground conductor sized according to Table 250.122.
- G. Where conduit enters or leaves any electrical enclosure with removable cover plates, provide conduit grounding bushings and bonding jumpers sized in accordance with NEC Table 250.122 between the grounding bushings and the enclosure rigid frame or ground bus.
- H. The ground conductors contained in the interstices of interlocked armor cable shall be connected to ground at every splice and termination point.

3.3 INSTALLATION, ATTACHMENT TO STRUCTURAL STEEL

- A. Location of attachment bonds of ground conductors shall be at points not subject to mechanical damage, but, if possible, where accessible for inspection.
- B. Attach preferably by molded fusion welding process.
- C. Where welding is prohibited, attach by bolting, 7/16" hole in steel, %" silicon bronze bolt, bolt end peened, steel surface bright and flat prior to bolting, just prior to bolting contact surfaces lightly coated with Vaseline or "NO-OX-ID-A Special."

3.4 GROUND ROD CONNECTION

A. Unless otherwise shown on drawings or specified, all below grade connections shall be by molded fusion welding process, all molds shall be new and unused at start of work and shall be replaced when worn or broken, and the use of crossover molds is prohibited.

3.5 INSTALLATION, SECONDARY ELECTRICAL SYSTEMS

- A. The neutral conductor of each and every low voltage, single or polyphase, system or distribution system, except special isolated double insulated systems, shall be solidly connected at one point only; at the main secondary switchgear; to system ground and shall be sized for current carrying capacity, not to be less than the following, which are listed in preferential order:
 - 1. As shown or specified.

- 2. As required by NEC, latest issue, Table 250.122.
- 3. Not less than 25 percent of the transformer full load current or main protective device rating, whichever is greater, based on NEMA standard bus size.
- B. Provide equipment grounding conductor, green colored insulation, with phase conductors, to primary side of all transformers rated 600 volts or less circuited to case and secondary neutral bushing, to motors, to motor control equipment, to Kitchen equipment, to heating equipment, and to all convenience outlets, insulation shall be same type as phase conductors.
- C. Transformer secondary neutral bushings shall also to be circuited to nearest metallic water pipe, building steel or ground rod.

END OF SECTION 26 05 26

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SECTION 26 05 53 – ELECTRICAL EQUIPMENT IDENTIFICATION

PART 1 - PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Documents and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections apply to the Work of this Section.
- B. The Work of Section 26 05 00 Electrical Basic Materials and Methods applies to the Work of this Section.

1.2 WORK INCLUDED

- A. Provide a complete, operating, tested, functioning, documented Electrical Equipment Identification System including all work shown, specified, or required for proper system operation.
- B. Under this Section provide equipment and circuit identification as follows:
 - 1. Typewritten panel directories with duplicates on As-Built Drawings.
 - 2. Panelboard nameplates.
 - 3. Panelboard breaker identification tags.
 - 4. Wiring color code.
 - 5. Wiring labeling.
 - 6. Junction box marking.
 - 7. Fire alarm detection junction box color coding.
 - 8. Motor starter/disconnect/VFD nameplates.
 - 9. Conduit marking.
 - 10. Panelboard voltage marking.
 - 11. Receptacle marking.
 - 12. Fire alarm device labeling.
 - 13. Arc flash equipment marking.

1.3 SUBMITTALS

- A. Provide submittals, shop drawings and coordination drawings. Provide for the following:
 - 1. Panel.
 - 2. Switchgear.
 - 3. Motor starters.
 - 4. Disconnect.
 - 5. VFD nameplates.
 - 6. Arc flash labeling.

1.4 RELATED WORK SPECIFIED ELSEWHERE

- A. Factory produced panelboard nameplates included in Specification Section 26 24 00.
- B. Color code for conductors provided in Specification Section 26 05 00.

PART 2 - PRODUCTS

2.1 IDENTIFICATION MATERIALS

A. Legend Plates:

- 1. Two ply, 1/16" thick flexible plastic legend plates, front etched with minimum 3/16" Gothic letters. Provide adhesive backing and a minimum of two 5/32" diameter screw holes. Plate size shall be minimum 1" x 3". Multi-layer, non-conductive material, machine-engraved with proper designation.
- 2. C & M Name Shop, Syracuse, or equal.
- 3. Stick on computer printed labels shall not be accepted.

B. Stencils:

- 1. Die cut, capital letters.
- 2. Letters 3/8" minimum height.

C. Wire Markers:

- 1. Adhesive backed mylar or fabric material with printed markings.
- 2. Brady or equivalent.

D. Voltage Markers:

1. Voltage markers shall be bright orange with black letters. Brady Style B (1" by $4\frac{1}{2}$ ") or equal. Examples:

Three Phase	Single Phase	Three Phase
208 volts	240 volts	480 volts
120 volts	120 volts	277 volts

E. Receptacle Source Marker:

1. 12 point black text on white or clear background, computer printed stick-on labels.

2.2 RC FLASH LABELING

A. Provide labels on all Contractor-provided electrical equipment. Provide sample label submittal for review.

2.3 PANEL SCHEDULE

- A. All panel schedules shall be type written. Handwriting in any form will not be accepted.
- B. Panel schedules shall identify voltage of operation, rating of buss or MCB and upstream overcurrent protection device.
- C. Breakers shall be identified with their pole space, current rating and load serviced.
- D. Contractor shall provide their company name and date of substantial completion on the schedule.

2.4 FIRE ALARM DEVICE ADDRESS LABELING

A. Provide computer-printed adhesive labels for each fire alarm device. Label shall indicate the device address number for initiating devices and the loop/zone number for notification devices.

PART 3 - EXECUTION

3.1 IDENTIFICATION, GENERAL

- A. Equipment name and number as shown on drawings to be used for equipment identification.
- B. Disconnect switches, starters, control, etc., serving utilized equipment shall be labeled on front cover.
- C. Step-down transformers shall be labeled with primary/secondary voltages.
- D. Utilized equipment which does not have service voltage clearly indicated shall also be labeled by the Contractor, as directed by the Engineer.
- E. Starters or control panels with interlock shall be provided with a warning sign to indicate separate control voltage and may be energized. Warning sign shall be mounted inside enclosure.

3.2 IDENTIFICATION MARKERS

- A. Securely fastened to equipment to be identified with adhesive material and plated screws.
- B. Locate on front of equipment to be identified in neat manner, plumb and true.
- C. All power supply equipment; i.e., branch circuit breakers, equipment disconnect switches, motor starters, etc. to be labeled to identify function and/or load served.

3.3 STENCILED LABELS

- A. To be used only on equipment in unfinished areas.
- B. Obtain Engineer's approval.

C. Locate on front of equipment to be identified in neat manner, plumb and true.

3.4 WIRE MARKERS

- A. Install approximately 2" from wire ends.
- B. All wiring to be identified via labeling at all ends, in junction and pull boxes, in panelboards, at equipment terminations, at terminal boards and/or cabinets. Wiring to be identified for continuity.

3.5 PANEL DIRECTORIES

- A. Install in a manner to be legible but protected from physical damage under conditions of normal use.
- B. Room names and numbers to be referenced on directory along with load supplied.

3.6 MATERIALS TO BE LABELED

A. Directories: Update existing panelboards to include new load served.

3.7 CONDUIT IDENTIFICATION

- A. Neat ½" high black handwritten with permanent marker, block letters at 6" from entrance to panelboards, junction boxes, starters, and equipment.
- B. Use a consistent numbering scheme, separate from circuit or load numbers, start with A1 and continue through Z99, omitting the Letters D, I, L and O. Conduits shall be marked in all spaces where exposed or accessible. Mark conduit numbers inside junction boxes where conduit is not exposed or accessible.
- C. Identify conduit layout and conduit numbers on As-Built Drawings.

3.8 FIRE ALARM/DETECTION

- A. Paint junction box covers red and mark zone and function in black permanent marker on outside of junction box cover.
- B. Omit red paint on junction box covers in finished areas. Mark zone and function on inside of junction box in finished areas.

3.9 RECEPTACLE IDENTIFICATION

A. Each receptacle shall be marked with source panel and breaker number.

3.10 ARC FLASH LABELS

A. Labels shall be customized, and type written for each piece of equipment.

B. Labels shall only be installed after all painting has been completed.

END OF SECTION 26 05 53

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SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide a complete, operating, tested, functioning, documented Lighting Control System including all work shown, specified, or required for proper system operation.
- B. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational lighting control system, as described herein.
- C. Contractor/Supplier shall examine all general specification provisions and drawings for related electrical work required as work under Division 26.

1.2 SUMMARY

- A. This Section includes time switches, photoelectric relays, emergency lighting control units, daylight sensors, occupancy sensors and multi-pole lighting relays and contactors.
- B. Related Sections include the following:
 - 1. Division 26 Section 26 05 00 Electrical Basic Materials and Methods.

1.3 SUBMITTALS

- A. Product data: Include dimensions and data on features, components, and ratings for lighting control devices. Provide for the following:
 - 1. Switches.
 - 2. Dimmers.
 - 3. Contactors.
 - 4. Relays.
 - 5. Photoelectric relays.
 - 6. Occupancy sensors.
 - 7. Lighting controllers.
 - 8. Emergency light control units.
 - 9. Intelligent system wiring.
- B. Samples: Occupancy sensors for color selection and evaluation of technical features.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain lighting control devices from a single source with total responsibility for compatibility of lighting control system components specified in this Section and throughout Division 26.

- B. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use and installation conditions by a testing agency acceptable to authorities having jurisdiction.
- C. Comply with 47 CFR 15 regarding unintentional radiation emitters, Subparts A and B, for Class A (commercial, business) digital devices.
- D. Comply with NFPA 70.

1.5 COORDINATION

- A. Coordinate features of devices specified in this Section with systems and components specified in other Sections to form an integrated system of compatible components. Match components and interconnections for optimum performance of specified functions. Include coordination with the following:
 - 1. Division 26 Section "Basic Materials and Methods".
 - 2. Division 26 Section "Lighting Fixtures".
- B. Where a light control device is selected as part of a system, all components of the system must be from the same manufacturer.

PART 2 - PRODUCTS

2.1 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection Device: Include in all 120- and 277-V solid-state equipment. Comply with UL 1449, 3rd Edition and with ANSI C62.41 for Category A locations.

2.2 TIME SWITCHES

- A. Description: Solid-state programmable units with alphanumeric display complying with UL 917. Where applicable, dry contacts shall be suitable for operation in conjunction with mechanically held contactors.
- B. Description: Electromechanical-dial type complying with UL 917.
 - 1. Astronomic dial.
 - 2. Two contacts rated 30 A at 277-V ac, unless otherwise indicated.
 - 3. Two pilot-duty contacts rated 2 A at 240-V ac, unless otherwise indicated.
 - 4. Eight-day program uniquely programmable for each weekday and holidays.
 - 5. Skip-day mode.

C. Manufacturers:

- 1. Diversified Electronics, Inc.
- 2. Leviton Manufacturing.
- 3. Paragon Electric Co., Inc.
- 4. Tork, Inc.

5. Intermatic.

2.3 PHOTOELECTRIC RELAYS

- A. Description: Solid state, with single-pole, double-throw dry contacts rated to operate connected relay or contactor coils or microprocessor input and complying with UL 773A. Where applicable, dry contacts shall be suitable for operation in conjunction with mechanically held contactors.
- B. Light-Level Monitoring Range: 0 to 3500 fc, with an adjustment for turn-on/turn-off levels.
- C. Time Delay: Prevents false operation.
- D. Indoor Ceiling- or Wall-Mounting Units: Adjustable for turn-on/turn-off levels, semi-flush, calibrated to detect adequacy of daylighting in perimeter locations, and arranged to turn artificial illumination on and off to suit varying intensities of available daylighting.
- E. Indoor Skylight Units: Housed in a threaded plastic fitting for mounting under skylight.
- F. Outdoor Sealed Units: Weathertight housing, resistant to high temperatures and equipped with sun-glare shield and ice preventer.
- G. Manufacturers:
 - 1. Area Lighting Research, Inc.
 - 2. Grasslin Controls, Corp.
 - 3. Tork, Inc.

2.4 DIMMER SWITCHES

A. Incandescent:

- 1. Dimmer shall be rated for resistive use.
- 2. Provide 1000W dimmer minimum.
- 3. Make: Lutron Nova T Series, Model NT-1000.

B. Fluorescent:

- 1. Dimmer shall be either three-wire or 0-10V dimming.
- 2. Dimmer technology shall be coordinated with the ballast controlled.
- 3. Make: Lutron Nova Series, Model NF10.

C. Magnetic Low Voltage:

- 1. Dimmer shall be standard phase control, leading edge type.
- 2. Provide 1000 VA (800W) dimmer minimum.
- Make: Lutron Nova Series, Model NLV-1000.

- D. Electronic Low Voltage and Line Voltage Dimmable LED Lamped Fixtures:
 - 1. Dimmer shall be reverse phase control, trailing edge type.
 - 2. Provide 450W dimmer minimum.
 - 3. Make: Lutron Diva Series, Model #DVRP-253P-WH.

E. 0-10v Controlled Loads:

- 1. Dimmer shall provide a 0-10v based control system for the connected load. Dimmer shall be of the current sinking type.
- 2. Dimmer shall include an on/off relay to disconnect power when the lights are off.
- 3. Make: Lutron Diva Series, Model #DVSTV-WH.

2.5 KEYED SWITCHES

- A. Toggle concealed key operated type.
- B. Color selected by Architect.
- C. Specification grade, slow make, slow break.
- D. 20 amperes at 120V rating.
- E. Make: Pass & Seymour 20AC1-L or approved equal.

2.6 TOGGLE SWITCHES

- A. Switches, Local:
 - 1. Toggle operated A.C. type.
 - 2. Color selected by Architect.
 - 3. Specification grade, slow make, slow break.
 - 4. 20 amperes at 120V rating.
 - 5. Make: P&S PT20AC1 single pole, PT20AC3 three way.
 - 6. Provide with plugtail connector PTS6STR3&4.

2.7 MECHANICALLY HELD LIGHTING CONTACTORS

- A. Description: Electrically operated and mechanically held and complying with UL 508 and NEMA ICS 2.
 - 1. Current Rating for Switching: UL listing or rating consistent with type of load served, including tungsten filament, inductive and high in-rush ballast (ballasts with 15 percent or less total harmonic distortion of normal load current) without contact welding.
 - 2. The contactors shall be rated 30 amperes with 2 to 12 poles as indicated on the drawings.
 - 3. The contactors shall have an interlock that removes the power from the pickup coil and shall require application of power to release the contactor to the OFF position.

- 4. The contactors shall be capable of operating such that it will not switch to OFF during power failure to the control circuit.
- 5. The contactor shall be installed in a NEMA 1 enclosure.
- 6. 30 ampere rated contactor have finger safe terminals and normally open and normally closed poles shall be interchangeable where the installation of the pole on the contactor base determines if the pole is normally open or normally closed and not the pole itself. Contactor shall be field configurable from electrically held to mechanically held.
- 7. Control Coil Voltage: Match control power source.
- B. Contactor and Relay Manufacturers:
 - 1. Cutler-Hammer Products; Eaton Corporation.
 - 2. GE Lighting Controls.
 - 3. Hubbell Lighting, Inc.
 - 4. Square D Company; Power Management Organization.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install equipment level and plumb and according to manufacturer's written instructions.
- B. Mount lighting control devices according to manufacturer's written instructions and requirements in Division 26 Section 26 05 00 Electrical Basic Materials and Methods.
- C. Mounting heights indicated are to bottom of unit for suspended devices and to center of unit for wall-mounting devices.

3.2 CONTROL WIRING INSTALLATION

- A. Install wiring between sensing and control devices according to manufacturer's written instructions and as specified in Division 26.
- B. Wiring Method: Install all wiring in raceway as specified in Section 26 05 00 Electrical Basic Materials and Methods.
- C. Bundle, train, and support wiring in enclosures.
- D. Ground equipment.
- E. Connections: Tighten electrical connectors and terminals according to manufacturer's published torquetightening values. In manufacturer's torque values are not indicated, use those specified in UL 486A.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26.

3.4 FIELD QUALITY CONTROL

- A. Schedule visual and mechanical inspections and electrical tests with at least seven working days' advance notice.
- 3. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.
- C. Check tightness of electrical connections with torque wrench calibrated within previous six months. Use manufacturer's recommend torque values.
- D. Verify settings of photoelectric devices with photometer calibrated within previous six months.
- E. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:
 - 1. Continuity tests of circuits.
 - Operational Tests: Set and operate devices to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.
 - a. Include testing of devices under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.
- F. Correct deficiencies, make necessary adjustments and retest. Verify that specified requirements are met.
- G. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.
- H. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

3.5 CLEANING

A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Notify Architect and Manufacturer in writing a minimum of 3 weeks prior to system start-up and testing.
- B. Tests and Inspections: Manufacturer's service representative shall perform the following inspections and prepare reports.
 - 1. Verify Class I and II wiring connections are terminated properly by validating system performance.

- Set IP addresses and other network settings of system front end hardware per facilities IT instructions.
- 3. Verify / complete task programming for all switches, dimmers, time clocks, and sensors.
- 4. Verify that the control of each space complies with the Sequence of Operation.
- 5. Correct any system issues and retest.
- C. Provide a report in table format with drawings or using a software file that can be opened in the manufacturer's system software including each room or space that has lighting control installed. Indicate the following:
 - Date of test or inspection.
 - 2. Loads per space, or Fixture Address identification.
 - 3. Quantity and Type of each device installed.
 - 4. Reports providing each device's settings.
- D. Schedule visual and mechanical inspections and electrical tests with at least seven working days' advance notice.
- E. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.
- F. Check tightness of electrical connections with torque wrench calibrated within previous six months. Use manufacturer's recommend torque values.
- G. Verify settings of photoelectric devices with photometer calibrated within previous six months.
- H. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:
 - 1. Continuity tests of circuits.
 - 2. Operational Tests: Set and operate devices to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.
 - a. Include testing of devices under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.
- I. Correct deficiencies, make necessary adjustments and retest. Verify that specified requirements are met.
- J. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.

3.7 FACTORY COMMISSIONING

A. Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustments and device placements to ensure a trouble-free lighting control system. This service will be provided at no cost to the Owner.

3.8 DEMONSTRATION AND TRAINING

- A. Before Substantial Completion, arrange and provide a one-day Owner instruction period to designated Owner personnel. Set-up, starting of the lighting control system and Owner instruction includes:
 - 1. Confirmation of entire system operation and communication to each device.
 - 2. Confirmation of operation of individual relays, switches, and sensors.
 - 3. Confirmation of system Programming, photocell settings, override settings, etc.
 - 4. Provide training to cover installation, programming, operation, and troubleshooting of the lighting control system.

3.9 PRODUCT SUPPORT AND SERVICE

- A. Factory telephone support shall be available at no cost to the Owner following acceptance. Factory assistance shall consist of assistance in solving application issues pertaining to the control equipment.
- B. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project site visits, when requested, to adjust light levels, make program changes and adjust sensors and controls to suit actual conditions.
- C. The Electrical Contractor shall provide both the manufacturer and the Engineer with ten (10) working days written notice of the scheduled commissioning date. Upon completion of the system fine tuning the factory authorized technician shall provide the proper training to the Owner's personnel in the adjustment and maintenance of the sensors.

3.10 INTELLIGENT LIGHTING CONTROL SYSTEM

A. Provide spare components as scheduled.

END OF SECTION 26 09 23

SECTION 26 24 00 - PANELBOARDS AND LOAD CENTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Documents and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections apply to the Work of this Section.
- B. The Work of Section 26 05 00 Electrical Basic Materials and Methods applies to the Work of this Section.

1.2 WORK INCLUDED

A. Provide panelboards and load centers including all work shown, specified, or required for proper system operation.

1.3 REFERENCE STANDARDS

- A. The panel board(s) and circuit breaker(s) referenced herein are designed and manufactured according to the latest revision of the following specifications:
 - 1. NEMA PB 1 Panelboards
 - 2. NEMA PB 1.1 Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or less.
 - 3. NEMA AB 1 Molded Case Circuit Breakers.
 - 4. NEMA KS 1 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
 - 5. UL 50 Enclosures for Electrical Equipment.
 - 6. UL 67 Panelboards.
 - 7. UL 98 Enclosed and Dead-front Switches.
 - 8. UL 489 Molded-Case Circuit Breakers and Circuit Breaker Enclosures.
 - 9. CSA Standard C22.2 No. 29-M (Latest Issue) Panelboards and Enclosed Panelboards.
 - 10. CSA Standard C22.2 No. 5-M91 Molded Case Circuit Breakers.
 - 11. Federal Specification W-P-115C Type I Class 1.
 - 12. Federal Specification W-P-115C-Type II Class 1.
 - 13. Federal Specification W-C-375B/Gen Circuit Breakers, Molded Case, Branch Circuit and Service.
 - 14. Federal Specification W-C-856C-Fusible Switches.
 - 15. NFPA 70 National Electrical Code (NEC).
 - 16. ASTM American Society of Testing Materials.

1.4 SUBMITTALS

- A. Submittal documents shall include:
 - 1. Drawings Displaying:

- a. Overall panelboard dimensions.
- b. Interior mounting dimensions.
- c. Wiring gutter dimensions.
- d. Location of the main, branches and solid neutral.
- e. One line diagrams with applicable voltage systems.
- 2. Provide submittals on each breaker type submitted.
- 3. Provide any series rating combination where applicable.

1.5 QUALIFICATIONS

A. Company specializing in manufacturing of panelboard products with a minimum of fifty (50) years documented experience. General Electric, Square D Company and Eaton Cutler-Hammer are Owner standard, no other manufacturers shall be accepted.

PART 2 - PRODUCTS

2.1 LIGHTING AND POWER DISTRIBUTION PANELS

A. Ratings:

- 1. Lighting panelboards shall be rated 208Y/120V, 3 phase, 4 wire, main lugs only or main circuit breaker as shown. Panelboards shall contain 42 circuits unless shown otherwise.
- 2. Power panelboards shall be rated 208Y/120V, 3 phase, or 3 phase, 4 wire as shown and main lugs only or main circuit breaker as shown.
- 3. Power and appliance panelboards shall be rated 208Y/120V, 3 phase, 4 wire, main lugs only or main circuit breaker as shown. Panelboards shall contain 42 circuits unless shown otherwise.
- 4. Maximum current ratings for mains shall be 225 amperes unless noted otherwise.
- 5. Panels shall be fully rated for a minimum 22,000 AIC, unless specifically shown otherwise. Series ratings will not be accepted.
- 6. All panelboards shall be bolt-on breaker type.

B. Enclosure:

- 1. Boxes shall be 20" wide or 24" wide as shown and 6" deep with wire bending space per National Electric Code. NEMA Type 1 unless shown otherwise.
- 2. Fronts shall be reinforced steel with concealed hinges and concealed trim adjusting screws. Trim clamps are unacceptable. Fronts shall allow for work to be performed on panelboards without being removed (hinged trim). The style of hinged trim shall be the type with a continuous piano hinge on one side, allowing the cover to hinge away from the panel without fully removing the cover. The traditional "door in-door" style is not desired; it is desired that the hinged cover be retained in place by screws rather than latches. Provide flush or surface mount cover as shown on drawings. Please note: Panel cover trim design known as "E-Z Trim" by Cutler Hammer, or similar models, shall not be acceptable as a substitute for specified panel cover.
- 3. All door locks shall be corrosion proof Valox (or equal) with retractable latches. All door locks shall be keyed for a single key.

- 4. Clear Lexan (or equal) directory card holders shall be permanently mounted on front door. Identification strips shall be displayed adjacent to each breaker to identify number.
- 5. All panelboard series ratings shall be prominently displayed on dead front shield.
- 6. Interiors shall permit top or bottom incoming cables.
- 7. Furnish engraved nameplate for panel to match Engineer designation. Install in panel as directed by Engineer.

C. Bus Bars:

- 1. Bus bars shall be phase sequenced, fully insulated, and supported by high impact Noryl (or equal) interior base assemblies.
- 2. Bus bars shall be mechanically supported by zinc finished galvanneal steel frames to prevent vibration and damage from short circuits.
- 3. Terminations shall be UL tested and listed and suitable for UL copper wire.
- 4. Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors for plug-in or bolt-on branch circuit breakers. Bus bars shall be fully rated copper.
- 5. Split solid neutral bus shall be plated and located in main compartment for all incoming neutral cables to be same length.
- 6. Lugs shall be rated for 75°C terminations.
- 7. Lugs for copper conductors on main lug only, connections shall be bolted lugs. Lugs for aluminum conductors shall be compression lugs.
- 8. Lug bodies shall bolt in place.

D. Circuit Breakers:

- 1. Molded case circuit breakers shall be bolt on devices.
- 2. All circuit breakers shall have thermal and magnetic trip elements in each pole with interrupting rating as scheduled.
- 3. 2 and 3 pole breakers shall have internal common trip crossbars for simultaneous tripping of each pole.
- 4. Circuit breakers shall not be restricted to any mounting location due to physical size.
- 5. All branch breakers 15 to 100 amperes shall be able to be mounted in any panel position for twin or double mounting without space penalty. Sum of ratings for two (2) such mounted devices shall not exceed 180 amperes.
- 6. Main and sub-feed circuit breakers shall be vertically mounted.
- 7. Branch breaker panelboard connections shall be copper to copper.
- 8. All panelboard terminations shall be rated as indicated on drawings.
- 9. All breakers shall have an over center mechanism and be quick make and quick break.
- 10. All breakers shall have handle trip indication and a trip indicator in window of circuit breaker housing.
- 11. Breaker handle and faceplate shall indicate rated ampacity.
- 12. Circuit breaker escutcheon shall have International I/O markings, in addition to standard ON/OFF markings.
- 13. Provide breakers for all circuits shown on the plans plus spares as scheduled.
- 14. Where shown or otherwise required, provide combination type Arc Fault Circuit Interrupter (AFCI) circuit breakers.

15. Breakers shown or specified for installation into existing panels shall be compatible with the panel to which they are installed and shall carry an interrupting rating of not less than 22,000 AIC.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards in accordance with manufacturer's written instructions, NEMA PB 1.1 and NEC Standards.
- B. Anchor panelboards to structure and make branch circuit connections.
- C. Coordinate the panelboard bus ratings and circuit breaker coordination rating with the available fault current.
- D. Install permanent ID strips adjacent breakers so that breaker numbers are clearly visible.

3.2 FIELD QUALITY CONTROL

- A. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.
- B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20% of each other. Maintain proper phasing for multi-wire branch circuits.
- C. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

3.3 CLEANING

- A. Clean interiors of panels to remove construction debris, dirt, shipping materials.
- B. Repaint scratched or marred exterior surfaces to match original finish.

3.4 LOAD TEST

- A. Conduct load test on panelboards and loadcenters prior to request for final payment. Written test reports shall be signed by an authorized representative of the equipment manufacturer, submitted to the Engineer, and shall comply with the following procedure:
 - 1. Energize maximum normal light and power load for a period of two (2) hours scheduled with the Owner and Engineer.
 - 2. Record voltage at service and at each panel.
 - 3. Measure current in each phase of all feeders.
 - 4. Reconnect circuits as required or directed to provide balance load on all feeders.
 - 5. Provide and install all necessary metering equipment.
 - 6. Arrange to have Engineer witness the test.

7. Owner shall assume cost of energy.

END OF SECTION 26 24 00

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SECTION 26 29 13 - MOTOR STARTERS AND DISCONNECTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Documents and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections apply to the Work of this Section.
- B. The Work of Section 26 05 00 Electrical Basic Materials and Methods applies to the Work of this Section.

1.2 WORK INCLUDED

A. Provide motor starters and disconnects, including all work shown, specified, or required for proper system operation.

1.3 REFERENCE STANDARDS

- A. The combination starters and protection devices in this specification shall be designed and manufactured according to latest revision of the following standards (unless otherwise noted):
 - 1. ANSI/NFPA 70 National Electrical Code Latest issue.
 - 2. CSA C22.2 No. 14 Industrial Control Equipment Latest issue.
 - 3. NEMA ICS 2 Industrial Control and Systems: Controllers, Contactors and Overload Relays, Rated Not More than 2000 Volts AC or 750 Volts DC Latest issue.
 - 4. UL 508 Industrial Control Equipment Latest issue.

1.4 SUBMITTALS

- A. Provide submittals on all products covered under this division. Submittals shall include:
 - 1. Dimensions.
 - 2. Fuses.
 - Accessories.
 - 4. All ratings.
 - 5. Auxiliary contacts.
 - 6. Overloads.
 - 7. Magnetic contactor specifications.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. All products in this section shall be by General Electric Company, Square D or Eaton Cutler-Hammer. These manufacturers are Owner Standard, no other manufacturers shall be accepted.

2.2 CLASSIFICATION/ASSEMBLY

- A. All products to be heavy duty grade classification, NEMA type as scheduled on drawings. General duty products not accepted.
- B. All products shall be factory assembled and wired and shall be UL approved. Assemblies fabricated by Contractor shall not be accepted.
- C. Units shall be horsepower rated for load served, current rating and poles as shown on Plans.

2.3 DISCONNECT SWITCHES (NON-FUSIBLE)

- A. Visible blade with dual color, red/black position indicator. Unit shall be padlockable in "off" position.
- B. Unit shall be the heavy-duty version.
- C. Where shown provide auxiliary interlock kits. Auxiliary interlocks are required on all disconnect switches serving VFD equipment.
- D. Rating: 600 Volts for all loads served.
- E. Make: Square D Class 3110 or equal in GE or Eaton Cutler-Hammer.

2.4 DISCONNECT SWITCHES (FUSIBLE)

- A. Visible blade with dual color, red/black position indicator. Unit shall be padlockable in "off" position.
- B. Unit shall be the heavy-duty version.
- C. Provide motor overload elements and fuse clips for Class 'R' fuses.
- D. Where shown provide auxiliary interlock. Auxiliary interlocks are required on all disconnect switches serving VFD equipment.
- E. Rating:
 - 1. 240 Volts for 208 and 240 Volt loads.
 - 2. 600 Volts for loads above 240 Volts.
- F. Make: Square D Class 3110 or equal in GE or Eaton Cutler-Hammer.

2.5 MANUAL MOTOR STARTERS

- A. Motor control switch and motor overload element in single enclosure.
- B. Make: Square D class 2510 or equal in GE or Eaton Cutler-Hammer.

2.6 COMBINATION MAGNETIC MOTOR STATER/FUSIBLE DISCONNECT SWITCH

- A. Provide motor overload elements and fuse clips for Class 'R' fuses.
- B. Visible blade with dual color, red/black position indicator. Unit shall be padlockable in "off" position.
- C. Parts subject to wear or arcing shall be removable and replaceable.
- D. Where shown provide auxiliary interlock kits. Auxiliary interlocks are required on all disconnect switches serving VFD equipment.
- E. Provide 24 or 120 volt control transformer as shown and 24 or 120 volt contactor coil, provide fuses for transformer.
- F. Provide cover mounted HOA switch.
- G. Make: Square D Class 8538 or equal in GE or Eaton Cutler-Hammer.

2.7 FUSES

- A. Dual Element, time delay.
- B. Type and size as required.
- C. Make: Buss Fustron, Shawmut Gould, or Brush Reliance.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount manual motor starters, magnetic motor starters and disconnects on substantial mount frames provided by the Electrical Contractor, with clearances according to the NEC.
- B. Circuit according to the NEC.
- C. For variable speed application, provide auxiliary interlock wiring for disconnects to disable variable frequency drive unit which feeds the disconnect.

END OF SECTION 26 29 13

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SECTION 26 50 00 - LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Drawings and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections apply to the Work of this Division.
- B. The applicable provisions of Sections 23 05 00 HVAC Basic Materials and Methods and 26 05 00
 Electrical Basic Materials and Methods apply to the Work of this Section.

1.2 WORK INCLUDED

- A. Provide lighting fixtures, lenses, globes, hangers, supports, LED light engines and lamps and appurtenances to provide a complete lighting system.
- B. Provide means of disconnect at ballasted luminaires for the purpose of servicing.
- C. Provide spare lamps and ballasts as identified in Part 3.

1.3 SUBMITTALS

- A. Submit shop drawings as described in Section 26 05 00. Luminaire shop drawings shall include photometric data for each luminaire utilizing the specified lens/louver type, lamp(s) and ballast(s). All luminaire types for the project shall be submitted in a single complete package which shall be in the form of a soft cover binder with each luminaire separated by an identified index tab. Information on each luminaire shall include:
 - 1. Manufacturer and Catalog Number.
 - 2. Dimensioned Construction Drawing(s).
 - 3. Complete Catalog "Cut" Sheet.
 - 4. Photometrics (space to mounting height ratio, coefficient of utilization complete values, IES distribution hard and electronic copy, candlepower distribution by angle and luminaire efficiency).
 - 5. Lens/Louver Type.
 - 6. Reflector information (type, material, reflectance, etc.).
 - 7. Ballast, LED driver or fluorescent with each type of luminaire as applicable (type, sound rating, overload protection, voltage, input/fixture wattage, ballast factor, power factor, etc.).
 - 8. Materials for all components.
 - 9. Socket Type.

- 10. Lamp (rated life, initial lumen output, mean lumen output, Kelvin color, color rendering index, dimensions, wattage, socket type, mercury content).
- 11. Certification of IES LM-79 and IES LM-80 testing for LED luminaires.
- 12. IES TM-21 life cycle testing results for LED luminaires.
- 13. Proof that the lamps and ballasts to be provided are on the Consortium for Energy Efficiency's (CEE) list of approved equipment.
- 14. Means of service disconnect.

1.4 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 GENERAL

- A. All fixtures of the same type shall be by the same manufacturer.
- B. All lamps of the same type shall be by the same manufacturer. Lamps shall be appropriate for the actual ballast furnished and shall be tested and certified for operation by the ballast manufacturer.

2.2 FIXTURES

A. Schedule (See Drawings).

2.3 LED LUMINAIRES

- A. LED luminaires shall be identical in construction features, options and appearance to the luminaires specified in the Luminaire Schedule. LED luminaires include white and RGB systems respectively.
 - LED luminaires shall be provided with all cables, controllers, power supplies, connectors, terminators, and accessories required for a complete installation. LED system shall utilize pulse width modulation, non-linear scaling techniques and reverse polarity protection for high-resolution output.

- 2. RGB LED systems shall be capable of at least 8-bit control of red, green, and blue module. RGB 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.
- 3. LED luminaires shall be high brightness and binned for forward voltage, luminous flux, and wavelength.
- 4. 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) and IESNA LM-80 (output luminous maintenance, 6,000 hour minimum test). Luminaire output efficacy shall be a minimum of 89 lumens/watt. Rated life as calculated according to IES Standard TM-21 shall be a minimum of 50,000 hours at 90% output. Testing shall be performed by a US Department of Energy (DOE) accredited laboratory.
- 5. The luminaire (to include LED lamps, LED chips, LED boards and LED drivers) shall have a full five (5) year minimum warranty for replacement and labor of any failed component or diode.
 - a. Acceptable LED Diode Manufacturers:
 - i. Philips.
 - ii. Osram.
 - iii. Cree.
 - iv. Nichea.
 - v. Lumiled.

2.4 LED POWER SUPPLIES & DRIVERS

- A. Power supplies shall meet or exceed the technical and performance standard all power supplies shall meet or exceed the following basis:
 - 1. The LED power supply shall accept an input voltage range of 120-277VAC ±10%.
 - 2. The LED power supply shall have a power factor of 0.9 or higher.
 - 3. The LED power supply shall have a maximum THD of 20% at full load (@ 120V or 277V).
 - 4. The minimum efficiency of the LED power supply shall be 85% at full load.
 - 5. Control Input:

a. Power supplies with dimmable outputs shall indicate whether the output is Pulse Width Modulated (PWM), Constant Current Reduction (CCR) or a combination.
 For PWM dimming, the frequency shall be >1000hz to minimize risks of strobe effect.

b. Phase Control:

- Dimming of the input power source down to 1% of the power supply output. It shall be the responsibility of the installing contractor to coordinate phase control dimming technology with the lighting control devices.
- 6. Phase-controlled power supply shall indicate the preferred method of phase-controlled input (forward or reverse):
 - a. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers:
 - i. Compatible with Passive or solid state current sink devices down to 1% of the power supply output.
 - ii. The 0-10VDC dimming circuit shall not exceed 15V DC in an unloaded or loaded condition.
 - iii. Must meet IEC 60929 Annex E for General White Lighting LED drivers.
 - iv. Connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 mA per driver at a low end of 0.3V. Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.
 - v. Must meet ESTA E1.3 for RGBW LED drivers.
 - vi. Interface with 0-10 dimming driver shall be completely isolated from AC power to prevent AC voltage on the 0-10V wires.
 - vii. The available sink current from each driver on the 0-10V interface shall not exceed 1 mA.
 - b. Digital (DALI Low Voltage Controlled) Dimming Drivers:
 - i. Must meet IEC 62386.
 - c. Digital Multiplex (DMX Low Voltage Controlled) Dimming Drivers:
 - i. Must meet DMX / RDM: USITT DMX512A and ANSI E1.20 (Explore & Address).
 - ii. Capable of signal interpolation and smoothing of color and intensity transitions.
- 7. The LED power supply shall comply with FCC Part 15 (Class A or Class B).
- 8. The LED power supply shall have a Class A sound rating.
- 9. The LED power supply shall have two cycle inrush current when power is applied that does not exceed 20 times steady state current per power supply.

- 10. Total Harmonic Distortion less than 20% percent and meet ANSI C82.11 maximum allowable THD requirements at full output. THD shall at no point in the dimming curve allow imbalance current to exceed full output THD.
- 11. The LED power supply shall have transient protection ANSI C62.41 Category A.
- 12. The LED power supply shall be UL 8750 Class 2 Recognized or Listed; Damp rated.
- 13. The LED power supply output voltage should not exceed 60V (Complies with Class 2 for US).
- 14. Driver should be UL Recognized under the component program and shall be modular for simple field replacement. Drivers that are not UL Recognized or not suited for field replacement will not be considered.
- 15. The LED Power supply shall have a minimum of 50,000 hours of rated lifetime at maximum operating conditions.
- 16. The LED Power supply shall have a minimum of 5-year warranty Tc of 75C or higher point.

2.5 FLUORESCENT LAMPS (FOR EXISTING LEGACY INSTALLATIONS)

- A. All fluorescent lamps shall be low Mercury, energy saving type and color temperature as scheduled.
- B. T8 lamps shall be 89 lumens per watt or greater.

2.6 FLUORESCENT BALLASTS (FOR EXISTING LEGACY INSTALLATIONS)

- A. All ballasts shall be of the PCB free type.
- B. Ballast shall meet performance Specifications scheduled on Drawings. Ballast factor is critical to meeting Code required lighting power budget.
- C. All ballasts shall be of the energy saving type. As scheduled.
- D. Make: Advanced, Lutron or Universal as scheduled.

2.7 LUMINAIRES DISCONNECT

- A. All ballasted lighting fixtures shall be provided with luminaire disconnect to allow for the simultaneous disconnect of hot and neutral conductors to the ballast.
- B. Make: Ideal "PowerPlug" luminaire disconnect or equal.

2.8 EMERGENCY FLUORESCENT (LEGACY) BALLASTS & LED DRIVERS

A. All emergency ballasts and drivers shall be inverter type with the following minimum requirements:

- 1. Shall operate indicated lamps at nearly full illumination for a minimum of 90 minutes.
- 2. Upon loss of normal power, luminaire shall automatically switch to inverter ballast/driver with battery.
- 3. Upon restoration of normal, luminaire shall return to normal power and ballast/driver shall return to charging mode.
- 4. Battery shall be maintenance free, nickel-cadmium type, and be an integral part of ballast assembly. Life expectancy of battery shall be a minimum of seven years.
- 5. Assembly shall be UL listed and approved under UL924-"Emergency Lighting and Power Equipment".
- 6. Shall include an emergency test switch with LED indicator mounted in a common utility/mechanical room.
- 7. Manufacturer: Bodine or approved equal.

2.9 REFLECTORS

- A. Reflectors and reflecting cones or baffles shall be as follows:
 - 1. Absolutely free of any tooling marks including spinning lines, indentations caused by riveting or other assembly techniques.
 - 2. No rivets, springs, or other hardware visible after installation.
 - 3. First quality polished, buffed, and anodized finish, "Alzak" or approved equal.
 - 4. Specular finish color as selected by the Architect or as specified in the fixture schedule.
- B. Other aluminum reflectors shall be as follows:
 - 1. Formed and finished as noted on the Drawings and elsewhere in the Specification.
 - 2. Reflectors free from blemishes, scratches, or indentations which would distort their reflective function.
 - 3. Finished by means of the "Alzak" process or approved equal unless otherwise noted.
- C. Reflector and housing shall comply completely enclose the fixture's fluorescent lamp in downlights in a plenum ceiling and provide the full rated output of the lamp. Fixtures that vent through the downlight reflector into the plenum are not acceptable.

2.10 LENSES

- A. All lenses secured by positive means with neoprene or silicone gasketing, or washers as required to hold the lens tight within a frame or attach to housing.
- B. All glass lenses shall be heat treated (tempered) or sealed with a clear acrylic laminate layer to provide a "safety glass" rating. All lenses which require removal for re-lamping or normal maintenance shall be attached to the fixture housing by a minimal length of safety chain to prohibit the lens from falling and striking surrounding surfaces.

- C. Acrylic lenses shall be 100 percent virgin acrylic polymer and colorless. For lenses with pattern of pyramids or cones, specified minimum thickness refers to distance from flat surface to base of pyramids (cones), or thickness of undisturbed material. All lenses shall be a minimum 0.156" thick.
- D. The quality of the raw acrylic material must exceed IES, SPI and NEMA Specifications by at least 100 percent which, as a minimum standard, shall not exceed yellowness factor of 3 after 2,000 hours of exposure in the Fade-o-meter or as tested by an independent test laboratory. Acrylic plastic lenses and diffusers shall be properly cast, molded, or extruded as specified, and shall remain free of any dimensional instability, discoloration, embrittlement, or loss of light transmittance for at least 15 years.

2.11 LOUVERS

- A. All louvers shall be fabricated of the specified material.
- B. All fluorescent light fixture louvers shall be parabolic and shall be rated at 90 percent or over on the VCP index.
- C. Louver finishes shall be provided as specified.
- D. All plastic parabolic louvers shall be destaticized before and after fabrication to insure minimum maintenance.
- E. All metal louvers shall be coated with anti-rust material and electrostatically painted.
- F. All louvers shall be heat tested to withstand lamp operating temperatures with no deformation of shape, paint blistering or discoloration.

2.12 FIXTURE TRIMS

- A. Fixtures shall have finish trim designed for the following types of ceiling systems: Ceiling Type Trim Type:
 - 1. Recessed Incandescent, Fluorescent, LED or Metal Halide Fixtures:
 - a. Plaster Overlap Trim.
 - b. Concrete Overlap Trim.
 - c. Tile Overlap Trim.
 - d. Gypsum Overlap Trim.
 - e. Metal Pan, Concealed M Modular, Fit-in Support.
 - f. Lay-in Modular, Tile with Flush Fit-in.

- B. Provide trim details as shown on the Drawings or as specified, which are indicative of appearance and dimensional requirements. The trim finish and dimensions subject to the approval of the Architect.
- C. Trimless fixtures shall be installed per manufacture's guidelines and shall be installed and coordinated with other trades as required.
- D. Mitered corners shall be continuously welded and smoothed before shop finish is applied. No lapping of trim metal for all flush mounted ceiling trims for rectangular or square recessed fixtures.
- E. Provide a mounting frame or ring with lock recessed or semi-recessed light fixture to secure the mounting frame to the ceiling and support any reflectors, trims, or lenses. Ring shall be compatible with the ceiling and of sufficient strength to rigidly support the fixture and any stress applied in re-lamping.
- F. Catalog numbers are included in the Lighting Fixture Schedule for reference. Provide all accessories and design features described herein regardless of whether such features are included in catalog reference including, mounting hardware, louvers, lenses, filters, transformers, etc.

2.13 WIRING

- A. Wiring within lighting fixture for connection to branch circuit shall be:
 - 1. NEC Type AF for 120 volt, minimum No. 18 AWG.
 - 2. NEC Type SF-2 for 277 volt, minimum No. 18 AWG.
- B. Stranded wire within lighting fixture shall be lead dipped.

2.14 EXIT LUMINAIRES

- A. Electrical characteristics:
 - 1. LED type for 120/277 volt supply.
 - 2. Use two LED strips for indirect illumination of the face. 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 fully automatic internal emergency power pack including a premium grade battery, three-stage charger (constant current, equalize and float charge), relay, low voltage battery disconnect and brownout protection circuits. Battery shall provide sufficient capacity to operate the lamps for 1½ hours to an end voltage of 87½% of nominal battery voltage.

5. Provide self-diagnostic circuitry to warn at malfunction of battery, charger, transfer circuit or emergency lamps by means of separate LED indicator lights. Also provide automatic programming which will include five minute discharge/diagnostic cycling every 28± days to exercise the unit's battery and check emergency operation.

2.15 EMERGENCY BATTERY PACK LUMINAIRES

- A. Completely self-contained in compact, low profile injection molded UL 94V-0 flame rated thermoplastic housing with universal mounting plate.
- B. Premium grade, pure lead maintenance free battery. Two with sufficient capacity to operate the lamps for 1½ hours to an end voltage of 87½% of nominal battery voltage. Three stage charger (constant current, equalize and float charge), relay, low voltage battery disconnect and brownout protection circuits.
- C. Two fully adjustable glare-free LED type lighting heads. Test switch and charge rate indicator.
- D. Universal 120/277 volt supply.
- E. Provide self-diagnostic circuitry to warn malfunction of battery, charger, transfer circuit of emergency lamps by means of separate LED indicator lights. Also provide automatic programming which will include five minute discharge/diagnostic cycling every 28± days to exercise the unit's battery and check emergency operation.

PART 3 - EXECUTION

3.1 FIXTURES

A. Securely support all fixtures in accordance with manufacturer's installation instructions and U.L. or ETL listing information.

B. Location:

- 1. Evenly proportioned in room, except adjusted to conform with ceiling pattern as described below and except where otherwise shown or dimensioned.
- 2. Edges of fixtures parallel with walls.

C. Plaster Frames:

- 1. Provide for all recessed fixtures in wet type ceilings.
- 2. Install in cooperation with other trades.

D. Mounting:

- 1. All fixtures must hang true to vertical, free from finger marks, flaws, scratches, dents, or other imperfections.
- 2. Take care when hanging fixtures not to deface in any way, ceilings, or walls.
- 3. Install continuous rows of fixtures in straight line; all fixtures at same level. Fixtures must not be rotated about longitudinal axis with respect to one another.
- 4. Mount surface fixtures tight to surface without distorting it.
- 5. Provide proper mounting equipment and trim for recessed fixtures to adapt them to the ceiling or wall construction and to prevent light leaks around trim.
- 6. Provide special means for supporting fixtures as hereinafter specified, as shown on plans, or as required.
- 7. All stem mounted fixtures shall be hung level from self-aligning hangers in canopies; all stems shall be constructed of formed and stamped sheet metal, no cast or "pot metal" parts shall be accepted.
- 8. Securely support all ceiling fixtures, hangers, and outlet boxes from structural members, not from ceiling members. In addition, the fixtures must be securely fastened to framing members of the ceiling in order to meet NEC, Article 410.36. Lock clip, wire-lashing or leveling supports shall be acceptable means.
- 9. Plastic inserts not permitted.
- 10. Outlet boxes shall not be supported by conduit.
- 11. Supports for each fixture shall be capable of supporting four (4) times fixture weight. Use ¼ inch threaded rod, fender washer and double nuts.
- 12. Exterior fixtures shall be installed with non-ferrous metal screws finished to match the fixture.
- 13. Fixtures shall be supported from building structure and using supports as follows (minimum requirements):
 - a. Ceiling Surface Mounted:
 - i. 1'x 4' two supports.
 - ii. All boxes (canopies) supported from structure.
- 14. Provide special extra wide toggle bolt support, 10" wide toggle, Paine Company #400, mounted above existing plaster ceilings where approved by Engineer and noted on Plans.

E. Surface Ceiling Mounting:

- 1. Mount surface luminaires tight to surface in a manner such that mounting surface does not distort fixture.
- 2. Luminaires installed in continuous rows may be fed by a single outlet if fixtures are UL approved and suitable for through wiring in luminaire raceway.
- 3. Luminaire fasteners or hangers shall be capable of supporting four times luminaire weight.

4. Luminaires shall be supported independent from ceiling system or other building services.

F. Recessed Mounting:

- 1. The Electrical Contractor shall verify ceiling type, construction, and material prior to placing an order for recessed luminaires.
- 2. The Electrical Contractor shall furnish fixtures with an IC rating for all recessed incandescent fixtures installed in direct contact with insulation.
- 3. The Electrical Contractor shall furnish and install plaster frames for plaster ceilings and flanged frames for drywall ceilings.
- 4. The Electrical Contractor shall furnish and install all required mounting hardware and accessories to adapt fixtures to ceiling construction.
- 5. Lay-in type luminaires shall be supported independent of the ceiling system at each end of the luminaire with galvanized support wire.
- 6. Provide and install seismic hold-down clips for all lay-in type lighting fixtures.

G. Pendant Mounting:

- 1. Mount pendant mounted luminaires from 1/4" threaded rods of required length.
- 2. Sleeve threaded rods with ½" EMT painted with color as directed by Architect/Engineer.
- 3. Luminaires installed in continuous rows may be fed by a single outlet if they are UL approved and suitable for through wiring in luminaire raceway.

H. Remote Fluorescent (Legacy) Ballasts & LED Drivers:

- Remote ballasts and LED drivers shall be mounted in an approved NEMA 1 enclosure.
 Remote ballasts shall be located in areas easily accessible to maintenance personnel.
- 2. Wiring from luminaire to remote ballasts and LED drivers shall not exceed the manufacturer's recommendations for distance.
- 3. Remote ballasts and LED drivers shall be clearly labeled indicating fixture served, voltage, panelboard and circuit number served from.

I. Aircraft Cable Suspension:

- 1. Cables shall be 1/16" aircraft cable with end safety fittings. Cable shall be provided with 2" diameter mini-canopy and threaded coupler for attachment to a ¼" 20 threaded stud extending ¾" below ceiling.
- 2. Cable assembly shall include a spring-loaded adjustment device mounted in the fixture.
- 3. The Contractor shall be responsible for providing required supports for cable attachment.
- 4. For cord feed to the luminaire provide continuous cord clip of matching color to attach the cord to the cable.
- 5. Support per manufacturer's recommendations.

J. Cove Lighting:

- 1. Fluorescent cove lighting shall be installed so as to produce a continuous and unbroken band of light with no shadows or light gaps.
- 2. A combination of 2 ft., 3 ft. and 4 ft. lamp fixtures may be required to accomplish a continuous band of light.

K. Mechanical Coordination:

- 1. Coordinate location of all hangers in rooms without ceilings with ductwork, plumbing piping, sprinkler piping, etc.
- 2. Make all necessary offsets and extensions so that stems and fixtures avoid beams, pipes, ducts, etc.
- 3. Where fixtures are located below heating, ventilation and air conditioning units, or ductwork and piping, provide trapeze hangers around obstruction and suspend fixture from trapeze hanger. Do not suspend from duct.

L. Architectural Coordination:

- 1. Locate all hangers at intersections of joints or at center of blocks in rooms with acoustical tile or other patterned type of ceiling materials.
- 2. Space continuous row fixtures to conform to corresponding joint intersections.
- 3. Coordinate all ceiling layouts and obtain Engineer's approval before proceeding.
- 4. Heights of fixtures not scheduled will be furnished on application to Engineer.
- Contractor is specifically required to verify ceiling construction and report in writing any discrepancies between the ceiling type and the fixture type before releasing fixtures for manufacture.
- 6. Coordinate all under cabinet lights with Engineer before roughing.

M. Care of Fixtures:

- 1. Remove and replace with new, all broken glassware, plastic or fixtures damaged before final acceptance at no additional expense to Owner.
- 2. No allowance made for breakage or theft before final acceptance.
- 3. Immediately prior to occupancy, damp-clean all diffusers, glassware, fixture trims, reflectors, lamps and replace burned-out lamps.

N. Wiring:

- 1. Fixture shall not be used as a raceway except as allowed in NEC, Article 410-31.
- 2. Wiring to fixture shall be 90° Centigrade minimum.
- 3. Provide servicing luminaire disconnect at fixture prior to the ballast.

3.2 GROUNDING

- A. Ground all non-current carrying parts of all lighting fixtures.
- B. All grounding shall be accomplished with NRTL tested grounding connectors suitable for this purpose.

3.3 RETROFITTING EXISTING LUMINAIRES

- A. Retrofit existing luminaires where called for. Perform the following work for each retrofit luminaire:
 - 1. Replace lamps.
 - 2. Replace ballast(s).
 - 3. Replace sockets.
 - 4. Replace any cracked, discolored or otherwise damaged lenses. Replacement lenses shall match existing.
 - 5. Clean lens and reflector surface with detergent solution and rinse with clear water.

 Assure no streaks remain on surfaces.

3.4 LAMPS

- A. All lamps for new fixtures shall be installed new. Provide spare lamps as required to allow replacement of flickering or bad lamps. Provide labor and material to replace any failed lamp during the one (1) year warranty period. In the event that more than 10% of the lamps in a particular room or lot fail within twelve (12) months of Project completion or earlier, the Contractor shall replace all lamps which were provided for that room or lot. Contractor shall provide all labor and materials for this work at no cost to the Owner and shall compensate the Owner for his personnel who provide access for the Contractor.
- B. Clean all fixtures and lamps prior to requesting punch list.
- C. Supply in O&M Manuals a list of lamps installed in light fixtures. Include manufacturer model number, lamp voltage and color temperature for each fixture type supplied.

3.5 SPARE LAMPS

- A. Unless shown otherwise, provide the following spare lamps:
 - 1. The greater of 2% or two (2) lamps of each size and manufacturer furnished.

3.6 BALLASTS

- A. Install in accordance with manufacturer's instruction. Provide labor and material to replace any failed ballast during one (1) year warrantee period. In the event that more than 10% of the ballasts in any particular room, lot or type of fixture fail within twelve (12) months of Project completion or earlier, the Contractor shall replace all ballasts which were provided for that room or lot or type of fixture. The Contractor shall provide all labor and materials for this work at no cost to the Owner and shall compensate the Owner for his personnel who provide access for the Contractor.
- B. Supply in O&M Manual a list of ballasts installed in light fixture. Include manufacturer model number for each fixture type supplied.

3.7 SPARE BALLASTS

- A. Unless shown otherwise, provide the following spare ballasts:
 - 1. The greater of 2% or two (2) ballasts of each size and manufacturer furnished.

3.8 SPARE LED BOARDS & LED DRIVERS

- A. Unless shown otherwise, provide the following spare LED boards or LED light engines:
 - 1. The greater of 2% or two LED boards or LED light engines for each type of fixture.
- B. Unless shown otherwise, provide the following spare LED drivers:
 - 1. The greater of 2% or two (2) LED drivers for each type of driver employed on the project.
- C. Spare parts are to be provided with first fixture shipment to allow for field replacement of any failed components during construction in a timely manner.
- D. Turn over all spare parts to the Owner as attic stock at completion of Project. Provide careful labeling and inventory control of each type of part with information on where it was installed, what fixture type, manufacturer, date, and other related information. If any spare parts are utilized during construction to replace any failed components, such parts shall be replenished prior to turn over.
- E. If any single component (LED board, LED light engine or LED driver) demonstrates a failure rate across the entire project in excess of 2% of the quantity provided within the first year, quantity of spare parts for that particular component to be turned over to the Owner, shall be increased from 2% to 5%, as identified in Parts A. and B. above.

3.9 QUALITY CONTROL

- A. To ensure uniformity of product installed, provide the following steps to remediate recognizable variations in light color and intensity:
 - 1. Replace bulbs.
 - 2. Replace ballasts.
 - 3. Replace fixture.

3.10 FINAL CLEANING

A. Immediately prior to acceptance, damp clean diffusers, glassware, luminaire trim, reflectors, lamps, louvers, lens, and similar objects of all luminaires. Remove all dirt, corrosion, foreign material, finger marks and blemishes. Replace all burned out lamps and failed components.

3.11 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 turn over to Owner for disposal.

3.12 REMOVAL OF LAMPS IN EXISTING LUMINAIRES

A. The Contractor shall provide containers and labels for the disposal of all fluorescent and HID laps. Turn containers over to Owner for disposal.

3.13 AIMING AND ADJUSTMENT

- A. All adjustable lighting units shall be aimed, focused, locked, etc., by the Contractor under observation of the Architect, Engineer and/or Lighting Designer. It is the responsibility of the Contractor that all fixtures scheduled for aiming shall be operational prior to the aim work session. All aiming and adjusting shall be carried out after the entire installation is complete. All ladders, scaffolds, etc., required shall be furnished by the Contractor. As aiming and adjusting is completed, locking setscrews and bolts and nuts shall be tightened securely. The aiming and adjustment of luminaires must take place after the project's amenities have been completely installed. These amenities shall include but are not limited to plantings, furniture, artwork, graphics, and signage.
- 3. Where possible, units shall be focused during the normal working day. However, where daylight interferes with seeing, aiming shall be accomplished at night.

END OF SECTION 26 50 00

War Memorial Lantern Retrofit LED tape

SW24/5.0

STRIP: Static White

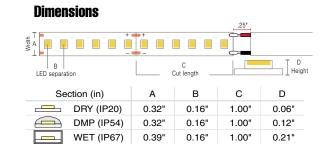




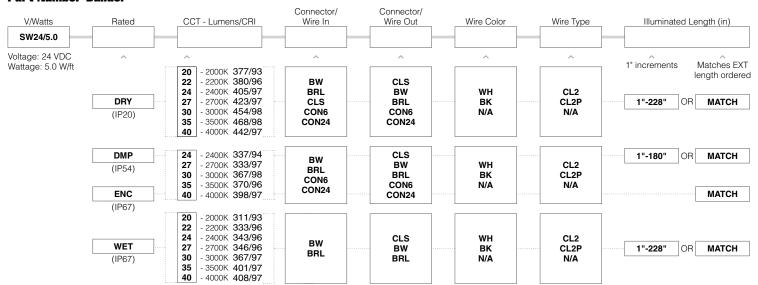
One step one bin static white LED strip with 454 lm/ft @ 3000K. This energy-efficient 24-volt, 5.0-watt/foot strip features 6 diodes per 1" cut point and is available in CCTs of 2000K, 2200K, 2400K, 2700K, 3000K, 3500K, and 4000K. Choose your connection type from bare wire, barrel connectors, or not soldered, and dry, damp, wet, or encapsulated finishes. CCTs 2200K and greater meet or exceed Title 24 and JA8. Pair with an aluminum extrusion to create a custom fixture.

The SW24/5.0 strip is Quick Ship eligible in CCT's of 2400K, 2700K, 3000K, and 3500K and is available in full reels or custom cut lengths.

Technical Information [Calculated L70 = 70000 hours] Tested with SW24/5.0-DRY CCT Lumen/ft Luminous Efficacy CRI Ra CRI R9 TM30 Rf TM30 Ra 2000K 377 79 Lm/W 93 89 103 2200K 380 79 Lm/W 96 89 94 100 2400K 405 84 I m/W 97 92 94 102 2700K 423 88 Lm/W 97 94 94 102 3000K 454 95 Lm/W 101 98 95 94 3500K 468 97 Lm/W 98 100 94 92 4000K 442 92 Lm/W 97 90 100



Part Number Builder



- If selecting BRL, select N/A for wire color and type
- **BW** comes in standard 24"- request custom length (Max 120") by writing it in inches next to "BW" in the order code box (ex. BW48)
- Wire orientation for **MATCH** will be dictated by extrusion Feed In/Feed Out selection
- Connector/Wire In or Out not needed to specify product. Standard configuration is BW for Wire In and CLS for Wire out
- If ordering an encapsulated extrusion, ENC (Encapsulated in Extrusion) must be chosen for your strip.
- ENC RATED STRIP ARE NOT FIELD CUTTABLE
- CL2 wire is standard non-plenum wire, CL2P wire is plenum rated
 - 5 year warranty
 - Field modifications must comply with Q-Tran's installation methods otherwise warranty is null & void
 - All data has +/- 5% tolerance

- UL Listed
- Title 24 JA8-2016 Strips: DRY, DMP, and WET rated, 2200K and above
- Ambient or mounting surface must not be lower than -40°F or higher than 108°F













SW24/5.0

STRIP: Static White



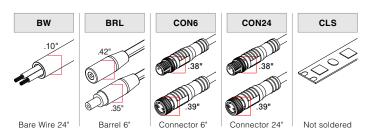


Compatible Extrusions

	SLIM	WIDE	ROND	TORQ	TRE3	LALO	TALO
DRY	~						
DMP	*	~	~	~	~	~	~
ENC				~		~	~
WET	No Lens	~		~	~	~	~

	ARKA	TELA	VEVE	FLUR	EMBD	LATO	MDIN	OPTI
DRY	~	~	~	~	~	~	~	~
DMP	~							
ENC				~	~	~		
WET	~	~	~	~	~	~		

Connector/Wire — In/Out



Compatible Power Supplies See website for additional power supply options



Compatible Accessories



Date:	Customer:	
Project:		
Type:		Qtv:



Olivio Medio LED **Universal Mount**



		Pole Or	der Code:	Series	Height	Finish	Option	ns	
OLML	Series	OLML Olivio Medio LED							
	Optics		20 F4 Ploot, 20° Floo Med		d, 78° Asyr	M nmetric SLH or SLV opti	on)		
	Mounting	U Universal	T1 Single Pole Top						
	Light Engine	2G350 15W / 1325lm	2G525 23W / 1978lm	2G700 31W / 2631lm	2G105 46W / 3941lm	1			* Based on F80 distribution and 3000K CC
	ССТ	27* 2700K	30 ¹ 3000K	35* 3500K	40 4000K	50* 5000K			¹ Dark Sky approved with (ds) option only. * Consult factory
	Finish	WH White	BK Black	BL Semi-Matte Black	BZ Bronze	SV Silver	SP Specify Premiur	m Color	
	Voltage	UNV 120-277V	120 120V	208 208V	240 240V	277 277V			
	Options	DS ² Dark Sky 0° Tilt Option	DM Dimming, 0-10V	SLH Spread Lens Horizontal (fixed)	SLV Spread Lens Vertical (fixed)	HL50 ^{3,5} High - low switching low output 50%	HX ⁴ Micro Hexcell Honey Comb Louver	CF Color Filter (consult factory)	2 IDA approved with (DS) option only and 3000K CCT. 3 Only available with 120V, 240V or 277V. 4 Cannot be combined with SLH, SLV, or ASM options 5 Cannot be combined with DM option.
Product Modifi	cations quirements for review by fo								Approvals









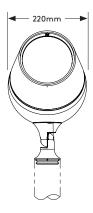






selux

OLML-T1



Specifications

Luminaire Housing - Two-piece high-pressure die-cast housing, made of low-copper aluminum alloy. Single recessed captive screw allows easy access to light engine & gear tray components.

Gasketing - UV and ozone-resistant silicone gasket between fixture housing and lens base provide IP67 level ingress protection. IP rated micro-membrane ensures pressure compensation.

Lens - Tempered clear glass lens.

LED Light Engine - Made from high flux COB and vacuum metalized aluminum reflectors. Selux is using brand name LED manufacturers. Available in 3000K and 4000K, CRI minimum 80. Reflectors made from high purity aluminum to ensure high efficiencies throughout lifetime. Complete light engine can be removed easily for future upgrade. LED light engine provides a reported lumen maintenance of 84.3% at 60,000 hours. L70 calculated greater than 60,000 hours.

LED Driver - Selux uses brand name high efficiency LED drivers. LEDs are driven by RoHS compliant high-efficiency driver. Excellent for cold temperature starting and instant on. Min. operating temperature -40°C/ -40°F.

Surge Protector - Designed to protect luminaire from electrical surge up to (20kA).

Power Cord - (not shown) Pre-installed at factory and hidden through the luminaire hinge and hinge arm. Power cords are specified to fit the length of the pole specified with the luminaire.

Exterior Luminaire Finish - Selux utilizes a high quality Polyester Powder Coating. All Selux luminaires and poles are finished in our Tiger Drylac certified facility and undergo a five stage intensive pretreatment process where product is thoroughly cleaned, phosphated and sealed. Selux powder coated products provide excellent salt and humidity resistance as well as ultraviolet resistance for color retention. All products are tested in accordance with test specifications for coatings from ASTM and PCI.

Standard exterior colors are White (WH), Black (BK), Semi-Matte Black (BL), Bronze (BZ), and Silver (SV). Selux premium colors (SP) are available, please specify from your Selux color selection guide. Hot Dip Galvanized finish (GV) on all steel parts also available.

5 Year Limited LED Luminaire Warranty - Selux offers a 5 Year Limited Warranty to the original purchaser that the Olivio Medio LED luminaire shall be free from defects in material and workmanship for up to five (5) years from date of shipment. This limited warranty covers the LED driver and LED array when installed and operated according to Selux instructions. Fixture suitable for ambient temperature of 40° C (104° F).

Listings and Ratings: Luminaire and LED tested to IP67 and IESNA LM-79-08 standards. LED tested to LM-80 standards. Luminaire and LED tested at 25°C ambient temperature.

OLIVIO LED suitable for ambient temperatures of 40°C (104°F). Minimum operating temperature of luminaire at -40°C (-40°F).

NRTL Listed for wet location (i.e. UL, CSA)

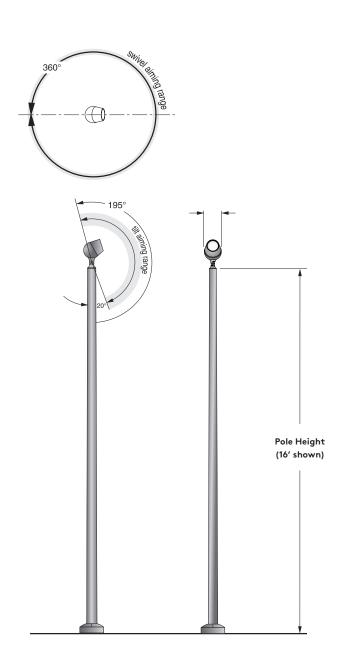
Visit selux.us for our LED End of Life recycling policy.

For Buy American compliance on poles, please consult the factory.

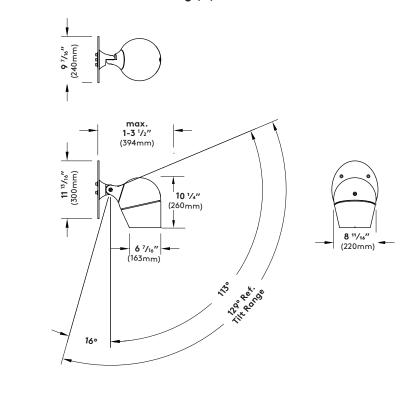
selux

Mounting

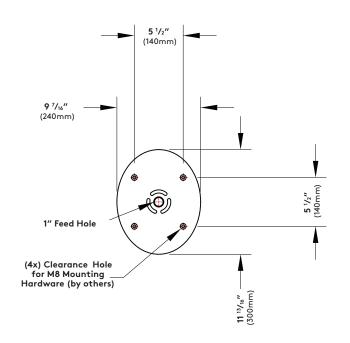
Single Pole Top (T1) EPA = 0.7 ft² (0.065 m²) Weight = 17 lbs. (7.7 kg)



Universal Surface Mounting (U)



Mounting Plate





Pole Series	Wall		EPA Inforn	nation (ft²)		Height	Finish	Options
Tole Series	vvaii	80mph	90mph	100mph	110mph	rieigiit	1 11 11 51 1	Options
O-A35 3 ½" Round Straight Aluminum Pole	0.197	7.3	5.4	4.0	3.1		WH White	REC GFCI Receptacle with
O-AT535 5" to 3 ½" Tapered Aluminum Pole	0.156	14.4	10.9	8.6	6.9	12 12 ft.	BK Black	weatherproof cover ¹
O-A35 3 ½" Round Straight Aluminum Pole	0.197	5.8	4.2	3.0	2.2		BL Semi-	REC2 GFCI Receptacle with padlockable in-use cover
O-AT535 5" to 3 1/2" Tapered Aluminum Pole	0.156	9.4	7.1	5.5	4.4	14 14 ft.	Matte	·
O-AT535 5" to 3 ½" Tapered Aluminum Pole	0.156	7.7	5.6	4.2	3.3	16 16 ft.	Black	REC3 USB & Duplex Receptacle w/ weather-proof cover
O-AT535 5" to 3 ½" Tapered Aluminum Pole	0.188	7.8	5.6	4.2	3.2	18 18 ft.	BZ Bronze	PEC 4 usp a p
O-AT535 5" to 3 ½" Tapered Aluminum Pole	0.188	6.4	4.5	3.2	2.4	20 20 ft.	SV Silver	REC4 USB & Duplex Receptacle with weatherproof
O-AT635 6" to 3 ½" Tapered Aluminum Pole	0.188	7.0	4.8	3.4	2.6	25 25 ft.	SP Specify Premiur Color	* Weatherproof cover intended for portable tools or other portable equipment connected to the outlet only when attended. For other requirements please consult factory.

Other pole configurations available, consult factory

EPA Calculations allow for 1.3 Gust Factor

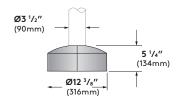
See Mounting Page for fixture w/arm EPA values

Pole Information

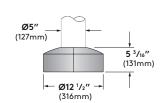


Base Cover Information Straight Poles (O-A35) BC5 Standard Base Cover

Two-piece die cast aluminum

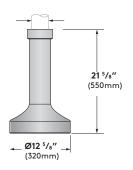


BC3 - Available for: O-AT535-156 O-AT535-188

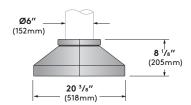


BC1 Optional Base Cover (O-A35)

One-piece die cast aluminum

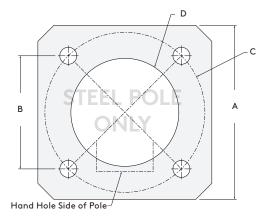


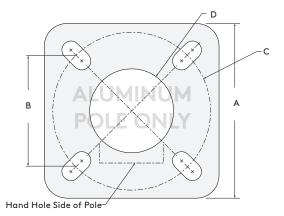
BC9 - Available for: O-AT64-156 O-ST5936-11





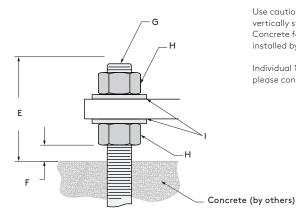
Mounting Plate Detail





Mounting Plate Details	A Base Plate SQ	B Base Plate SQ	C Base Circle Ø	D Conduit Opening Ø
O-A35-197 3.5" Round Straight Alum Pole	8" (203mm)	5 ½" (139mm)	7 ³/₄" (197mm)	3" (76mm)
O-AT535-156 5" to 3.5" Round Tapered Alum Pole	9 ⁵ /8" (244mm)	6 1/8" (155mm)	8 5/8" (219mm)	4 5/8" (117mm)
O-AT535-188 5" to 3.5" Round Tapered Alum Pole	9 ⁵ /8" (244mm)	6 1/8" (155mm)	8 5/8" (219mm)	4 ⁵ /8" (117mm)
O-AT635-188 6" to 3.5" Round Tapered Alum Pole	10 5/16" (262mm)	6 ¹¹ /16" (171mm)	9 ½" (241mm)	5 ½" (140mm)

Anchor Bolt Detail



Use caution when setting anchor bolts. Bolts must be vertically straight and centered on dimension shown. Concrete footing and feed conduit to be designed and installed by others.

Individual 1:1 scale drawings for installation available, please consult factory.

All Hardware is Galvanized

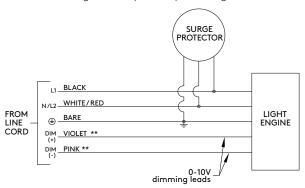
Anchor Bolt Details	E Bolt Projection	F For Leveling	G Anchor Bolt	H Heavy Hex Nut	J Flat Washer
O-A35-197 3.5" Round Straight Alum Pole	3 ¼" (82mm)	½" (13mm)	3/4"-10 UNC x 17"	3/4"-10 UNC	3/4" ID
O-AT535-156 5" to 3.5" Round Tapered Alum Pole	3 ¼" (82mm)	½" (13mm)	³/4"-10 UNC x 17"	³/4"-10 UNC	3/4" ID
O-AT535-188 5" to 3.5" Round Tapered Alum Pole	3 ¼" (82mm)	½" (13mm)	3/4"-10 UNC x 17"	3/4"-10 UNC	3/4" ID
O-AT635-188 6"-3.5" Round Tapered Alum Pole	3 ½" (89mm)	½" (13mm)	³/4"-10 UNC x 17"	3/4"-10 UNC	3/4" ID

selux

Wiring Diagrams

Standard Wiring (120V-277V)

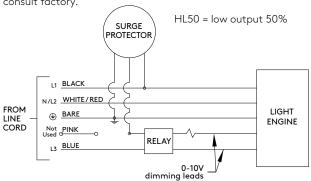
**When dimming is not required cap dimming wires.



Wire Designation Table							
Source Voltage (VAC)	Wire Color	Wire Designation					
120V or 277V	Black	L1					
	White	Neutral					
208V or 240V	Black	L1					
208V or 240V	Red	L2					
UNV (120V-277V)	Black	L1					
	White	Neutral (120/277V) or L2 (208/240V)					

Hi-Lo Switching Option (HL) Wiring HL50 Only

120V, 240V, 277V. When blue is energized, light output will be at "Lo" level. Specify low-level by using the level listed below. For other combinations, consult factory.

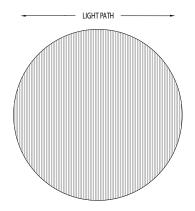


Options

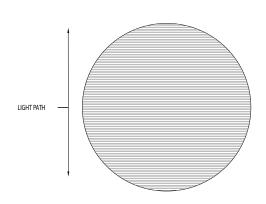
selux

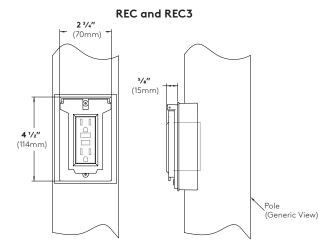
Dark Sky 0° Tilt Option (DS) -Luminaire head tilt angle preset and fixed at factory to comply with IDA Dark Sky and BUG U0 ratings. IDA Dark Sky compliant with 3000K CCT only.

Horizontal Spread Lens (SLH) - Spread lens for horizontal light distribution. Replaces clear lens and intended to be used with reflectors for S09, F40 or F80 distribution. Preset and fixed at factory.



Vertical Spread Lens (SLV) - Spread lens for vertical light distribution. Replaces clear lens and intended to be used with reflectors for S09, F40 or F80 distribution. Preset and fixed at factory.



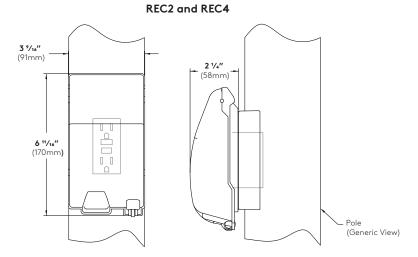


Cover shown in the closed position

GFCI Receptacle (REC) - 120V 15A GFCI duplex receptacle with weatherproof, self-closing cover; located 36" (915mm) o.c. from base of pole, in-line with hand hole. Receptacle is intended only for portable tools or other portable equipment to be connected to outlet only when attended by operating personnel (120V only).

USB & Duplex Receptacle (REC3) (not shown) - 120V 20A duplex receptacle with USB combination ports. (1) type A and (1) type C high power 5A, 5V USB outlets. With weatherproof, self-closing cover; located 36" (915mm) o.c. from base of pole, in-line with hand hole. Receptacle is intended only for portable tools or other portable equipment to be connected to outlet only when attended by operating personnel.

REC3 does not incorporate GFCI (Ground Fault Circuit Interrupter) protection, and shall be powered by a GFCI protected branch circuit (by others).



Cover shown in the closed position

GFCI Receptacle (REC2) - 120V 15A GFCI duplex receptacle with weatherproof, self-closing, padlockable in-use cover; located 36" (915mm) o.c. from base of pole, in-line with hand hole. Receptacle is intended only for portable tools or other portable equipment to be connected to outlet only when attended by operating personnel (120V only).

USB & Duplex Receptacle (REC4) (not shown) - 120V 20A duplex receptacle with USB combination ports. (1) type A and (1) type C high power 5A, 5V USB outlets. With weatherproof, self-closing padlockable in-use cover; located 36" (915mm) o.c. from base of pole, in-line with hand hole. Receptacle is intended only for portable tools or other portable equipment to be connected to outlet only when attended by operating personnel.

REC4 does not incorporate GFCI (Ground Fault Circuit Interrupter) protection, and shall be powered by a GFCI protected branch circuit (by others).

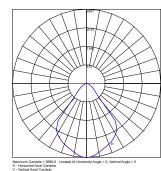
selux

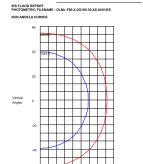
Photometry

F80 / 46W LED / 3000K CCT

Catalog #: OLML-F80-X-2G105-30 Delivered Lumens: 3941 Input Watts: 46W Maximum candela of 2686.6 Maximum candela Angle 0H x 0V NEMA Classification: 6H x6V Power Factor: 0.990

IES FLOOD REPORT PHOTOMETRIC FILENAME: CLML-F80-X-2G105-30-XX-UNV.IES AXIAL CANDELA DISPLAY



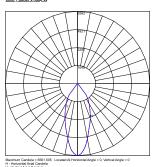


tscimum Candela = 2688.6 Located At Horizontal Angle = 0, Vertical Angle = 0 0% Maximum Candela = 1343.3

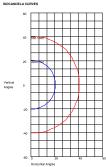
F40 / 46W LED / 3000K CCT

Catalog #: OLML-F40-X-2G105-30 Delivered Lumens: 4059 Input Watts: 46W Maximum candela of 6561.5 Maximum candela Angle 0H x 0V NEMA Classification: 5H x 5V Power Factor: 0.990

IES FLOOD REPORT PHOTOMETRIC FILENAME : OLML-F40-X-2G105-30-XX-UNV.II



IES FLOOD REPORT PHOTOMETRIC FILENAME: OLML-F40-X-2G105-30-XX-UNVJE

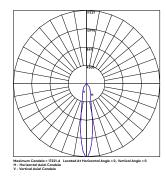


Maximum Candela = 6561.505 Located At Horizontal Angle = 0, Vertical Angle = 0 50% Maximum Candela = 3280,7525 10% Maximum Candela = 566.1505

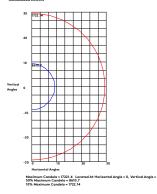
S20 / 46W LED / 3000K CCT

Catalog #: OLML-S20-X-2G105-30 Delivered Lumens: 4290 Input Watts: 46W Maximum candela of 17221.4 Maximum candela Angle 0H x 0V NEMA Classification: 4H x 4V Power Factor: 1.00

IES FLOOD REPORT PHOTOMETRIC FILENAME : OLML-S20-X-2G105-30-XX-UNV.IE



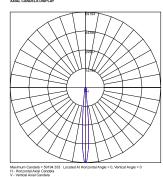
IES FLOOD REPORT PHOTOMETRIC FILENAME : OLML-S20-X-2G105-30-XX-UNV.IES



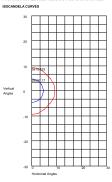
S09 / 46W LED / 3000K CCT

Catalog #: OLML-S09-X-2G105-30 Delivered Lumens: 4074 Input Watts: 46W Maximum candela of 59194.3 Maximum candela Angle 0H x 0V NEMA Classification: 1H x 1V Power Factor: 1.0

IES FLOOD REPORT PHOTOMETRIC FILENAME : OLML-S09-X-2G105-30-XX-UNV.IE



IES FLOOD REPORT PHOTOMETRIC FILENAME: OLML-S09-X-2G105-30-XX-UNV.IES



Maximum Candela = 59194.333 Located At Horizontal Angle = 0, Vertical Angle = 0 50% Maximum Candela = 29597.1665



Finish Options

All colors are polyester powder coat paint. Custom color or RAL color available by request that meet AAMA 2604 standard.

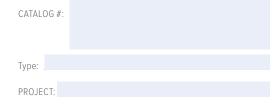


LED Enclosed & Gasketed Industrial/Garage Lighter





6-3/4" 5-1/2



FEATURES

- Wide distribution optics are ideal for parking garage applications
- Fully gasketed fixture is built tough to resist contaminants
- Toggle latches ensure a tight seal and provide easy access to electrical components
- Optional tamper-resistant latches available
- Standard stainless steel latches protect the fixture from corrosion in harsh environments
- NSF/ANSI Standard 2-Splash Zone certified
- IP65, IP66, and IP67 certified
- Closed-cell polyurethane gasket poured and formed in place to ensure tight seal-does not absorb water or promote fungal growth
- High-performance up to 147 lm/W
- Made Right Here® in the USA

SPECIFICATIONS

- ENCLOSURE Outer housing consists of 5VA (f1) fiberglass, rated for flame and weather resistance.
- INTERNAL HOUSING .050" aluminum.
- LATCHING Stainless steel latches. Injection-molded polycarbonate latches available (not recommended for use in harsh environments, such as a car wash).
- REFLECTOR 95% reflective highly specular aluminum.
- SHIELDING Frosted or clear, impactresistant acrylic.
- ELECTRICAL High-quality mid-power LED board. L70 >50,000 hours. -20°C to 40°C maximum ambient operating temperature. -40°C minimum operating temperature with LA40 option.
- MOUNTING Surface or suspended. Stainless steel ceiling mount brackets included.
- LISTINGS
 - cETLus conforms to UL STD 1598 and UL STD 8750. Certified to CAN/CSA STD C22.2 No. 250.0. Suitable for wet locations when specified with watertight hub, STOW or SOOW cord, or mini-male
 - ntd, 510W of 500W cord, or mini-male receptacle option.

 NSF/ANSI Standard 2–Splash Zone certified, IP65, IP66, and IP67 certified, and rated for NEMA 4X.
- WARRANTY 5-year limited warranty, see hew.com/warranty.

ORDERING INFO

SERIES	LENGTH	LUMENS [1]	CRI	ССТ	SHIELDING
97	2 2' 4 4'	2' L25 2500lm L37 3700lm L45 4500lm	8 80	30 3000K 35 3500K 40 4000K 50 5000K	FR Frosted, impact-resistant acrylic A Clear, impact-resistant acrylic with frosted ends
		L50 5000lm L79 7900lm L95 9500lm			

ORDERING EXAMPLE: 97 - 4 - L95/840 - FR - OPTIONS - CONTROL/DRV - UNV

OPTIONS [3]

EM/10W 10-watt emergency battery [5]

EM/6WC 6-watt emergency, low temperature battery [6] LA40 -40°C minimum operating temperature (L__)

Additional lower lumen packages available Example: 6,100 lumens = 97-4-L79/840-FR-(**L61**) ^[7] (1) 1/2" watertight hub ^[8]

WET/1 (2) 1/2" watertight hubs [9] WET/2

Stainless steel chain mounting brackets [10] **SSCMB** Injection-molded polycarbonate latches. [11] PCI

Tamper-resistant screws [12]

CONTROL None

See page 3 for Additional Control Options. [13]

DRIVER [4]

DIM Dimming driver **DRV** Non-dimming driver

VOLTAGE 120 120V 277 277V **UNV** 120-277V

347 347V [14]

ACCESSORIES

TPTG TOOL Tamper-resistant tool for tri-groove screws. [15]

NOTES

- Lumen output based on 4000 CCT and FR shielding. Actual lumens may vary +/-5%. See page 2 for FIXTURE PERFORMANCE DATA.
- Extended lead times may apply. Consult factory for availability. Stainless steel latches required for applications with harsh chemicals. See page 2 for CORD OPTIONS. See page 2 for OPTION DETAILS.
- See page 3 for ADDITIONAL DRIVER OPTIONS.
- 4' only. 25°C maximum ambient operating temperature at or below L79.
- 4' only. Rated for -20°C to 25°C ambient temperature. Specify in increments of 100 nominal lumens. Option must be specified with next higher lumen package.
- Factory-installed in end of housing. Factory-installed in ends of housing. Not available with occupancy sensor option.
- 2 per fixture
- 11 Not recommended for use in harsh environments, such as a car
- This option requires a tamper-resistant tool, see Accessories.
 See page 3 for SENSOR PLACEMENT DETAILS.
- Not available with EM batteries.
- Tamper-resistant tool must be ordered separately. Please specify quantity required per project.

97 LED Enclosed & Gasketed Industrial/Garage Lighter

FIXTURE PERFORMANCE DATA

	LED PACKAGE	DELIVERED LUMENS	WATTAGE	EFFICACY (Im/W)
	L25	2559	18.3	139.8
~	L37	3756	27.2	138.0
	L45	4554	30.8	147.5
	L50	5118	34.7	147.1
4	L79	7920	57.3	138.1
	L95	9590	64.7	148.1

- Photometrics tested in accordance with IESNA LM-79. Results shown are based on 25°C ambient temperature.
- Wattage shown is average for 120V through 277V input.
- Results based on 4000K, 80 CRI, actual lumens may vary +/-5%
- Use multiplier tables to calculate additional options.

MULTIPLIER TABLES

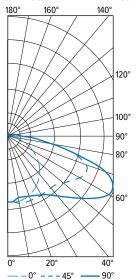
	COLOR TEMPERATURE			
	ССТ	CONVERSION FACTOR		
	3000K	0.96		
80 CRI	3500K	0.97		
80	4000K	1.00		
	5000K	1.03		

	5000K	1.03
\equiv		
	3000K	0.79
공	3500K	0.80
90 CRI	4000K	0.83
	5000K	0.86

CONVERSION FACTOR	
1.00	
0.98	

PHOTOMETRY

97-4-L95/840-FR-DRV-UNV Total Luminaire Output: 9590 lumens; 64.8 Watts | Efficacy: 148 lm/W | 86.8 CRI; 4166K CCT

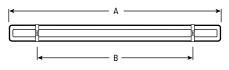


	VERTICAL ANGLE	HORIZONTAL ANGLE			ZONAL LUMENS
		0°	45°	90°	ZUNAL LUMENS
	0	1545	1545	1545	
	5	1570	1599	1458	149
	15	1528	1609	1501	442
	25	1427	1608	1553	717
	35	1285	1595	1680	970
ᅙ	45	1088	1629	2050	1243
5	55	844	1853	2546	1582
是	65	565	2070	2778	1795
ᅙ	75	307	1660	1823	1408
2	85	109	716	689	665
CANDLEPOWER DISTRIBUTION	90	70	460	411	
	95	51	314	281	285
	105	36	185	172	154
	115	22	117	134	95
	125	11	65	95	52
	135	0	30	54	22
	145	0	12	28	8
	155	0	0	10	2
	165	0	0	0	0
	175	0	0	0	0
	180	0	0	0	

	ZONE	LUMENS	% FIXTURE
≿	0 - 30	1308	14
LUMEN SUMMARY	0 - 40	2278	24
₹	0 - 60	5103	53
S	0 - 90	8971	94
뿔	90 - 120	534	6
⇉	90 - 150	617	6
	90 - 180	619	7
	0 - 180	9590	100

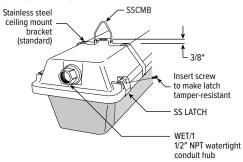
FIXTURE DETAILS

BACKVIEW



NOMINAL LENGTH	OVERALL LENGTH (A)	MOUNTING DISTANCE (B)
2′	27-5/8"	12"- 17" OC
4′	51-7/8"	30"- 42" OC
8′	100-1/4"	48"- 80" OC

OPTION DETAILS



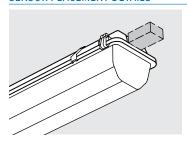
CORD OPTIONS

EXAMPLE: 5WMRC6				
NUMBER OF CONDUCTORS	POWER CONNECTION - NON-DIMMING	CORD LENGTH		
	WMR Mini-male receptacle only	-		
3 3-wire 4 4-wire	WC STOW cord	6 6'		
4 4-WIIE	WMRC Mini-male receptacle with STOW cord	20 20'		
	POWER CONNECTION – DIMMING			
.	WMR Mini-male receptacle only	-		
5 5-wire 6 6-wire	WC SOOW cord	6 6'		
6 6-wife	WMRC Mini-male receptacle with SOOW cord	20 20'		

Wet location cord sets are yellow.

97 LED Enclosed & Gasketed Industrial/Garage Lighter

SENSOR PLACEMENT DETAILS



ADDITIONAL CONTROL OPTIONS

WS-FSP-321B-L_-120-480 Wattstopper PIR motion and daylight sensor using 0-10V internal control, 120V-480V. Must specify lens: L2, L3 or L7. Factory installed.

SPECIFICATIONS TYPE PIR Motion + Daylight MOUNTING HEIGHT 8' - 40' **DETECTION ANGLE** 360° TEMPERATURE RANGE -40° to 75°C COMMISSIONING App (iOS or Android)

IP66 certified for wet locations. Not rated for NEMA 4X.

SENSOR COVERAGE PATTERNS

L2 8' height: ø48' coverage





L3 20' height: ø40' coverage





L7 40' height: ø100' coverage





SENSOR DETAIL



WS-HB350W-L3W-___ Wattstopper PIR motion sensor. Must specify voltage: 120 or 277V.

SPECIFICATIONS	
TYPE	PIR Motion
MOUNTING HEIGHT	20'
DETECTION ANGLE	360°
TEMPERATURE RANGE	-40° to 70°C
RELATIVE HUMIDITY	20 to 90%, non-condensing

IP65 certified for wet locations. Not rated for NEMA 4X.

SENSOR COVERAGE PATTERNS

20' height: ø40' coverage





SENSOR DETAIL



ADDITIONAL DRIVER OPTIONS

Note: Lumen restrictions apply, consult product builder at hew.com/product-builder.

Note: Lumen restrictions apply, consult product builder at new.com/product-builder.		
CATALOG NUMBER	DESCRIPTION	
DRV	Driver prewired for non-dimming applications	
DIM	Dimming driver prewired for 0-10V low voltage applications	
DIM1	1% dimming driver prewired for 0-10V low voltage applications	
DIM LINE	Line voltage dimming driver (TRIAC and ELV compatible, 120V only)	
DIM TRC	Line voltage dimming driver (TRIAC compatible, 120V only)	
SD40	40% step-dimming driver	
SD50	50% step-dimming driver	
DALI	DALI dimming driver	
LDE1	Lutron Hi-lume 1% EcoSystem dimming LED driver	

		·

SECTION 26 84 00 - FIRESTOPPING AND SMOKESTOPPING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Specification 07 84 13 - Penetration Firestopping applies to the work of this Section.

1.2 WORK INCLUDED

- A. Provide firestopping and smokestopping for Electrical Systems to comply with IBC 714.
- B. Provide submittals and installation detail sheets.

1.3 SUBMITTALS

- A. Provide a schedule of each type of penetration together with the proposed method of protecting that penetration type. Schedule shall include the following details:
 - 1. Penetrated item (e.g., wall, floor, roof).
 - 2. Construction of item (e.g., metal studwall with gypsum wallboard).
 - 3. Fire rating of item (e.g., 1 hour wall).
 - 4. Description of penetrating item (e.g., 1" to 3" Schedule 40 pipe).
 - 5. Identification of penetrating seal to be used in this case (e.g., Rectorseal biostop pipe collar).
 - 6. UL or FM detail sheet (e.g., per attached example).
 - 7. UL of FM system number (e.g., WL1200).
- B. Submittal shall include complete details for each penetration covered by this Division.
- C. It is intended that the submittal include each detail in full for each system used, so that it is clear that the installing Contractor has the correct reviewed information in the field.

1.4 QUALITY ASSURANCE

- A. Firestopping Materials: Provide penetration seal assemblies whose fire-resistance ratings have been determined by testing in the configurations required and which have fire-resistance ratings at least as high as that of the fire-rated assembly in which they are to be installed.
 - 1. Comply with all applicable codes including but not limited to:
 - a. American Society of Testing and Materials (ASTM).

- b. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials:
 - i. ASTM E 119 Method of Fire Tests of Building Construction Materials.
 - ii. ASTM E 814 Test Method for Fire Tests of Through Penetration Firestops.
 - iii. ASTM C 665 (Corrosion & Microbial Resistance Portions) Standard
 Specification for Mineral-Fiber Thermal Insulation for Light Frame
 Construction and Manufactured Housing.
 - iv. ASTM E 90 Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- 2. Listed by Underwriters Laboratories (UL) and/or Factory Mutual Research Corporation for each specific intended application:
 - a. UL Building Materials Directory.
 - b. UL Fire Resistance Directory.
 - c. UL 2079 Test.

PART 2 - PRODUCTS

2.1 GENERAL

A. Firestopping and Smokestopping materials shall allow normal expansion and contraction (intumescent) of the penetrating item without failure of the penetrations seal and shall be heat absorbing (endothermic). Products may not emit hazardous, combustible, or irritating byproducts during installation or curing. Products shall not require special tools for installation.

2.2 MASONRY EXEMPTION

- A. The Contractor shall note IBC 714.3.1 Exemption, which states:
 - 1. **Exception:** Where the penetrating items are steel. ferrous or copper pipes, tubes or conduits, the annular space between the penetrating item and the fire-resistance-rated wall is permitted to be protected by either of the following measures:
 - a. In concrete or masonry walls where the penetrating item is a maximum 6-inch (152 mm) nominal diameter and the area of the opening through the wall does not exceed 144 square inches (0.0929 m2), concrete, grout or mortar is permitted where installed the full thickness of the wall or the thickness required to maintain the fire-resistance rating.

b. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.

2.3 MANUFACTURERS

- A. Manufacturers: Provide products complying with requirements of the Contract Documents and made by one of the following:
 - 1. Rectorseal.
 - 2. Hilti, Inc.
 - 3. 3M Fire Protection Products.
 - 4. Specified Technologies Inc.
 - 5. U.S. Gypsum Company.
 - 6. Johns Manville.
 - BlazeMaster.

2.4 FIRESTOPPING PRODUCTS

- A. Provide firestopping products which:
 - 1. Provide firestopping systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain fire resistance rating of assembly:
 - a. F-rated systems in accordance with ASTM 814.
 - b. T-rated systems in accordance with ASTM 814.
- B. Firestopping Flamespread Performance Requirements:
 - 1. Provide products with flamespread ratings of less than 25 and smoke-development rating of less than 50 as determined in accordance with ASTM E 84.
- C. Firestopping UL Performance Requirements:
 - 1. Provide products with UL ratings specified for assembly indicated as determined in accordance with UL listing.
- D. FM approval in lieu of UL shall be accepted by the Owner.

- E. Where a specific firestopping product is identified on the Drawings, either that product or a similar product which has been tested in the exact application shown on the Drawings shall be employed, after review by the Engineer.
- F. Firestop caulk shall be Johns Manville Firetemp Cl, Rectorseal Biostop 500+, or approved equal, except where otherwise shown on the Drawings.

2.5 SMOKESTOPPING PRODUCTS

- A. Provide smokestopping products which:
 - 1. Allow normal expansion and contraction movement of the penetrating item without the failure of the penetration seal.
 - 2. Maintain at least the smoke resistance of the barrier penetrated.
 - 3. Firestop caulk shall be Johns Manville Firetemp Cl or approve equal.

PART 3 - EXECUTION

3.1 INSTALLATION AND QUALITY ASSURANCE

- A. Install firestopping materials in exact accordance with the manufacturer's instructions and conditions of the testing; provide all accessory materials required.
- B. Provide the services of a factory representative of the fire proofing product to review the installation practices and conduct training of the applications.
- C. Installer shall be trained to perform work.
- D. Inspection: The Authority Having Jurisdiction shall have final inspection review of all work performed. Contractor shall make modifications to completed and uncompleted work as directed by the AHJ at the Contractor's expense.
- E. Refer to the Certified Installation Instructions sheet on the following page for an example of an acceptable installation method.

3.2 FIRESTOPPING AND SMOKE STOPPING ITEMS

- A. Under Division 26, provide and pay for all firestopping materials, assemblies, and labor to provide complete firestopping and smokestopping.
- B. Provide firestopping of penetrations at each fire-rated floor, wall, or roof assembly of the following components:
 - 1. Conduits and raceways provided by Division 26.

2. Other equipment or work provided by Division 26 which penetrates rated walls.

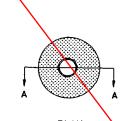
Attachment(s): Example Detail Sheet

END OF SECTION 26 84 00





500+GW-92 Wall Penetration 1, 2 Hr. Rating



1 layer of 5/8" **UL Classified** Gypsum Wallboard for 1 Hr. Rating or 2 layers of 5/8"

Max. 1" Corrugated Stainless Steel Tubing (PVC Coated)

for 2 Hr. Rating 1/2" depth Metacaulk® 1000 Steel Sleeve/ Mineral Wool Wire Mesh **Backing Material**

SECTION A-A

EXAMPLE

SYSTEM CONFIGURATION INFORMATION															
PRODUCT(S)		PENETRATING ITEM(S)		HOLE ANNULAR SIZE SPACING		ADDITIONAL INSTALLATION MATERIALS AND AIDS				ASTM E 814 RATING					
FILL MAT'L	MIN. THICK.	OTHER	TYPE	SIZE	INSULATION	MAX.	MIN.	MAX.	WIRE MESH	STEEL SLEEVE	OTHER	TYPE	DEPTH	Т	F
500+	1/2" both sides	none	PVC Coated Corruagated Stainless Steel Tubing	up to	none	3"	1/4"	1 1/2"	No. 8 steel wire mesh	min. 20 gauge	none	minimun 4.0 pcf mineral wool	1	0	2

INSTALLATION INSTRUCTIONS

These instructions are for the installation of through-penetration fire stop system 500+GW-92 in minimum 4 1/2 inch thick steel or wood stud fire rated gypsum wallboard partitions as listed by Underwriters Laboratories Inc. Refer to above drawings and System Configuration Information for component details.

Step Procedure

- 1 Cut hole in wall in required size to accommodate pipe penetrations and allowable annular spacing. Do not exceed maximum specified hole diameter.
- Install 1 inch PVC Coated Corrugated Stainless Steel Tubing. Support pipe rigidly on both sides of wall. 2
- Install specified wire mesh or minimum 20 gauge steel sleeve cut to size, formed to hole shape centered inside wall 3 around tubing and allowed to spring back snugly against periphery of hole.
- Install backing material by tightly packing annular space in between and around tubes with specified mineral wool 4 flush with wall. Recess mineral wool 1/2" on both sides of wall.
- 5 Apply a 1/2" depth of Biostop™ 500+ into annular space around tubing on both sides of wall. Tool surface to a smooth defect-free finish.

JOBNAME:

ARCHITECT:

CONTRACTOR:

CUSTOMER:

REPRESENTATIVE:

CUSTOMER ORDER NO:

REPRESENTATIVE ORDER NO:

RECTORSEAL

2601 SPENWICK HOUSTON, TEXAS 77055

REVISION NUMBER: 121499

SHEET NUMBER:

OF

SECTION 28 31 00 - FIRE ALARM SYSTEM IMPROVEMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Drawings and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections apply to the work of this Section.
- B. The Work of Section 26 05 00 Electrical Basic Materials and Methods applies to the Work of this Section.

1.2 EXISTING SYSTEM

A. The existing fire alarm system consists of a recently installed FCI E3 0 fire alarm control panel installed in McFaddin Hall and an FCI E3 System installed in Lyon Hall. The sprinkler coverage in War Memorial tunnel is monitored by the McFaddin flow switch.

1.3 WORK INCLUDED

- A. Under this project the existing sprinkler system in the basement tunnel below the War Memorial Cloister will be temporarily removed during renovations. As part of the work a temporary heat detector system will be installed in the construction area to prevent the adjacent structures from possible exposure fires from the construction area. At the end of the construction phase, the sprinkler system will be reinstalled and a flow and tamper switch installed. The existing main flow and tamper switches for Lyon and McFaddin Halls are also located in the tunnel and will be continuously monitored by the McFaddin panel during construction.
- B. The work of this Section shall include providing all materials, labor, services, permits and related work to furnish a complete, operating, tested, functioning, documented Fire Alarm and Detection Systems, and modifications and additions to the existing Fire Alarm and Detection System, including all work shown, specified, or required for proper system operation including, but not limited to, the following:
- C. Protect existing system devices from entrance of construction dust and debris. Device bagging shall not be allowed. Smokes shall be swapped with temporary heat detectors. That swap-out work shall be performed separately by the Owner.
- D. Provide and install new conduit pathways and boxes for new fire alarm Class 'A' circuiting as shown on Drawings.
- E. Salvage, protect and reinstall existing fire alarm devices as shown on Drawings.

- F. Provide testing of equipment and conductors.
- G. Provide extension of existing Class 'A', Style Z, notification appliance circuits.
- H. Provide Certificate of Completion and fees for permits and inspections.
- I. Provide openings in existing and new construction as required for the work of this Division.
- J. Provide maintenance of system in good condition until final acceptance.
- K. Provide acceptance testing. Provide all system testing paperwork.
- L. Provide programming with designators approved by Owner.
- M. Provide system device labeling per Owner's Specification.
- N. Provide start-up, testing and troubleshooting services as required.
- O. Provide one (1) year warranty from date of final acceptance.
- P. Provide Owner training.
- Q. Provide "As-Built" Drawings.

1.4 AGENCY APPROVALS

- A. All equipment shall be listed by Underwriters Laboratories, Inc. or approved by Factory Mutual or as accepted by the Authority Having Jurisdiction.
- B. The fire alarm system in its entirety shall be in compliance with all applicable fire and electrical codes and comply with the requirements of the local authority having jurisdiction over said systems.
- C. Accessory components as required shall be catalogued by the manufacturer and U.L. listed to operate with the manufacturer's control panel.

1.5 SUBMITTALS

A. General Requirements:

- 1. The installing contractor shall be licensed by the State of New York to engage in the business of installing fire alarm systems. Provide copy of valid license.
- 2. Delivery dates of the equipment to be supplied shall be furnished.

- 3. Installation and final test/acceptance dates of the equipment installed shall be coordinated with the inspector and shall be prior to the date of project substantial completion.
- 4. Substituted equipment shall not be allowed.
- 5. Fire alarm field technicians in charge of testing and commissioning shall have a NICET certification in fire alarm systems, minimum of Level II. Provide copy of technician's certificate.
- 6. Fire alarm project managers in charge of system design and submittal creation shall have a NICET certification in fire alarm systems, minimum of Level IV. Provide copy of Project Manager's certificate.

B. Fire Alarm System:

- 1. Contractor shall supply cut sheets for all proposed fire alarm system equipment, including but not limited to:
 - a. Fire alarm control panels and components.
 - b. Annunciator panels.
 - c. NAC extender panels.
 - d. Releasing panels.
 - e. Smoke, heat, carbon monoxide detectors.
 - f. Notification appliances.
 - g. Monitor modules.
 - h. Output relays.
 - i. Power relays.
 - j. Batteries.
 - k. Fire alarm conductors.
 - Detector bases.
- 2. Provide battery calculations showing total capacity to meet code required durations.
- 3. For projects expanding onto an existing fire alarm control system, it shall be the Contractors responsibility to supply product that can integrate under normal operation with the existing system.

C. Satisfying the Entire Intent of these Specifications:

- It is the Contractor's responsibility to meet the entire intent of these Specifications.
 Deviations from the specified items shall be at the risk of the Contractor until the date of final acceptance by the Architect and Engineer.
- 2. All costs for removal, relocation or replacement of a substituted item shall be at the risk of the Electrical Contractor.

1.6 CODES AND STANDARDS

A. The Fire Alarm and Detection System shall comply with all local and state codes with no exception.

PART 2 - PRODUCTS

2.1 EQUIPMENT MATERIAL AND GENERAL REQUIREMENTS

- A. All equipment furnished for this project shall be new and unused. All components and systems shall be designed for uninterrupted duty. All equipment, materials, accessories, devices, and other facilities covered by this specification or noted on Contract Drawings and installation Specifications shall be the best suited for the intended use and shall be provided by a single manufacturer. If any of the equipment provided under this Specification is provided by different manufacturers, then that equipment shall be recognized as compatible by both manufacturers, and "Listed" as such by Underwriters' Laboratories.
- B. System installation and operations shall be verified by the manufacturer's representative and a verification certificate presented upon completion. The manufacturer's representative shall be responsible for an on-site demonstration of the operation of the system and initial staff training as required by the Consulting Engineer.

2.2 NOTIFICATION APPLIANCE - WALL-MOUNTED STROBE

- A. The strobe shall be a System Sensor SpectrAlert Advance Model SRL Listed to UL Standard 1971 and shall be approved for fire protective service.
- B. The strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1Hz over the strobe's entire operating voltage range.
- C. The strobe light shall consist of a xenon flash tube and associated lens/reflector system.
- D. Strobes and horn/strobes shall have field-selectable candela settings including 15, 15/75, 30, 75, 95, 110 and 115.
- E. Provide sync module.

2.3 MAGNETIC DOOR HOLD

- A. Surface or semi-recessed mount as shown on Drawings.
- B. 24 VDC, fail-safe, sprayed aluminum finish, 35 lbs. holding power.

C. Rixson Model 996 or 998.

PART 3 - EXECUTION

3.1 INSTALLER'S RESPONSIBILITIES

- A. The installer shall coordinate the installation of the fire alarm equipment with the manufacturer or their authorized distributor.
- B. All conductors and wiring shall be installed according to the manufacturer's recommendations.
- C. It shall be the installer's responsibility to coordinate with the supplier, regarding the correct wiring procedures before installing any conduits or conductors.

3.2 INSTALLATION OF SYSTEM COMPONENTS

- A. System components shall be installed in accordance with the latest revisions of the appropriate NFPA Codes and Standards, the requirements contained herein, National Electrical Code, local and state regulations, the requirements of the fire department and other applicable authorities have jurisdiction.
- B. Low energy U.L. listed fire protective signaling circuit cable with 105°C insulation may be used when allowed by the local Authority Having Jurisdiction.
- C. Installer shall verify that smoke detectors are mounted not less than three (3) feet from air supply and return diffusers.
- D. Install visual only notification appliances in offices, toilet rooms and hearing impaired rooms.

3.3 WIRING & INSTALLATION

- A. For fire alarm use, wire and cable shall be U.L. listed and a minimum of 18 AWG as required by local codes and authority having jurisdiction. All fire alarm and detection circuits shall be in FPLP plenum rated cabling.
- B. Provide wiring between main control panel devices as required for specified operation.
- C. Raceways containing conductors identified as "Fire Protective Alarm System". Conductors shall not contain any other conductors and no AC current carrying conductors shall be allowed in the same raceway with the D.C. fire alarm detection and signaling conductors.

D. Contractor shall punch out/drill holes in fire alarm cabinets and vacuum cabinets clean prior to installing the interiors. If panels arrive with the interiors in place, Contractor shall remove and protect them during construction. Any damage done to interiors due to metal shavings falling onto the boards shall be repaired or replaced at the Contractor's expense.

3.4 SYSTEM IDENTIFICATION/LABELING

- A. Provide lettered plates for the following equipment, components, and accessories. The plate shall contain the equipment identification (custom panel number, area served), as well as power circuit source and breaker number. Label shall be plastic lamicoid engraved plated or approved equal. (Note: ALL lettered plates shall be reviewed and approved by Cornell University's Environmental Health and Safety Department prior to installation.)
 - 1. Fire Alarm Control Panels.
 - 2. Remote Annunciators.
 - 3. Digitize "Mux Pads".
 - 4. Remote Power Supplies.
- B. Provide type-written directories on the following equipment, components, and accessories:
 - 1. Fire Alarm Control panels (non-addressable systems).
 - 2. Remote Annunciators (non-addressable systems).
- C. Provide computer-generated adhesive labels and install on the bases of all initiating device and notification appliances, as well as any remote test and monitoring station. The label shall indicate the address and must be legible from a standing position below.
 - 1. Labeling guideline for signaling line circuit (SLC):
 - a. FACP/Board Loop/cct# Device#.
 - 2. Labeling guideline for notification appliance circuit (NAC):
 - a. FACP/Board Loop/cct# Device# (where addressable).
- D. Initiating, notification, signaling and other fire alarm 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.). Wiring shall be consistent throughout the system with no color changes on individual loops from the FACP.
- E. Junction and splice boxes containing fire alarm system wiring, circuits and conductors shall have red covers and marked "FIRE ALARM" in 3/4" (three-quarter inch) white letters.

- F. Fire alarm equipment supplied with 120 VAC power shall be labeled with the panel source information, including panel name, room number and source breaker number.
- G. End-of-line resistance in two-wire systems shall be located at the fire alarm control panel, if feasible; otherwise, end-of-line resistors shall be installed in designated junction boxes with red covers and marked in accordance with the Specifications of this section.

3.5 TESTING

A. The Contractor shall be responsible for coordinating tests between the Owner's representative and the fire alarm manufacturer.

B. Testing Required:

1. Acceptance Test:

- a. The fire alarm system detection zone and notification zone shall be tested 100% prior to acceptance. All devices in the zone, whether within the area of construction or not, shall be tested.
- b. Provide minimum (72) hours prior notice to EH&S and AHJ.
- c. Complete and submit Program sheets to EH&S.
- d. Ensure that the system is pre-tested.
- e. Contractor to provide all testing equipment.
- f. Smoke detectors shall be tested by smoke.
- g. Heat detectors shall be tested by heat.

2. Re-Acceptance Testing:

- a. Adding Device: The new component shall be functionally tested.
- b. Deleting Device: The circuit affected shall have a device on the line tested.
- c. Program Changes: All known functions affected by the change shall be tested 100%. In addition, 10% of all initiating devices not affected shall be tested.

Final Test:

- a. Before the installation shall be considered completed and acceptable by the Owner, a test on the system shall be performed as follows:
 - i. The Contractor's job foreman, in the presence of a representative of the manufacturer, a representative of the Owner, and the inspector shall operate each building fire alarm device to ensure proper operation of the device, and correct annunciation at the control panel, the remote annunciator and building alarms.

- ii. The signaling circuits shall be opened in at least two (2) locations per zone to check for the presence of correct supervisory circuitry.
- iii. When the testing has been completed to the satisfaction of both the Contractor's job foreman and the representatives of the manufacturer and Owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the Engineer and the Fire Department.
- iv. The Contractor shall leave the fire alarm system in proper working order and without additional expense to the Owner, shall replace any defective materials or equipment provided by him under this Contract, within one (1) year from the date of final acceptance by the Owner.
- v. Prior to final test the fire department must be notified in accordance with local requirements.

3.6 AS-BUILT DRAWINGS

- A. Maintain a dedicated set of Construction Drawings at a protected location at the Job Site for the recording of actual installed locations of piping, ductwork, equipment, and accessories. Record any and all variations from the original Construction Drawings in neat, legible hand drawn lines and text. Attach copies of field sketches and Architect's supplementary instructions where they occur.
- B. Provide the original or copies of the As-Built Drawings to the Architect or Engineer in accordance with the provisions of the General Conditions and Division 1. If reproducible As-Built Drawings are not included under the General Condition and Division 1, provide the original copy of Record Drawings to the Engineer for the Owner with one (1) photocopy for the Engineer's files. The Contractor shall retain a second photocopy to be retained by the Contractor. As-Built Drawings shall be signed and dated and include the legend "As-Built" and the Company name. The Contractor shall be responsible to the safe keeping and maintenance of the As-Built Drawings throughout construction for transmission of the original and one (1) photocopy at the Contractor's office for a period of not less than one (1) year following final acceptance.
- C. A complete set of reproducible "As-Built" Drawings showing installed wiring, color coding and wire tag notations for exact locations of all installed equipment shall be delivered to the Engineer upon completion of system.
- D. Contractor shall mark addressable IDs of each device onto the As-Built Drawings.

3.7 OPERATION AND MAINTENANCE INFORMATION

A. Prepare copies of an Operation and Maintenance Manual and submit to the Engineer for approval. Provide two (2) hard copies plus one (1) electronic copy.

- B. The Operation and Maintenance Manual shall be bound in a 3-ring binder. The binder shall be a view binder with clear vinyl panels on cover and spine, as available at Office Max or other office supply stores. On the spine of the manual mark the project number, the name of the building, the name of the project, the words "O&M Manual" and the trade (plumbing, HVAC, electric etc.), in letters ½" to ½" high. On the cover provide similar information. It is the intent of this paragraph to require O&M Manuals to be identifiable while stored in a bookshelf. Stick-on labels are not acceptable. Contractor names on spine of binders are not acceptable.
- C. The first page of the O&M Manual shall be a cover sheet listing the Contractor, Contractor's address, contact person, telephone and fax number, and the same information for major subcontractors. Identify the name and contact person of the Engineer, Architect and Colgate project manager.
- D. The second page of the O&M Manual shall be a typed guarantee from the Contractor with a one (1) year guarantee stated as commencing on the date of final acceptance by the University. Identify this date.
- E. The third page of the O&M Manual shall be an index sheet listing the type of equipment (e.g., "switchgear"). The vendor or distributor (e.g., "Elect Sales Co Inc."), the contact person (e.g., "John Smith") and the phone and fax number. This information shall be provided for each source of supply or subcontractor used on the contract.
- F. The remaining pages in the Manual shall include tabs for sections. Each section shall be a specification section of type of equipment installed under the contract. It shall include information on each replaceable part, valve, and appurtenance and on each item capable of requiring lubrication, maintenance, or adjustment.
- G. Each tab section shall include the following:
 - 1. Original approved Shop Drawing.
 - 2. Manufacturer's O&M information.
 - 3. Parts list.
- H. The Operation and Maintenance information for each item shall include a copy of the accepted Shop Drawing, plus all manufacturer's printed installation, operation, and maintenance instructions. Photocopies of manufacturer's information are not acceptable. Only original manufacturer's catalog and O&M information is acceptable. Delete information not specific to this project.
- I. In each manual, provide spare parts lists and directories for all equipment.
- J. In each manual provide a photocopy of all test reports, electrical, plumbing, or other inspections, fire system test reports and any other data test or certification data.

- K. Compilation of Shop Drawings only is not considered an adequate Operation and Maintenance Manual and will be returned to the Contractor for re-submission.
- L. Maintenance instructions shall be complete, easy to read, understandable and shall provide the following information:
 - 1. Instruction on replacing any components for the system, including internal parts.
 - 2. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions.
 - 3. A complete list of all equipment and components with information as to the address and phone number of both the manufacturer and local supplier of each item.
- M. User operating instructions shall be provided prominently displayed on a separate sheet located next to the control unit in accordance with U.L. Standard #864.
- N. Provide list of all notification devices with addresses, descriptors, and voltage at terminals.

3.8 OWNER TRAINING

- A. After submission and acceptance of the Operating and Maintenance information and prior to final acceptance of the Project, provide a scheduled instruction period for the Owner's designated representative. Instruction period shall be sufficient to cover the contents of the Operating and Maintenance portfolio, a walk-through of the Project and a review of all systems.
- B. Conduct additional instruction periods as required to cover any special systems and retain the services of manufacturer's representatives for special systems.
- C. At the conclusion of the instruction period, provide one (1) copy of the accepted Operation and Maintenance Manual to the Owner's representative and obtain a signed receipt.

3.9 GUARANTEE

- A. Prior to application for final payment, the Contractor shall provide a written guarantee covering all portions of the work of this Division. The guarantee shall warranty all work and materials for a period of one (1) year from the date of final acceptance. The guarantee shall provide for the repair or replacement of any defective equipment, materials, products, or work at no cost to the Owner.
- B. Items or work which are repaired or replaced under this guarantee shall be covered under an extended guarantee by the Contractor so that the replaced products or work shall have performed satisfactorily without repair or replacement for a period of one (1) year.

- C. The failure of any manufacturer to provide a one (1) year warranty, or the failure of any manufacturer or vendor to honor a warranty shall not relieve the Contractor from his obligation to provide a complete parts and labor guarantee on all work provided under his Contract for a period of one (1) year.
- D. Supplemental Guarantees Supplemental Guarantees and extended warranties may be included under this Contract as part of specific specification sections.

3.10 SYSTEM COMMISSIONING

A. Fire alarm program list to be provided to EH&S for review and approval prior to release to the fire alarm vendor. This effort is to allow for the fire alarm device descriptors and room numbers to be coordinated prior to entering into the fire alarm panel, as well as to verify the programming and operational sequence.

END OF SECTION 28 31 00

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SECTION 321400 - UNIT 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, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Unit stone paving.
- 2. Slotted stone drainage pavers
- 3. Edge restraints.
- 4. Granite benches around flagpole.
- 5. Pedestals for flagpole lighting.

B. Related Requirements:

- 1. Section 071353 "Sheet Membrane Waterproofing" for waterproofing below paving.
- 2. Section 033000 'Concrete" for concrete footings for site wall (Alternate No. 4 Scope)
- 3. Section 265000 "Lighting" for associated electrical work with flagpole lighting.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

1.4 ACTION SUBMITTALS

A. Product Data:

- 1. For materials other than water and aggregates.
- 2. For the following:
 - a. Pavers.
 - b. Stone setting materials.
 - c. Mortar and grout materials.
 - d. Edge restraints.
 - e. Sealant and backer rod.
- B. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C136.
- C. Samples for Initial Selection: For each type of unit paver indicated and the following:

- 1. Joint materials involving color selection.
- 2. Perforated edge restraints.
- 3. Slotted granite paver
- 4. Granite Paving
- 5. Granite curbs.
- D. Samples for Verification: For full-size units of each type of unit paver indicated. Include Samples of the following:
 - 1. Joint materials.
 - 2. Perforated edge restraints.
 - 3. Full size slotted granite paver
 - 4. Granite paver for cloister
 - 5. Granite paver for new paving around flagpole
 - 6. Small sample (12" by 12") of granite for new benches

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Adhesion and Compatibility Test Reports: From latex-additive manufacturer for mortar and grout containing latex additives.
- C. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.
 - 1. For solid interlocking paving units, include test data for freezing and thawing according to ASTM C67.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified unit paving installer. Installer's field supervisor and personnel assigned to the Work.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
 - 2. Mockup shall be stepped to show all layers of the paver assembly, including pavers (both slotted and solid), setting bed, drainage layer, and waterproofing membrane. Mockup to be installed in a drain sump area.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Submit to latex-additive manufacturer, for testing as indicated below, Samples of flooring materials that will contact or affect mortar and grout that contain latex additives.
 - 1. Use manufacturer's standard test methods to determine whether mortar and grout materials will obtain optimal adhesion with, and will be nonstaining to, installed brick and other materials constituting brick flooring installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquids in tightly closed containers protected from freezing.
- E. Store asphalt cement and other bituminous materials in tightly closed containers.

1.9 FIELD CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Mortar and Grout:
 - 1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and higher.
 - a. When ambient temperature exceeds 100 deg F (38 deg C), or when wind velocity exceeds 8 mph (13 km/h) and ambient temperature exceeds 90 deg F (32 deg C), set pavers within 1 minute of spreading setting-bed mortar.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 STONE MATERIALS

- A. Granite Pavers for Cloister: Rectangular paving slabs made from granite complying with ASTM C615/C615M.
 - 1. Color and Grain: Gray granite to match Engineer's sample. Cornell standard paving granite American Mist as supplied by Polycor
 - 2. Finish: Flame
 - 3. Match Engineer's samples for color, finish, and other stone characteristics relating to aesthetic effects.
 - 4. Thickness: 2 inches unless noted otherwise.
 - 5. Face Size: 24 inches square, unless noted otherwise
- B. Granite for new benches around flagpole and for new flagpole lighting pedestals:
 - 1. Color and Grain: Gray granite to match Engineer's sample, American Mist as supplied by Polycor.
 - 2. Finish: Flame
 - 3. Size: as delineated on Contract Drawings.
- C. Granite for pavers around flagpole:
 - 1. Color and Grain: Barre Gray as supplied by Polycor.
 - 2. Finish: Propane Flamed.
 - 3. Size: To be determined by Owner.

2.3 EDGE RESTRAINTS

- A. Stainless Steel Perforated Edge Restraints: Manufacturer's standard epoxy coated edge restraint.
 - 1. Manufacturer: Green Roof Solutions: Glenview IL 60025

2.4 ACCESSORIES

A. Compressible Foam Filler: Preformed strips complying with ASTM D1056, Grade 2A1.

2.5 AGGREGATE SETTING-BED MATERIALS

A. Stone Screenings for Leveling Course: Sound stone screenings complying with ASTM D448 for Size No. 10.

- B. Stone for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 (1.18-mm) sieve and no more than 10 percent passing No. 200 (0.075-mm) sieve.
 - 1. Provide sand of color needed to produce required joint color.
- C. Drainage Geotextile: Nonwoven needle-punched geotextile fabric as specified in Section 071353 "Sheet Membrane Waterproofing"
- D. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

2.6 MORTAR SETTING-BED MATERIALS

- A. Setting materials for isolated stone steps.
- B. Portland Cement: ASTM C150/C150M, Type I or Type II.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Sand: ASTM C144.
- E. Latex Additive: Manufacturer's standard acrylic resin or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed, and not containing a retarder.
- F. Water: Potable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Where unit paving is to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations, including areas where waterproofing system is turned up or flashed against vertical surfaces.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and waterproofing protection is in place.

3.2 PREPARATION

A. Clean surface of filter fabric prior to installing setting membrane.

3.3 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
- D. Joint Pattern: As indicated.
- E. Pavers over Waterproofing: Exercise care in placing pavers and setting materials over waterproofing so protection materials are not displaced and waterproofing is not punctured or otherwise damaged. Carefully replace protection materials that become displaced and arrange for repair of damaged waterproofing before covering with paving.
 - 1. Provide joint filler at waterproofing that is turned up on vertical surfaces unless otherwise indicated; where unfilled joints are indicated, provide temporary filler or protection until paver installation is complete.
 - 2. Install slotted pavers over restraining angles as indicated.

F. Tolerances:

1. Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage) or 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.

G. Expansion and Control Joints:

- 1. Provide for sealant-filled joints at locations and of widths indicated. Provide compressible foam filler as backing for sealant-filled joints unless otherwise indicated; where unfilled joints are indicated, provide temporary filler until paver installation is complete. Install joint filler before setting pavers. Sealant materials and installation are specified in Section 079200 "Joint Sealants."
- 2. Provide cork joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.
- H. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
 - 1. Install edge restraints to comply with manufacturer's written instructions. Lap geotextile filer fabric up at perforated edge restraints as indicated.
 - 2. Where pavers set in mortar bed are indicated as edge restraints for pavers set in aggregate setting bed, install pavers set in mortar and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.

3.4 AGGREGATE SETTING-BED APPLICATIONS

- A. Place leveling course and screed to a thickness of a minimum of 2" taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.
- B. Coordinate leveling course with installation of Snow Melt flexible tubing. Set tubing in the leveling course evenly, with equal cover top and bottom.
- C. Treat leveling course with herbicide to inhibit growth of grass and weeds. Use product that will not damage snow melt tubing.
- D. Set pavers with a minimum joint width of 1/4 inch being careful not to disturb leveling base and not damage waterproofing (at Cloister only). If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size unit pavers.
 - 1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
- E. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.
 - 1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches (900 mm) of uncompacted pavers adjacent to temporary edges.
 - 2. Before ending each day's work, compact installed concrete pavers except for 36-inch (900-mm) width of uncompacted pavers adjacent to temporary edges (laying faces).
 - 3. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches (90 mm) of laying face.
 - 4. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and cover leveling course on which pavers have not been placed with nonstaining plastic sheets to protect them from rain.
- F. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.
- G. Do not allow traffic on installed pavers until sand has been vibrated into joints.
- H. Repeat joint-filling process 30 days later.

3.5 MORTAR SETTING-BED APPLICATIONS

- A. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Before placing pavers, cut back, bevel edge, and remove and discard setting-bed material that has reached initial set. Mortar bed applications limited to steps and engraved stones only
- B. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set or disturb pavers for purposes of realigning finished surfaces or adjusting joints.

3.6 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.
- C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.
 - 1. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to paver and grout manufacturers.
 - 2. Do not allow protective coating to enter floor drains. Trap, collect, and remove coating material.

END OF SECTION 321400

SECTION 33 61 00 - EXTERIOR SNOW MELTING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and the General Provisions of the Contract, including the General Conditions of the Contract for Construction, Supplementary Conditions, Special Conditions and Division 1 Specification Sections, apply to the work of this Section.

1.2 WORK INCLUDED

- A. Provide a complete, operating, tested, functioning, documented exterior Snow Melting System including all work shown, specified, or required for proper system operation.
- B. Provide a BTU meter for the snow melting system and identify a value for the installed unit in the bid.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of piping specialties of types and sizes required and whose products have been in satisfactory use in similar service.
- B. All insulation specified hereinafter shall be new, undamaged, and clean material. Insulation shall be installed neatly according to the Engineer, the Owner, and the manufacturer's instructions. Workmanship shall be subject to the approval of the Engineer and the Owner's representative.
- C. The insulation and materials specified shall be delivered to the job bearing manufacturer's label and shall be applied only by mechanics skilled at such work. The appearance of the finished work shall be of equal importance with its mechanical correctness and efficiency.
- D. All products shall be certified to be free of asbestos.
- E. Insulation Compounds: Provide adhesives, cements, sealers mastics and protective finishes compatible with insulation, jacketing and surfaces to be covered.
- F. Insulation Accessories: Provide bands, wire, wire netting, tape, and anchors, as recommended by insulation manufacturer for applications indicated.
- G. Piping shall be pressure and leak tested, inspected, and approved prior to installation of insulation.

1.4 SUBMITTALS

- A. Submittal drawings and technical data shall be submitted by the Contractor for review by the Engineer. Submittal drawings shall include all details of the manufacturer's materials used for installation as well as dimensioned layout drawings. NO acceptance, written or verbal, of any drawings, descriptive data or samples of material shall relieve the Contractor of his responsibility to furnish the complete installation in perfect working order and in complete compliance with the Specifications and Drawings. Under no circumstances shall the Contractor install any materials until the Engineer has made final review.
- B. Product Data: Submit manufacturer's technical product data, including installation instructions. Include pressure drop curve or chart for each type and size of pipeline strainer. Submit schedule showing manufacturer's figure number, size, location, and features for each required piping specialty.
- C. Shop Drawings: Submit product data for all piping specialties specified.
- D. Product Data: Submit manufacturer's technical product data.
- E. Submit schedule of insulation applications.
- F. Samples, only when requested.
- G. Operating and Maintenance Manuals and Parts List.

1.5 PIPING INSTRUCTIONS

A. All piping shall be installed in a neat and workmanlike manner.

1.6 REPAIR OF EXISTING UNDERGROUND PIPING

- A. The Contractor shall take special precautions to avoid damage to any existing services which either cross, or parallel the new lines being installed.
- B. If any piping or conduit is damaged in any way, the damaged section shall be replaced to the satisfaction of the Owner. Any other incidental work, appurtenances, or material necessary to accomplish this work, no matter how extensive, shall be performed or provided by this Contractor at his own expense.
- C. All utilities, drainage tiles and other subsurface improvements which are broken as part of this work shall be replaced and reconnected. All drainage tiles shall be assumed to be active irrespective of age or condition.

1.7 FIRE/SMOKE RATINGS

A. All insulation, jackets, facings, and adhesives shall have a non-combustible fire and smoke hazard system rating and label as tested by ASTM E-84, NFPA-225, and UL 73 not exceeding Flame Spread 25, Fuel Contributed 50, Smoke Developed 50. All accessories shall have equal ratings.

1.8 GUARANTEE

A. System herein specified shall be free from defects in workmanship and material under normal use and service. If within twelve (12) months from date of acceptance any of the equipment herein described is proved to be defective in workmanship or materials, it will be replaced or repaired free of charge.

PART 2 - PRODUCTS

2.1 TUBING

- A. System shall be constructed of 3/4" CTS Watts Radiant PEX or approved equal. Tubing shall be rated at 200°F at 80 psig. Tubing shall be manufactured to ASTM F876 and ASTM F877.
- B. Tubing shall include an oxygen diffusion barrier to prevent oxygen diffusion and protect corrodible components of closed loop heating systems.

2.2 PRE-INSULATED UNDERGROUND SNOWMELT PIPE

- A. Factory fabricated, pre-insulated piping system. The pre-insulated piping system must be of a flexible design, and all components of carrier pipe, insulation, and jacket must be able to expand and contract as a unit without overstressing or adversely affecting any of the materials. The insulation shall completely fill the annular space between the service pipe and jacket and shall be completely bonded to both. The system shall be designed to be installed in a manner that will not require expansion loops or compensators of any type. The system shall be installed with the fewest number of underground joints possible. The system shall be supplied complete with coupling fittings, insulation kits, and termination fittings all supplied by the piping system supplier.
- B. Carrier Pipe: Cross-linked polyethylene (PEX) pipe suitable for temperatures up to 204°F at 90 psig.

C. Jacket Casing:

1. The outer protective jacket shall be corrugated seamless polyethylene completely encompassing and protecting the insulation from moisture and damage, designed for H-20 loading at a burial depth of 2 foot minimum.

Carrier Pipe (Nominal)	Jacket Size (OD)
3/4"	3" to 6.3"
1"	3" to 6.3"
11/4"	3" to 6.3"
1½"	3" to 6.3"
2"	4.5" to 6.3"
2½"	4.5" to 6.3"
3"	6.42" to 7.90"
4"	6.42" to 7.90"
5"	7.20"
5½"	8.00"

- D. Underground Buried Fittings (excluding fittings inside manifolds):
 - 1. Fittings shall be either copper, brass, or carbon steel compression type compatible with the PEX carrier pipe.
 - 2. All fittings shall be enclosed in a watertight, factory-provided field insulation kit.
- E. Insulation shall be foamed-in-place closed cell polyurethane foam with a minimum density of 2.0 pounds per cubic foot and a 'K' value of 0.17. Insulation shall completely fill the annular space between the carrier pipe and the jacketing.
- F. The pre-insulated piping shall be provided as a coil to the greatest extent possible to minimize field joints. The pre-insulated piping shall be one continuous length with no joints for the section installed in sleeves as shown on the Drawings.
- G. Exposed insulation at ends of pipes to be sealed with mastic. Heat shrink end seals shall be used on ends of pipe exposed in pullboxes and buildings. Heat shrink material to be CANUSA WTS or Reychem WPC 50.
- H. All buried field joints on fittings shall be field insulated with foam kits and sealants as recommended by the manufacturer.
- I. Acceptable Manufacturer: Rhinoflex by Rovanco, R-Flex Single by Watts Radiant or approved equal.

2.3 MANIFOLD PIPING

A. All piping and fittings shall be new and marked with manufacturer's name complying with applicable ASTM and ANSI Standards. All pipe and fittings shall be American made and marked with the country of origin.

B. Copper Pipe:

- 1. Type: Type L, ASTM B-88.
- 2. Fittings: Wrought or cast solder type pressure fittings.
- 3. Make: Anaconda or equal by Mueller, Revere.
- 4. Solder and Flux: Solder shall be in solid wire form of Type II 95-5 tin antimony solder conforming to ASTM B-32, grade 5A. Flux shall be zinc chloride or a mixture of zinc and ammonium chlorides. Solders containing lead shall not be used. 96.5-3.5 and 95-5 tin/silver solders may be used.

C. Manifold Headers:

- 1. Headers shall be either field fabricated or factory fabricated from copper piping with 3/4" stubs spaced at 4" on center. Watts CopperStub CustomCut manifolds are acceptable.
- 2. Factory built headers with integrated isolation valves and balance valves shall not be used.

D. Ball Valves:

- 1. Isolation Valves: Single piece brass ball, bronze body, chromium plated brass ball, 150 psig sat. steam, 600 psig W.O.G., blow-out proof stem, removable operation handle, soldered ends. Design Valve: Apollo, Fig. 70-400 Series or equal in Watts, Jamesbury, Nibco.
- 2. Vent and drain Valves: Hose end ball valve bronze ball valve with hose end thread, vacuum breaker and cap. Make: Apollo 78-200 Series with dust cover and chain, with Watts 8A vacuum breaker.
- 3. "Contractor Series" ball valves shall not be used.

E. Balancing Valve:

- 1. Description: Y pattern, globe style balance valve with handwheel positioning, and vernier or numeric position readout. 100% positive leakproof shutoff. Hidden memory stop.
- 2. Threaded or soldered bronze body Sizes $\frac{1}{2}$ " 2".
- 3. Cast-iron body flanged for size 2½" and Larger.
- 4. Sizing table: Provide valves sized according to the table below to provide a pressure drop of 2 ft wg in full open position:

GPM Flow	<u>Size</u>	Connection
0 - 2.7	1/2"	Sweat or Thread
1.44 - 6.1	3/4"	Sweat or Thread
2.75 - 9.4	1"	Sweat or Thread
3.54 - 15	11/4"	Sweat or Thread

GPM Flow	<u>Size</u>	Connection
4.63 - 21	1½"	Sweat or Thread
8.90 - 36	2"	Sweat or Thread
27 - 92	21/2"	Flanged
72 - 129	3"	Flanged
48 - 205	4"	Flanged
63 - 323	5"	Flanged
129 - 453	6"	Flanged

F. Manufacturer: Victaulic TA Series.

2.4 BTU METER

- A. Electronic Flow Meter, 150# flanged carbon steel body, signal converter in NEMA 6 Wall mount enclosure, wall mount kit.
- B. Flow Processor, NEMA 4 wall mount enclosure
- C. Matched Pair of fully potted 1000 ohm RTD temperature sensors, 25 ft of cable.
- D. Power supply to provide 24v DC for Meter and Processor from 120v source, NEMA 4 or NEMA 12 enclosure.
- E. Brass threaded thermowells for sensors.
- F. Manufacturer and Model: Spirax Sarco MAG3100 electromagnetic flow meter, FP93B flow processor, JMS 3XSBNK RTD sensors.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install in strict accordance with manufacturer's Snow Melt installation manual and manufacturer's representative instructions.
- B. Coordinate layout and pours with General Contractor.
- C. Provide sleeves at tubing exit from slab and at expansion joints.
- D. Insulation covering shall be continuous and shall extend through walls. Coverings shall be neatly finished at pipe and fittings, etc.

- E. At all points where existing lines are broken to cut in new connections, the insulation shall be repaired to its original condition.
- F. Insulation is required on all piping unless otherwise indicated in the Contract Documents.

3.2 BTU METER

A. Install and configure to record BTU output to slab. Arrange with a dry contact output from the Snowmelt control pump to enable or disable BTU measurement. Meter shall not log any BTU usage unless system pump is enabled by the Energy Management System.

3.3 CLEARANCE AND RESTORATION OF SITE

- A. Remove all material, fence, trees, brush, logs, stumps, and debris, etc., as required in performance of the work of this Contract.
- B. Restoration of site, including replacement and support of poles, replacement of sidewalk surfaces, excavation and backfill shall be completed to the satisfaction of the Owner and Engineer.

3.4 INSTALLATION

A. Piping:

- 1. General: Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently leakproof piping systems, capable of performing indicated service without piping failure. Install each run with minimum joints and couplings, reduce sizes (where indicated) by use of reducing fittings.
- 2. Install piping in trench with top of pipes in line. See details on Drawings.
- 3. All work shall be installed in a workmanlike manner as determined by the Owner and Engineer.
- 4. Accurately establish grade and elevation of all piping. Install piping without springing or forcing (except where specifically called for). Arrange piping with necessary offsets, flanges, valves, to allow for easy removal and maintenance, as approved.
- 5. Once a joint has been disassembled, the threads shall be re-cleaned, and new joint compound applied.
- 6. Changes in direction of pipelines can be made using the pipe flexibility and minimum bending radius.
- 7. Ream pipe and tube ends. Remove burrs.
- 8. Remove scale and dirt, inside and outside, before assembly.
- 9. Remover foreign material from pipe and fitting materials.
- B. Valves:

- 1. Install valves where required for proper operation of piping system. Locate valves so as to be accessible.
- 2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward or horizontal plane unless approved by the Owner and Engineer.
- 3. Select and install valves with ends to match piping system requirements.
- 4. Select and install valves with renewable seats, except where otherwise indicated.
- 5. Vents shall connect at the top of the pipe regardless of final valve position.
- 6. Drains shall connect at the bottom of the pipe.

3.5 TESTING

- A. Test all systems as described herein. Provide all necessary equipment and gauges for making tests. Pay all costs involved in making tests and adjustments.
- B. Time of Tests: Before restoration of surfaces.
- C. Correctional Action: When tests reveal that the line has faulty joints, joints that have leaked shall be remade and the system retested.
- D. Witnesses: Notify Owner and Engineer at least 48 hours in advance of test so that they may be present at the test.

E. System Test:

- 1. Pressure test tubing with air to 100 psig minimum for 24 hours prior to pour. Test gauge shall not vary more than 5%.
- 2. Maintain pressure at 80 to 100 psig throughout concrete pour. MC shall be on site and have repair kits on hand during pour process.
- 3. Provide the services of the manufacturer's representative to perform pre-pour and during-pour inspection.

3.6 EXISTING INSULATION REPAIR

A. Repair damaged sections of existing mechanical insulation, both previously damaged and damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping seal over existing.

3.7 PROJECT COMPLETION

A. Upon completion of the insulation work, the insulation contractor shall leave the Project ready for use without the need of further cleaning of any kind and with any work in new condition and perfect order.

B. All insulation debris shall be removed from the site and legally disposed of off-site.

3.8 BACKFILL - SNOWMELT LINES

A. First layer (around piping): #1B Stone dust or sand (with 6 to 8 percent moisture) free of any stones larger than ¼" diameter from 6" below the pipes to 12" minimum above the largest pipe. Work stone dust in under pipes with a shovel and hand tamp in 6" lifts.

B. Second layer (top of trench):

- Under paving or sidewalks, run-of-crusher fill per Table 4 in Specification Section 31 23 23.13 to bedding level required for sidewalks or drive reconstruction. Gravel to be compacted to meet H-20 Highway Loading.
- 2. Under grassy areas, fill with select native material with no stones larger than 4" and compacted in lifts of 6" to a level 12" below finish grade. Fill remaining 12" to grade with topsoil imported from off-site compacting in two lifts.

TABLE 4
GRADATION REQUIREMENTS: RUN-OF-CRUSHER

SIEVE SIZE	PERCENT PASSING BY WEIGHT
1½"	100
1/4"	25 - 60
No. 40	5 - 40
No. 200	0 -10

C. Compaction:

- 1. Compaction to not less than 95% density compared to maximum laboratory tests by weight, per modified ASTM D-1557-64T, latest editions, method "A" in all areas whether under roadways, sidewalks, and paving, and 90% in areas under grass or forested areas. Cooperate with testing service agency provided by Owner.
- 2. Any settlement of backfill shall be repaired to proper grade by placing additional backfill and compacting.
- D. During the backfill and compaction of the final materials care must be taken to keep the materials from mixing together.

END OF SECTION 33 61 00

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