



**State of Michigan**  
Department of Technology, Management and Budget  
State Facilities Administration  
Design and Construction Division

**DCSPEC**  
Bidding and Contract Document  
Minor Projects

File No. 551/21167.TYC  
Department of State Police  
Elevator Replacement  
Northville Forensic Laboratory  
42145 W. Seven Mile Road  
Northville, Mi. 48167

August 18, 2023  
Issued for Bids



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## BID SUMMARY

**DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET  
 STATE FACILITIES ADMINISTRATION  
 DESIGN AND CONSTRUCTION DIVISION  
 3111 W. St. Joseph Street  
 Lansing, Michigan 48917**

**Bids must be submitted electronically at:** <https://sigma.michigan.gov/webapp/PRDVSS2X1/AltSelfService>

FILE NUMBER 551/21167.TYC	DEPARTMENT/AGENCY Department of State Police		
CONTRACT TIME(S) Within 45 Calendar Weeks of Notice to Proceed	PROJECT NAME Northville Forensic Laboratory Elevator Replacement	LOCATION 42145 W. Seven Mile Rd. Northville, Mi. 48167	
BID OPENING DATE  September 13, 2023 at 2:00 pm ET		FOR AN EXAMINATION OF THE SITE CONTACT:  Ms. Ashley Sellenraad @sellenraada@michigan.gov	
SEE SECTION 00100 INSTRUCTIONS TO BIDDERS AND SECTION 00700 GENERAL CONDITIONS PROVIDED WITH THE BIDDING DOCUMENTS. <b>BID: WE PROPOSE TO FURNISH, PERFORM AND COMPLETE THE ENTIRE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS IN CONSIDERATION OF THE BID PRICE (S) STATED BELOW.</b>			
FIRM NAME AND COMPLETE ADDRESS		TELEPHONE NUMBER and E-MAIL ADDRESS	
<input type="checkbox"/> Qualified Disabled Veteran		<b><u>SIGMA VENDOR NUMBER</u></b>	
		<small>(protected information required for processing payments)</small>	
BIDDER'S SIGNATURE AND TITLE	DATE	WITNESS' SIGNATURE	DATE

By signing this bid above, bidder certifies their enclosed Qualified Disabled Veteran and Michigan-Based Business Certifications.

**BASE BID FROM BID SCHEDULE** (Include specified Allowances):

(use words)	Dollars \$	(in figures)
Alternate 1: (Add/Subtract) _____	Dollars \$	(in figures)
(use words)		
Alternate 2: (Add/Subtract) _____	Dollars \$	(in figures)
(use words)		
Alternate 3: (Add/Subtract) _____	Dollars \$	(in figures)
(use words)		

A PERFORMANCE BOND AND A PAYMENT BOND ARE REQUIRED FOR ALL BIDS OVER \$50,000.00. EACH BID MUST BE ACCOMPANIED BY A FIVE (5) PERCENT BID GUARANTEE. BUILDERS RISK INSURANCE IS REQUIRED TO BE PROVIDED BY THE CONTRACTOR UNLESS OTHERWISE INDICATED IN THE BID DOCUMENTS.

BIDDERS ARE ALSO CAUTIONED TO FAMILIARIZE THEMSELVES WITH ALL OF THE OTHER CONDITIONS OF THE CONTRACT.

**Project Scope of Work:**

Replacement of single existing 3 stop hydraulic elevator with a new hole-less type hydraulic elevator complete. HVAC is added to the existing room containing the elevator equipment and controls.

The Bidder must figure its Base Bid on the specified, or Addendum-approved, materials and equipment **only**. No "or equal" or substitution proposals will be permitted after Bid opening, except as provided in the General Conditions.





DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET  
State Facilities Administration  
Design & Construction Division

**Qualified Disabled Veteran (QDV)  
Business Representation**

'Qualified Disabled Veteran,' means a business entity that is 51% or more owned by one or more veterans with a service-connected disability.

'Qualified Disabled,' means a business entity that is 51% or more owned by one or more with a service-connected disability.

The vendor represents that it IS \_\_\_\_\_, a qualified disabled veteran.

The contractor represents and warrants that the company meets the above (when checked) and has attached supporting documentation per the following:

Each bid requesting the Qualified Disabled Veterans (QDV) preference, in accordance with Public Act 22 of 2010, MCL 18.1241.3 shall include a DD214 Proof of Service and Discharge, a Veterans Administration rating decision letter, proof of disability (if the disability is not indicated on the DD214), and appropriate legal documents setting forth the 51% natural persons QDV ownership.

**Fraudulent Certification as a Qualified Disabled Veteran may result in debarment under MCL 18.264.**

**Certification of a Michigan Based Business**

(Information Required Prior to Contract Award for Application of State Reciprocity Provisions)

To qualify as a Michigan Based Business:

Vendor must have, during the 12 months immediately preceding this bid deadline:

or

If the business is newly established, for the period the business has been in existence, it has:

(Check all that apply):

- Filed a Michigan single business tax return showing a portion, or all the income tax base allocated or apportioned to the State of Michigan pursuant to the Michigan Single Business Tax Act, 1975 PA 228, MCL 208.1 – 208.145: or
- Filed a Michigan income tax return showing income generated in or attributed to the State of Michigan; or
- Withheld Michigan income tax from compensation paid to the bidder's owners and remitted the tax to the Department of Treasury; or

I certify that I **have personal knowledge** of such filing or withholding, that it was more than a nominal filing for the purpose of gaining the status of a Michigan business, and that it indicates a significant business presence in the state, considering the size of the business and the nature of its activities.

I authorize the Michigan Department of Treasury to verify that the business has or has not met the criteria for a Michigan business indicated above and to disclose the verifying information to the procuring agency.

Bidder shall also indicate one of the following:

- Bidder qualifies as a Michigan business (provide zip code: \_\_\_\_\_)
- Bidder does not qualify as a Michigan business (provide name of State: \_\_\_\_\_).
- Principal place of business is outside the State of Michigan, however service/commodity provided by a location within the State of Michigan (provide zip code: \_\_\_\_\_).

Fraudulent Certification as a Michigan business is prohibited by MCL 18.1268 § 268. A BUSINESS THAT PURPOSELY OR WILLFULLY SUBMITS A FALSE CERTIFICATION THAT IT IS A MICHIGAN BUSINESS OR FALSELY INDICATES THE STATE IN WHICH IT HAS ITS PRINCIPAL PLACE OF BUSINESS IS GUILTY OF A FELONY, PUNISHABLE BY A FINE OF NOT LESS THAN \$25,000 and subject to debarment under MCL 18.264.

## BID BOND

BID SUBMITTED ON the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

Bid Security is in the form of a Bid Bond \_\_\_\_\_ Bid Bond form has been duly executed \_\_\_\_\_; or

A Bank Certified or Cashier's check \_\_\_ or Money Order \_\_\_ is attached to this page \_\_\_\_ (*If Bid Security is by Check or Money Order, the original check or money order must be delivered to the issuing office before Bid Due Time. ALL other SIGMA bid submittals are also still to be made.*)

**If the Bidder is an Individual:**

Name of Individual: \_\_\_\_\_

Name & Title of Person Authorized to sign: \_\_\_\_\_

Signature: \_\_\_\_\_  
(If not the Individual, Attach Power of Attorney) Date

Doing Business as: \_\_\_\_\_

Business Address: \_\_\_\_\_

County of registration \_\_\_\_\_

Telephone: \_\_\_\_\_ FAX: \_\_\_\_\_

**If the Bidder is a Partnership:**

By: \_\_\_\_\_  
(True Name of the Partnership)

Partner Authorized to Sign \_\_\_\_\_ Date

Signature: \_\_\_\_\_  
(Attach evidence of Authority to sign) Date

Business Address: \_\_\_\_\_

County of registration \_\_\_\_\_

Telephone: \_\_\_\_\_ FAX \_\_\_\_\_

**If the Bidder is a Corporation:**

By: \_\_\_\_\_  
(Legal Corporation Name)

Name & Title of Authorized Officer: \_\_\_\_\_

Signature: \_\_\_\_\_  
(Attach evidence of Authority to sign) Date

Name & Title of Officer Attesting: \_\_\_\_\_

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

Business Address: \_\_\_\_\_

Telephone: \_\_\_\_\_ FAX \_\_\_\_\_

(State of Incorporation): \_\_\_\_\_

**If The Bidder is A Joint Venture:** JOINT VENTURE SIGNATURES MUST BE AS PROVIDED IN INSTRUCTIONS TO BIDDERS. EACH JOINT VENTURER SIGNING THE BID MUST SIGN IN THE MANNER INDICATED FOR AN INDIVIDUAL, A PARTNERSHIP OR A CORPORATION. IF MORE THAN TWO JOINT VENTURERS OF THE SAME TYPE ARE INCLUDED, USE ADDITIONAL PAGES. JOINT VENTURE STATE OF INCORPORATION \_\_\_\_\_ OR COUNTY OF REGISTRATION \_\_\_\_\_

## POST-BID SUBMITTALS

The PSC will request this submittal after bid opening. Complete and submit these items within two business days after the request.

**BIDDER'S EXPERIENCE MODIFICATION RATING (EMR)** \_\_\_\_\_

Attach letter of explanation if the Bidder does not have an EMR.

**PROPOSED PROJECT SUPERINTENDENT** \_\_\_\_\_

Attach brief resume or list of similar successful projects.

**LIST OF SIMILAR PROJECTS COMPLETED BY THE BIDDER**

Please list at least three completed projects of similar size and complexity to the project being bid, with reference contact information

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**REFERENCE #** \_\_\_\_\_

Owner: \_\_\_\_\_

Project/Contract Name: \_\_\_\_\_

Location of Project/Contract: \_\_\_\_\_

Contract Price: \_\_\_\_\_ Project/Contract Started: \_\_\_\_\_ Completed: \_\_\_\_\_

Owner's Representative (Name and Telephone): \_\_\_\_\_

Scope of Project/Contract: \_\_\_\_\_

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**REFERENCE #** \_\_\_\_\_

Owner: \_\_\_\_\_

Project/Contract Name: \_\_\_\_\_

Location of Project/Contract: \_\_\_\_\_

Contract Price: \_\_\_\_\_ Project/Contract Started: \_\_\_\_\_ Completed: \_\_\_\_\_

Owner's Representative (Name and Telephone): \_\_\_\_\_

Scope of Project/Contract: \_\_\_\_\_

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**REFERENCE #** \_\_\_\_\_

Owner: \_\_\_\_\_

Project/Contract Name: \_\_\_\_\_

Location of Project/Contract: \_\_\_\_\_

Contract Price: \_\_\_\_\_ Project/Contract Started: \_\_\_\_\_ Completed: \_\_\_\_\_

Owner's Representative (Name and Telephone): \_\_\_\_\_

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Scope of Project/Contract: \_\_\_\_\_

**POST BID SUBMITTALS: LIST OF SUBCONTRACTORS**

The Apparent Low Bidder shall nominate for each Division of Specification and/or trade category, the Subcontractor to be awarded Sub-agreements, including the apparent Low Bidder if work is to be self-performed. Nominated subcontractors shall not be removed, replaced, or added to except by written request for good reason, subject to Owner acceptance.

Division, Specification Section and/or Trade	Nominated Subcontractor(s)	Amount of Subcontract
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____
9. _____	_____	_____
10. _____	_____	_____
11. _____	_____	_____
12. _____	_____	_____
13. _____	_____	_____
14. _____	_____	_____

The undersigned Apparent Low Bidder \_\_\_\_\_ certifies that all the information and data furnished in this List of Subcontractors are current, accurate and complete as of the date stated below.

Signed by: \_\_\_\_\_ Name \_\_\_\_\_ Title \_\_\_\_\_

on this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

**PERFORMANCE BOND**  
**SURETY COMPANY REFERENCE No. \_\_\_\_\_**

That "the **Contractor**," \_\_\_\_\_, a corporation \_\_\_\_, individual \_\_\_\_, partnership \_\_\_\_, joint venture \_\_ of the State of \_\_\_\_\_, qualified to do business in the State of Michigan, as Principal, and "the Surety," \_\_\_\_\_, of the State of \_\_\_\_\_, as surety, are held and bound unto the State of Michigan, "the **Owner**," as Obligee, in the amount of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_), for the payment of which the **Contractor** and Surety bind themselves, their respective heirs, successors, legal representatives and assigns, jointly and severally, in compliance with 1963 PA 213, as amended, MCL 129.201 et seq.

The **Contractor** has entered into "the Contract" with the **Owner** for \_\_\_\_\_, "the Work," covered by the Contract Documents, which are incorporated into this Performance Bond by this reference.

If the **Contractor** faithfully performs and fulfills all the undertakings, covenants, terms, conditions, warranties, indemnifications and agreements of the Contract Documents within the Contract Time (including any authorized changes, with or without notice to the Surety) and during the Correction Period, and if the **Contractor** also performs and fulfills all the undertakings, covenants, terms, conditions, warranties, indemnifications and agreements of any and all duly authorized modifications of the Contract Documents, then THIS OBLIGATION IS VOID, OTHERWISE TO REMAIN IN FULL FORCE AND EFFECT.

A. No change in Contract Price or Contract Time, "or equal" or substitution or modification of the Contract Documents (including addition, deletion, or other revision) releases the Surety of its obligations under this Section 00610 Performance Bond. The Surety expressly waives notice of any such change in Contract Price or Contract Time, "or equal" or substitution or

modification of the Contract Documents (including addition, deletion, or other revision).

B. This Performance Bond must be solely for the protection of the **Owner** and its successors, legal representatives or assigns.

C. It is the intention of the **Contractor** and Surety that they must be bound by all terms and conditions of the Contract Documents (including, but not limited to General Conditions and this Performance Bond). However, this Performance Bond is executed pursuant to 1963 PA 213, as amended, MCL 129.201 et seq., and if any provision(s) of this Performance Bond is/are illegal, invalid, or unenforceable, all other provisions of this Performance Bond must nevertheless remain in full force and effect, and the **Owner** must be protected to the full extent provided by 1963 PA 213, as amended, MCL 129.201 et seq.

**IMPORTANT:** The Surety must be authorized to do business in the State of Michigan by the Department of Licensing and Regulatory Affairs – Insurance Bureau, must be listed on the current U.S. Department of the Treasury Circular 570, and, unless otherwise authorized by the **Owner** in writing, must have at least an A– Best’s rating and a Class VII or better financial size category per current A. M. Best Company ratings.

Name, Address and Telephone of the Surety: \_\_\_\_\_ Address and Telephone of Agent, who is either a resident of, or whose principal office is maintained in, the State of Michigan

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

THE **CONTRACTOR**: (Print Full Name and Sign) By: \_\_\_\_\_

WITNESS \_\_\_\_\_ Name & Title: \_\_\_\_\_  
Telephone No. \_\_\_\_\_

THE SURETY: (Print Full Name and Sign) Agent: \_\_\_\_\_

WITNESS \_\_\_\_\_ Attorney-in-Fact: \_\_\_\_\_

Telephone No. \_\_\_\_\_

**PAYMENT BOND**  
**SURETY COMPANY REFERENCE No.** \_\_\_\_\_

"the **Contractor**," \_\_\_\_\_, a corporation \_\_\_\_\_, individual \_\_\_\_\_, partnership \_\_\_\_\_, joint venture \_\_\_\_\_ of the State of \_\_\_\_\_, qualified to do business in the State of Michigan, as Principal, and "the **Surety**," \_\_\_\_\_, of the State of \_\_\_\_\_, as surety, are held and bound unto the State of Michigan, "the **Owner**," as Obligee, in the amount of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_), for the payment of which the **Contractor** and Surety bind themselves, their respective heirs, successors, legal representatives and assigns, jointly and severally, in compliance with 1963 PA 213, as amended, MCL 129.201 et seq.

The **Contractor** has entered into "the Contract" with the **Owner** for \_\_\_\_\_, "the Work," covered by the Contract Documents, which are incorporated into this Payment Bond by this reference.

If the **Contractor** promptly pays all claimants supplying labor or materials to the **Contractor** or to the **Contractor's** Subcontractors in the prosecution of the Work, then THIS OBLIGATION IS VOID, OTHERWISE TO REMAIN IN FULL FORCE AND EFFECT.

A. All rights and remedies on this Payment Bond are solely for the protection of all claimants supplying labor and materials to the **Contractor** or the **Contractor's** Subcontractors in the prosecution of the Work and must be determined in accordance with Michigan Law.

B. No change in Contract Price or Contract Time, "or equal" or substitution or modification of the Contract Documents (including addition, deletion, or other revision) must release the Surety of its obligations under this Payment Bond. The Surety

hereby expressly waives notice of any such change in Contract Price or Contract Time, "or equal" or substitution or modification of the Contract Documents (including addition, deletion, or other revision).

C. It is the intention of the **Contractor** and Surety that they must be bound by all terms and conditions of the Contract Documents (including, but not limited to this Payment Bond). However, this Payment Bond is executed pursuant to 1963 PA 213, as amended, MCL 129.201 et seq., and if any provision(s) of this Payment Bond is/are illegal, invalid, or unenforceable, all other provisions of this Payment Bond must nevertheless remain in full force and effect, and the **Owner** must be protected to the full extent provided by 1963 PA 213, as amended, MCL 129.201 et seq.

**IMPORTANT:** The Surety must be authorized to do business in the State of Michigan by the Department of Licensing and Regulatory Affairs – Insurance Bureau, must be listed on the current U.S. Department of the Treasury Circular 570, and, unless otherwise authorized by the **Owner** in writing, must have at least an A– Best's rating and a Class VII or better financial size category per current A. M. Best Company ratings.

Name, Address and Telephone of the Surety:

Address and Telephone of Agent, who is either a resident of, or whose principal office is maintained in, the State of Michigan

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

THE **CONTRACTOR**: (Print Full Name and Sign) By: \_\_\_\_\_

WITNESS \_\_\_\_\_ Name & Title: \_\_\_\_\_  
Telephone No. \_\_\_\_\_

THE **SURETY**: (Print Full Name and Sign) Agent: \_\_\_\_\_

WITNESS \_\_\_\_\_ Attorney-in-Fact: \_\_\_\_\_  
Telephone No. \_\_\_\_\_

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## **DIVISION 00**

# **BIDDING REQUIREMENTS AND CONTRACT CONDITIONS**

## SECTION 00010 PRE-BID INFORMATION

1. **Invitation to Bid (ITB)** – Your firm is invited to submit a Bid. The State of Michigan as the Owner will receive **bids electronically through the SIGMA VSS website at <https://sigma.michigan.gov/webapp/PRDVSS2X1/AltSelfService>**, for Department of State Police Northville Forensic Lab Elevator Replacement until 2:00 p.m., ET, on Wednesday, September 13, 2023. The State reserves the right to cancel this Invitation to Bid (ITB) or change the date and time for submitting Bids by announcing same at any time before the established date and time for Bid opening. Bids must remain open for acceptance by the Owner for no less than the Bid hold period. Contractor may agree to extend the Bid hold period. However, any such extension must be based upon no increase in the Bid Price and/or Contract Time.
2. **Work Description** – The Work, Replacement of a single hydraulic elevator, Agency No. 551, DTMB File No.551/21167.TYC includes, but is not necessarily limited to: : Replacement of one existing 3 stop hydraulic elevator. Removal of all existing elevator equipment. Provide new hole-less type hydraulic elevator equipment and new cab, doors, entrance frames complete. Provide new HVAC equipment. Provide new in floor oil interceptor and sump equipment. Tie new elevator into the existing building fire alarm system.

The site is located at 42145 W. Seven Mile Road, Northville, Mi. 48167, as shown on the Drawings.

3. **Bidding Documents** - Sets of Bidding Documents may be obtained at <https://sigma.michigan.gov/webapp/PRDVSS2X1/AltSelfService> .

4. **Bid Security** – Each Bid must enclose a duly executed Bid Security, in the amount of five percent (5%) of the Bidder's Base Bid, paid to the "State of Michigan" in the form of a certified or cashier's check or money order drawn upon a bank insured by an agency of the Federal Government, or a bid bond signed by both the Contractor and authorized surety company. *If Bid Security is by check or money order, such certified or cashier's check or money order must be delivered in original copy before the Bid Due Time to:*

State Facilities Administration  
Design & Construction Division  
3111 W. St. Joseph Street  
Lansing, Michigan 48917

All other Bid information must be submitted via SIGMA as per standard bidding procedure

5. **Pre-Bid Conference** – A mandatory pre-bid conference will be held at North entrance of the MSP Northville Forensic Lab, 42145 W. Seven Mile Rd., Northville, Mi. 48167 on August 31, 2023 at 11:00 a.m. Local Time. A tour of the work scope area will be held on the same day, immediately following. All prospective Bidders are required to attend the tour, if held. Other parties interested in the Work are encouraged to attend the tour. Addenda may be issued, in response to issues raised at the pre-bid conference and tour, or as the Owner and/or Professional may otherwise consider necessary.

The purpose of the pre-bid conference and inspection is to answer questions and provide an inspection tour of the Project site at the scheduled time on the day of the meeting. A representative will be available to assist the Contractors. Other inspection visits may be allowed if needed. Individuals needing special services to fully participate in the meeting due to a disability may contact Mr. Todd Cordill, CordillT1@michigan.gov.

FOR CORRECTIONAL FACILITIES ONLY: All contractor/vendor representatives attending a Pre-Bid Walk Through Meeting must submit a Vender/Contractor LEIN Request five business days prior to the meeting date, (LEIN Request For CAJ-1037 attached to Bid posting). Send the LEIN Request form, filled out and signed, by email to Daniel T. Smith at email address: [SmithD76@michigan.gov](mailto:SmithD76@michigan.gov). The email "Subject" must include (Facility Name, Project Name, Date & Time of Pre-Bid Walk Through Meeting).

6. **SIGMA VENDOR NUMBER:** If you are bidding a State job for the first time, visit the State of Michigan SIGMA website, <https://sigma.michigan.gov/webapp/PRDVSS2X1/AltSelfService>, and follow the "SOM VSS User Guide for New Vendors" instructions, located under Forms and Reference Documents. Registration is required for bid submission. **Do not wait until the last minute to submit a proposal**, as the SIGMA system requires the creation of an account and entry of certain information, in addition to uploading and submitting the materials. The SIGMA system **will not** allow a proposal to be submitted after the proposal deadline, even if a portion of the proposal has been updated.

Questions on how to submit information or how to navigate in the SIGMA VSS system can be answered by calling **(517) 373-4111 or (888) 734-9749**.

7. **Equal Employment Opportunity** – Covenants to not discriminate in employment by Contractors, Subcontractors and Suppliers required by Law are contained in Instructions to Bidders and General Conditions and are applicable to the Work and any Sub-agreement under the Contract.
8. **Contract Times** – The Contract Times and the associated liquidated damages are specified in the Contract.

- 9. Contact Person** – All requests or inquiries concerning the Bidding Documents, or the Work must be addressed to: Hobbs + Black Associates, Inc., Dan Kohler via email [dkohler@hobbs-black.com](mailto:dkohler@hobbs-black.com) and DTMB, Todd Cordill, CordillT1@michigan.gov. Questions will be accepted until Friday, September 8, 2023 at 3:00 p.m. local time.
- 10. Award** – Subject to any agreed extension of the period for holding Bids, Bids must remain valid for acceptance by the Owner for 60 Calendar Days after the date of Bid opening. In addition, the Owner expressly reserves the right, within the Owner's sole discretion, to reject any or all Bids, to waive any irregularities, to issue post-Bid Addenda and re-bid the Work without re-advertising, to re-advertise for Bids, to withhold the award for any reason the Owner determines and/or to take any other appropriate action.
- 11. Performance and Payment Bonds** – A performance bond and a payment bond are required for all contracts over \$50,000.00.

**END OF SECTION 00010**

## SECTION 00100 INSTRUCTIONS TO BIDDERS

- 1. PREPARATION OF BID:** Execute Bid fully and properly. Bid Summary Form (DTMB -0401D) and Bid Form Attachments must be used and completely filled out for the Bid to be considered responsive and meeting the requirements of the contract solicitation. All Bid prices must be printed or typed in both words and figures.
- 2. BID CHECKLIST:** Submit Bid Summary Form with original signatures plus Bid Form Attachments in accordance with the electronic bidding procedures on the SIGMA VSS website.

A complete Bid will consist of the following forms, which are included immediately following the Bid Summary Form:

<u>Bids</u>	<u>SUBMIT THESE Bid Forms and Bid Form Attachments</u>
-------------	--

- |          |   |
|----------|---|
| All Bids | <input type="checkbox"/> <b>Signed</b> and completed Bid Summary Form (DTMB-0401D). |
|          | <input type="checkbox"/> Bid Schedule.  |
|          | <input type="checkbox"/> Qualified Disabled Veteran (QDV) Business Representation.  |
|          | <input type="checkbox"/> Bid Security in the amount of 5% of Base Bid Price.        |

*If Bid Security is by check or money order, such certified or cashier's check or money order must be delivered in original copy before the Bid Due Time to:*

State Facilities Administration  
Design & Construction Division  
3111 W. St. Joseph Street  
Lansing, Michigan 48917

*All other Bid information must be submitted via SIGMA as per standard bidding procedure*

- |                          |   |
|--------------------------|---|
| <input type="checkbox"/> | Signature Authorization or copy of the partnership agreement if signed by all partners.   |
| <input type="checkbox"/> | Other Forms;  |
| Over \$50K               | <input type="checkbox"/> Forms listed under All Bids.                                     |
|                          | <input type="checkbox"/> Payment and Performance Bond (upon issuing the Notice of Award). |
| Over \$100K              | <input type="checkbox"/> Forms listed under All Bids.                                     |
|                          | <input type="checkbox"/> Certification of a Michigan Based Business.                      |
|                          | <input type="checkbox"/> Payment and Performance Bond (upon issuing the Notice of Award). |
| Over \$250K              | <input type="checkbox"/> Forms listed under All Bids.                                     |
|                          | <input type="checkbox"/> Certification of a Michigan Based Business.                      |
|                          | <input type="checkbox"/> Payment and Performance Bond (upon issuing the Notice of Award). |

### Apparent Low Bidders ONLY (upon request from the Professional)

- Experience Modification Rating (EMR), or a letter stating why the Bidder does not have one.
- Identification of the proposed project superintendent, with a resume or list of similar projects handled by that individual.
- A list of at least three (3) projects completed by the Bidder, within the last three (3) years of similar size and complexity, with contact information for references for each.
- A list of nominated sub-contractors, including proposed self-performed categories, for each Division/Trade/etc.

- 3. BID SUBMISSION:** Bids must be submitted electronically through the SIGMA VSS website at <https://sigma.michigan.gov/webapp/PRDVSS2X1/AltSelfService>.

- 4. BID GUARANTEE:** Each proposal must be accompanied by either a bank certified or cashier's check on an open, solvent bank or a bid bond with an authorized surety company (the surety must be listed on the current U.S. Department of the Treasury Circular 570) in the amount of five percent of the base bid payable to the State of Michigan, as a guarantee of good faith. If the successful Bidder fails to furnish satisfactory bonds and insurance within fifteen Calendar Days after Notice of Award, such guarantee must be forfeited to the State as liquidated damages. *If Bid Security is by check or money order, such certified or cashier's*

check or money order must be delivered in original copy before the Bid Due Time to the Issuing Office. The bid security, exclusive of bid bonds, of all unsuccessful Bidders will be returned when an award is made or upon substitution of a bid bond. The bid security of the successful Bidder will be returned when the performance bond and labor and material bond are approved.

5. **Left Blank Intentionally.**
6. **MICHIGAN BASED BUSINESS CERTIFICATION:** All Bidders submitting Bids in excess of \$100,000.00 must complete the Certification of Michigan Based Business. This information will determine if a Bidder qualifies as a "Michigan" business for purposes of application of reciprocity where applicable.
7. **POST-BID SUBMITTAL: For all projects, the Professional may request a Post-Bid Submittal from the** Apparent Low Bidders. The Apparent Low Bidders must submit to the Professional, within **two** Business Days after receipt of the Professional's request,
- Experience Modification Rating (EMR), or a letter stating why the Bidder does not have one.
  - Identification of the proposed project superintendent with a resume or list of similar projects managed by that individual.
  - A list of at least three (3) projects completed by the Bidder, within the last three (3) years of similar size and complexity, with contact information for references for each.
- Failure to provide the submittals may disqualify the Bid.**
8. **SIGNATURES:** All Bids, notifications, claims, and statements must be signed as follows:
- (a) **Corporations:** Signature of official must be accompanied by a certified copy of the Resolution of the Board of Directors authorizing the individual signing to bind the corporation.
  - (b) **Partnerships:** Signature of one partner must be accompanied by a signed copy of the legal document (e.g., Power of Attorney or partnering agreement) authorizing the individual signing to bind all partners. If Bid is signed by all partners, no authorization is required.
  - (c) **Individual:** No authorization is needed. Each signature must be witnessed.
9. **BID PRICES:** The Bidder's Base Bid and Alternate Bid prices must include, and payment for completed Work will compensate in full for: all services, obligations, responsibilities, management, supervision, labor, materials, devices, equipment, construction equipment, general conditions, permits, patent fees and royalties, testing, inspection and approval responsibilities, warranties, temporary facilities, small tools, supplies, Bonds, insurance, taxes, mobilization, close-out, overhead and profit and all connections, appurtenances and any other incidental items of any kind or nature, as are necessary to complete the Work, in a neat, first quality, workmanlike and satisfactory manner in accordance with the Drawings and Specifications and as otherwise required to fulfill the requirements of the Bidding Documents. For each Cash Allowance item, the Bidder must include, within the Bid, all labor costs, construction equipment costs, insurance and Bond premiums and other general conditions costs and Fees (Bidder's and Subcontractors') to complete Work associated with the material, equipment, or other designated item to be furnished under the Cash Allowance. For each Provisionary Allowance, the Bidder must include, within the Bid, insurance, premiums (not recoverable as labor burden) and Bond premiums required to complete Work that may be ordered under a Provisionary Allowance.
10. **INSPECTION OF BIDDING DOCUMENTS AND SITE CONDITIONS:** The Bidder must carefully review and inspect all documents referenced and made part of this ITB, site conditions, all applicable statutes, regulations, ordinances, and resolutions addressing or relating to the goods and services under this contract. Failure to do so or failure to acquire clarifications and answers to any discovered conflicts, ambiguities, errors, or omissions in the Bidding Documents will be at the Bidder's sole risk.
11. **SAFETY REQUIREMENTS AND LAWS:** The Bidder awarded the Contract must comply with all applicable federal, state, and local Laws including health and safety regulations, environmental protection, permits and licensing.
12. **INTERPRETATIONS AND ALTERATIONS TO THE BID AND BIDDING DOCUMENTS:** All requests for clarification or interpretation of the Bidding Documents, all proposals for any modifications to the Bidding Documents, all requests for information and all other questions or inquiries about the Bidding Documents and/or the Work shall be submitted in writing to the Contact Person identified in the Bid Documents. Requests or inquiries received less than seven Calendar Days before the date of Bid opening will be answered only if (a) the response can be given through an Addendum made available at least seventy-two hours before Bid opening (counting Business Days only), (b) the Bid opening is postponed by Addendum, or (c) the Work is rebid without re-advertising following the issuance of post-Bid Addenda.

Bidders must not rely upon any oral statements or conversations regarding interpretations, clarifications, corrections, additions, deletions or other revisions or information to the Bidding Documents. Any addition, limitation or provision made with or attached to the Bid may render it non-responsive and/or irregular and be a cause for rejection. The Owner reserves the right to issue a post-Bid Addendum after opening the Bids and set a new date for the receipt and opening of sealed Bids. The Bidder acknowledges that any quantities of Unit Price Work given in this ITB are approximate only and payments will be made only for actual quantities of Unit Price Work completed in accordance with the Contract Documents.

**13. MODIFICATION OF BID:** The entire bid must be resubmitted on the SIGMA VSS website.

- 14. BID WITHDRAWAL:** Except for timely filed claims of mathematical or clerical errors granted by the State, no Bid may be withdrawn within sixty Calendar Days after the Bid Opening time and date or before the Bid expiration date without forfeiting Bid security. The request to withdraw a Bid due to error must be submitted in writing along with the supporting documents within two Business Days after the date of Bid Opening. The claim must describe in detail the error(s), include a signed affidavit stating the facts of the alleged error(s) and request that the Bidder be released from its Bid. The review of the claim and its supporting documents by the State is only for the purpose of evaluating the Bidder's request and must not create duty or liability on the State to discover any other Bid error or mistake. The sole liability of any Bid error or mistake rests with Bidder.
- 15. OBJECTION TO THE AWARD:** A Bidder may file a written protest with the Director-DCD to object to the Apparent Low Bidder. This objection must be filed within seven Calendar Days after the date of Bid opening and must describe in detail the basis for the protest and request a determination. The Director-DCD will either dismiss or uphold the protest and notify the protestor within ten Calendar Days after receipt of the written protest.
- 16. BID IRREGULARITIES:** The following irregularities on any Bid Form or Bid Form Attachment must be resolved as follows:
- (a) between SIGMA entry and signed Bid Summary attachment, the signed Bid Summary attachment will be used.
  - (b) between words and figures, the words must be used.
  - (c) between any sum, computed by the Bidder, and the correct sum, the sum computed by the Bidder must be used.
  - (d) between the product, computed by the Bidder, of any quantity and Bid Unit Price and the correct product of the Unit Price and the quantity of Unit Price Work, the product extended by the Bidder must be used.
  - (e) between a stipulated Allowance and the amount entered, the Allowance must be used.
  - (f) any mobilization pay item exceeding the maximum specified must be ignored and the Bid must remain unchanged.
  - (g) if any Bidder fails or neglects to bid a Unit Price for an item of Unit Price Work but shows a "Bid Price" for that item, the missing unit price must be computed from the respective quantity and the Item Bid Price shown.
  - (h) if any Bidder fails or neglects to show a "Bid Price" for an item of Unit Price Work but bids a unit price, the missing Bid Price must remain as "zero"; and
  - (i) if any Bidder fails or neglects to enter a Bid Price in both words and figures, the Bid Price printed or typed, whether in words or figures, must be used.
- 17. CERTIFICATION:** The bidder certifies to the best of its knowledge and belief that, within the past three (3) years, the bidder, an officer of the bidder, or an owner of a 25% or greater interest in the bidder:
- (a) Has not been convicted of a criminal offense incident to the application for or performance of a contract or subcontract with the State of Michigan or any of its agencies, authorities, boards, commissions, or departments.
  - (b) Has not had a felony conviction in any state (including the State of Michigan).
  - (c) Has not been convicted of a criminal offense which negatively reflects on the bidder's business integrity, including but not limited to, embezzlement, theft, forgery, bribery, falsification, or destruction of records, receiving stolen property, negligent misrepresentation, price-fixing, bid rigging, or a violation of state or federal anti-trust statutes.
  - (d) Has not had a loss or suspension of a license or the right to do business or practice a profession, the loss or suspension of which indicates dishonesty, a lack of integrity, or a failure or refusal to perform in accordance with the ethical standards of the business or profession in question.
  - (e) Has not been terminated for cause by the Owner.
  - (f) Has not failed to pay any federal, state, or local taxes.
  - (g) Has not failed to comply with all requirements for foreign corporations.
  - (h) Has not been debarred from participation in the bid process pursuant to Section 264 of 1984 PA 431, as amended, MCL 18.1264, or debarred or suspended from consideration for award of contracts by any other State or any federal Agency.
  - (i) Has not been convicted of a criminal offense or other violation of other state or federal law, as determined by a court of competent jurisdiction or an administrative proceeding, that in the opinion of DTMB indicates that the bidder is unable to perform responsibly or which reflects a lack of integrity that could negatively impact or reflect upon the State of Michigan, including but not limited to, any of the following offenses under or violations of:
    1. The Natural Resources and Environmental Protection Act, 1994 PA 451, MCL 324.101 to 324.90106.
    2. A persistent and knowing violation of the Michigan Consumer Protection Act, 1976 PA 331, MCL 445.901 to 445.922.
    3. A finding that the bidder failed to pay the wages and/or fringe benefits due within the time period, as may be required by applicable law.
    4. Repeated or flagrant violations of 1978 PA 390 MCL 408.471 to 408.490 (law relating to payment of wages and fringe benefits).
    5. A willful or persistent violation of the Michigan Occupational Health and Safety Act, 1974, PA 154, MCL 408.10001 to 408.1094, including: a criminal conviction, repeated willful violations that are final orders, repeated violations that are final orders, and failure to abate notices that are final orders.
    6. A violation of federal or state civil rights, equal rights, or non-discrimination laws, rules, or regulations.
    7. Been found in contempt of court by a Federal Court of Appeals for failure to correct an unfair labor practice as prohibited by Section 8 of Chapter 372 of the National Labor Relations Act, 29 U. s. C. 158 (1980 PA 278, as amended, MCL 423.321 et seq).
  - (j) Is not an Iran-Linked Business as defined in MCL 129.312.

A false statement, misrepresentation, or concealment of material facts on this certification may be grounds for rejection of this proposal or termination of the award and may be grounds for debarment.

- 18. REJECTION OF BID:** The Bidder acknowledges the right of the Owner to reject any Bids and to waive any informality, defects or irregularity in any Bid received. In addition, the Bidder recognizes the right of the Owner to reject a Bid if:
- the Bid is in any way incomplete or irregular.
  - the Bidder, Subcontractor or Supplier is not responsible as determined by the Owner.
  - the Bidder's performance as a Contractor was unsatisfactory under a prior Contract with the Owner for the construction, repair, modification, or demolition of a facility with the Owner, or under any other Contract, which was funded, directly or indirectly, by the Owner.
  - there are reasonable grounds for believing that collusion or unlawful agreements exists between any Bidders, that a Bidder is interested in more than one Bid, or that the Bid is not genuine.
  - the Bid exceeds the funds available.
- 19. MATERIALS AND EQUIPMENT SUBSTITUTION:** Any Bidder wishing to use manufacturers or materials other than those specified must submit a written request to the Professional not later than seven days before due date for Bids. Request must be accompanied by product data to permit evaluation and comparison with specified products or materials. The Person submitting the request will be responsible for its prompt delivery. The Professional and the Owner will examine and evaluate the product data and if found acceptable, an Addendum will be issued and mailed or delivered to each Person who has received a set of Drawings and Specifications. All Addenda issued must be made a part of the Contract requirements. Contractor will be responsible for any extra work and expense incurred to satisfactorily and completely incorporating each substitute product into the Project.
- 20. MICHIGAN PRODUCTS AND RECYCLED PRODUCTS:** All Contractors and Suppliers are encouraged to provide Michigan-made products and/or recycled products and/or green products and/or environmentally friendly products whenever possible where price, quality, and performance are equal to, or superior to, non-Michigan products and the requirements of the Contract Documents. The Contractor will be required to use alternatives to landfills for waste disposal such as reuse or recycle of asphalt, bricks, concrete, masonry, plastics, paint, glass, carpet, metals, wood, drywall, insulation, and any other waste materials to the extent practical.
- ~~**21. PRE-AWARD PRODUCT SUBMITTALS:** If requested, the Apparent Low Bidders must submit a summary of preliminary technical data on each product listed in \*\*\*. The Apparent Low Bidders will furnish this summary data to the Professional within forty-eight hours of the Bid Opening. These submittals will be used to evaluate the Bid before the award. Failure to provide the submittals may disqualify the Bid.~~
- 22. CONTRACT AND CONTRACT AWARD:** The Owner intends to award a Contract to the responsive and responsible best value bidder, except as provided below relative to veteran's preference.
- Determination of the lowest three Bidders shall be based on the sum of the Base Bid and any additive and deductive Alternates the Owner accepts, in the order in which they are listed only. The Owner will accept an Alternate only if all other previously listed Alternates are also accepted unless acceptance by the Owner of Alternates in a different order does not affect determination of the lowest three bidders in any way.
  - The bids will be evaluated for best value based on price and qualitative components by comparing the qualitative components of the three lowest responsive and responsible Bidders. The comparison may also include other Bidders whose bids are within 10% of the lowest responsive and responsible Bidder.
  - If a Qualified Disabled Veteran meets the requirements of the contract solicitation, provides acceptable responses to both Part One and Part Two of the Best Value Construction Bidder Evaluation to achieve a Best Value recommendation and with the veteran's preference is the lowest responsive, responsible, best value Bidder, the Owner will award the contract to the Qualified Disabled Veteran bidder. A determination as to whether the requirements of the bid solicitation have been met will be based solely on the Owner's and Professional's evaluation of the Bid Summary, Bid Attachments, Bidder-provided documents, and interview.
  - For the purpose of evaluating and determining the low responsive bid, 10% of the lowest responsive bid (the bid that would otherwise receive the contract award if the preference were not being considered) will be deducted from all QDV bids. If the low responsive QDV bid, less the 10% preference, is less than the lowest responsive bid, then the QDV bid will be declared the official low responsive bid. The original QDV bid amount will be the basis of the contract award.



**Example:**

Lowest Responsive Bid	\$100,000
Lowest Responsive QDV Bid	\$109,000
Preference (10% of the Lowest Responsive Bid)	\$ 10,000
Lowest Responsive QDV Bid Less Preference	\$ 99,000 (\$109,000 - \$10,000)
<b>Official Low Responsive Bid</b>	<b>\$109,000</b>

22.5 The Apparent Low Bidders will be evaluated for responsiveness and responsibility based on the following:

- Compliance with the bid specifications and requirements.
- The Bidder's financial resources.
- The Bidder's technical capabilities.
- The Bidder's technical experience.
- The Bidder's past performance.
- The Bidder's insurance and bonding capacity.
- The Bidder's business integrity.

Some qualitative components that may be evaluated are:

- Technical approach.
- Quality of proposed personnel.
- Management plans.

22.6 For contracts under \$250,000, best value will primarily be based on the lowest responsive and responsible bid.

**23. CONTRACT TIME; LIQUIDATED DAMAGES:** Work of all trades as specified in the Contract Documents must be completed in 45 calendar weeks from the date of Notice-to-Proceed except for minor replacement, correction, or adjustment items which do not interfere with the complete operation and utilization of all parts of the Contract Work. This Contract Time is of the essence and liquidated damages for each Calendar Day that expires after this Substantial Completion of the entire Work must be in the amount of \$250.00. Liquidated damages are not a penalty, are cumulative and represent a reasonable estimate of the Owner's extra costs and damages, which are difficult to estimate with accuracy in advance.

**24. MOBILIZATION:** If used in the Specifications/Bid schedule, all the up-front costs incurred by the Contractor must be covered by the mobilization. The costs to establish temporary site offices, to obtain required permits for commencing the Work and for bonds and insurance premiums are examples of costs to the Contractor that are covered by mobilization pay item. This cost must not exceed four percent (4%) of the Base Bid, unless otherwise expressly provided in the Bidding Documents.

**25. SOIL EROSION AND SEDIMENTATION CONTROL:** All Work under this Contract must meet the storm water management requirements of the Project and comply with the applicable Soil Erosion and Sedimentation Control (SESC) rules and regulations and specific provisions for same within the Contract Documents. SESC measures will be monitored and enforced by the State Facilities Administration, or another authorized enforcing agency if so delegated, through the review of the Contractor's implementation plans and site inspections. State Facilities Administration or the Professional will notify the Contractor in writing of any violation(s) of the applicable SESC statutes and/or the corrective action(s) undertaken by the Owner and may issue stop work orders. State Facilities Administration has the right to assess a fine to the Contractor for noncompliance with the provisions of the Contract Documents and/or SESC regulations applicable to this Work and fines must be in addition to any other remediation costs or liquidated damages applicable to the Project and may exceed the value of the Contract.

**END OF SECTION 00100**

**SECTION 00120 SUPPLEMENTARY INSTRUCTIONS**

The provisions of this Section amend or supplement Section 00100 Instructions to Bidders and those other provisions of the Bidding Requirements that are indicated below. All other Bidding Requirements that are not so amended or supplemented remain in full force and effect.

**END OF SECTION 00120**

## SECTION 00200 INFORMATION FOR BIDDERS

### 1. UNDERGROUND UTILITIES

~~Information or data about physical conditions of existing Underground Utilities, which have been used by the Professional in preparing the Bidding Documents, is shown, or indicated in the Drawings and technical Specifications and those Underground Utility drawings itemized immediately below.~~

### 2. PERMITS, APPROVALS, LICENSES AND FEES

- 2.1 If the Owner has secured or will secure any permits, approvals and licenses and has paid or will pay any associated charges and fees, any such permits, approvals and licenses are itemized in this paragraph:
- 2.2 If any permits, approvals, and licenses itemized above have been obtained by the Owner and the fees have been paid, copies of those permits, approvals, licenses, and corresponding fee receipts, are attached to this Section 00200 Information for Bidders.

Except for any permits, approvals, licenses, and fees identified above, the Contractor shall be responsible for all permits, approvals, licenses, and fees applicable to Work.

### 3. SEQUENCING REQUIREMENTS

Refer to the technical Specifications, including, but not limited to the General Requirements, for information, data, and criteria on sequences of Work restraints, construction, and maintenance of service to existing facilities, which, if provided, must govern the selection of Work sequences. Each Bidder must be responsible for any conclusions or interpretations the Bidder makes related to the selection of sequences and Means and Methods, based on the technical data made available, and/or those additional investigations or studies made or obtained by that Bidder.

### 4. SUBSURFACE CONDITIONS – Not Applicable

### 5. OTHER PHYSICAL CONDITIONS – Not Applicable

## END OF SECTION 00200

## SECTION 00700 GENERAL CONDITIONS

1. **Interpretations:** Any requests for clarifications or interpretations of the Contract Documents must be in writing to the Professional, who will issue written clarifications or interpretations as appropriate. If the Contractor believes that such clarification or interpretation justifies an adjustment to the Contract Price/Time, the Contractor must promptly notify the Professional in writing before proceeding with the Work Involved.
  - 1.1 **Standards:** The Contract Documents describe the entire Work. The provisions of the Contract Documents must govern over any standard specifications, manual or code of any technical society, organization, or association but, if lower than the standards set by any Law applicable to the Work or the Project, the higher standards must govern. The Contractor's responsibilities extend to cover Subcontractors and Suppliers if liable as a result of their actions or obligations.
  - 1.2 **Contract Time Computation:** The time to complete the Work must be made in Calendar Days and must include both the first and last day. The first day is established by the Notice-to-Proceed.
  - 1.3 **Technical Specifications and Priority:** The following applies whenever priority is called for in Contract Documents: specifications must govern Drawings; figured dimensions must govern scaled dimensions; detail drawings must govern general drawings; Drawings must govern Submittals.
  - 1.4 **Indemnification:** The Contractor is required to defend, indemnify and hold harmless the Owner and the Professional, their employees, agents, servants, and representatives from and against all claims, suits, demands, actions of whatever type and nature and all judgments, costs, losses and damages, whether direct, indirect or consequential including, but not limited to, charges of architects, engineers, attorneys and others and all court, hearing and any other dispute resolution costs arising from:
    - (a) any patent or copyright infringement by the Contractor.
    - (b) any damage to the premises or adjacent lands, areas, properties, facilities, rights-of-way, and easements, including loss of use to the business and property of others as a result of Contractor's operations.

- (c) any bodily injury, sickness, disease or death, or injury to or destruction of property, including loss of use due to or related to the Work and caused in whole or in part by the Contractor or Subcontractor or Supplier's negligence, omissions, or failure to maintain the required insurance and coverage and,
- (d) a failure by the Contractor to appropriately handle Hazardous Materials for the Work or the Contractor's operations in compliance with the Owner requirements and/or applicable Laws and regulations.

The indemnification obligations are not affected by the limitation on the amount and types of damages, compensation or benefits payable by or for the Contractor or Subcontractor or Supplier under worker's or workman's compensation acts, disability benefit acts or other employee benefit acts.

- 1.5 **Contract Documents Ownership:** The State is the owner of the Contract Documents. The Contractor, Subcontractor or Supplier must not reuse any of the documents on any other Project without prior consent of the State and Professional. The Professional will furnish on behalf of the Owner at no cost to the Contractor, one (1) electronic copy of the Drawings and Project Manual. If the **Contractor**, or the Contractor's Subcontractors or Suppliers request hard copy sets, reproduction of these documents will be the responsibility of the **Contractor**.

## 2. GENERAL PROVISIONS

- 2.1 **Owner:** The Project Director and/or Owner Field Representative will represent the Owner. Neither the Project Director nor the Owner Field Representative has the authority to interpret the requirements of the Contract Documents or to authorize any changes in the Work or any adjustment in Contract Price/Time. The State will provide the necessary easements for permanent structure and permanent changes in existing lands, areas, properties, and facilities. However, the Contractor must obtain, at no increase in Contract Price/Time, permits for any other lands, areas, properties, facilities, rights-of-way, and easements required by the Contractor for temporary facilities, storage, disposal of soil or waste material or any other purpose. The Contractor must submit copies of the permits and written agreements to the Owner. The Contractor must engage a registered land surveyor to establish the necessary reference points and/or base lines for construction and must be responsible for protecting them including benchmarks and Project elevations.
- 2.2 **Professional:** Acting as the Owner's representative during the Contract Time period, the Professional will endeavor to guard the Owner from Defective work and to keep the Owner informed of the progress of the Work. Unless delegated by specific written notice from the Owner, the Professional and the Professional's representatives do not have the authority to authorize any changes in the Work or any adjustment in Contract Price/Time. The On-site Inspections by the Owner Field Representative and/or the Professional do not relieve the Contractor from its obligation to provide the Work in accordance with the Contract Documents or represent acceptance of Defective Work.
- 2.3 **Contractor:** The Contractor must manage, supervise, and direct the Work competently, applying the management, supervision, skills, expertise, scheduling, coordination, and attention necessary to provide the Work in accordance with the Contract Documents with a minimum disturbance to or interference to the business operations on site or adjacent properties. The Contractor must assign and maintain a competent full-time **superintendent** on the Work, as its representative, at all times while Work is being done on site and must not be replaced without the Owner's consent. The Contractor shall enforce good order among its employees and shall not employ on the work any disorderly, intemperate, or unfit persons, or not skilled in the work assigned to them. The Contractor is solely responsible for his Means and Methods, safety precautions and programs related to safety, the Contractor's failure to execute the Work in accordance with the Contract Documents and any act of omissions by the Contractor, Subcontractor or Supplier. The Contractor must **compare Contract Documents for conflicts**, unworkable or unsafe specified Means and Methods and verify against manufacturer's recommendations for installations and handling and must notify the Professional in writing of the discovery of any such conflicts or errors. The Contractor is required to furnish certifications that lines and grades for all concrete work were checked before and after placing concrete, and that final grades are as required by the Contractor Documents. Wherever required, the Contractor must be responsible for all cutting, fitting, drilling, fixing-up, and patching of concrete, masonry, gypsum board, piping and other materials that may be necessary to make in-place Work and dependent Work fit together properly. The Contractor must restore to pre-existing conditions all walks, roadways, paved or landscaped areas and other real and personal property not designated for alteration by the Contract Documents. The Contractor must maintain at the site one copy of safety data sheets (SDS) and one copy of all **as built/Record Documents** in good order and annotated in a neat and legible manner to show:
- (a) all revisions made,
  - (b) dimensions noted during the furnishing and performance of the Work, and
  - (c) all deviations between the as-built installation and the Contract Documents, all approved Submittals and all clarifications and interpretations.

The Contractor must maintain and furnish promptly to the Owner and the Professional upon their request **daily field reports and photos** recording the on-site labor force and equipment (Contractor and Subcontractors); materials/equipment received; visits by Suppliers; significant in-progress and completed trade Work within major areas; and other pertinent information. The Contractor is obligated to act to prevent threatened damage, death, injury, or loss without any special instruction in **emergencies** and must give the Owner prompt written notice of any changes in Work resulting from the action taken for review and approval.

- 2.4 **Subcontractors and Suppliers:** The Owner assumes no contractual obligations to anyone other than the Contractor. All trade construction Drawings must be field coordinated before fabrication and/or installation. The Owner reserves the right to reject or revoke, for its convenience, any approved Subcontractor/Supplier. Work performed by any Subcontractor or Supplier must be through an appropriate written agreement that:
- (a) expressly binds the Subcontractor/Supplier to the requirements of the Contract Documents,
  - (b) requires such Subcontractor or Supplier to assume toward the Contractor all the obligations that the Contractor assumes toward the Owner and the Professional, and
  - (c) contains the waiver of rights and dispute resolution provisions.

- 2.5 **Access to Payroll Records:** The Contractor and its Subcontractors must, to the extent applicable, comply with the Prevailing Wage Rates for the county where the Project is located, and must maintain and keep, in accordance with generally accepted accounting principles, records pertaining to the bidding, award and performance of the Work, including, but not limited to certified payroll, employment records and all data used in estimating the Contractor's prices for the Bid, Change Order, proposal or claim. The Owner or its representative must have access to those records, must have the right to interview the Contractor's employees and must be provided with appropriate facilities for the purpose of inspection, audit/review and copying for five years after final payment, termination, or date of final resolution of any dispute, litigation, audit exception or appeal. The payroll and other employment records of workers assigned to the site must contain the name and address of each worker, correct wage classification, rate of pay, daily and weekly number of hours worked, deduction made, and actual wages paid. The Contractor must maintain records that show: (a) the anticipated costs or actual costs incurred in providing such benefits, (b) that commitment to provide such benefits is enforceable, and (c) that the plan or program is financially responsible and has been communicated in writing to the workers affected.

### 3. Bonds and Insurance:

- 3.1 Both the Performance Bond and Payment Bond must remain in effect from the date of Contract Award until final completion of the Work or the end of Correction Period, whichever comes later. The surety bonds required for a Construction Contract will not be accepted by SFA unless the surety bonding company is listed in the current United States Government, Department of Treasury's, Listing of approved sureties (bonding/insurance companies), Department Circular 570. Copies of the current Circular listing may be obtained through the internet web site <https://www.fiscal.treasury.gov/fsreports/ref/suretyBnd/c570.htm>.

Insurers must have an "A-" A.M. Best Company Rating and a Class VII or better financial size category as shown in the most current A.M. Best Company ratings. Insurance must be provided by insurers authorized by the Department of Insurance and Financial Services (DIFS) to do business as an insurer in Michigan. The insurance company and must attach evidence of the authorization. These certificates must specify the Project File No., Project Title, and a description of the Project. The Contractor agrees that insurance coverage afforded under the policies as such coverage relate to the State under this Contract as determined by the Contractor will not be modified or canceled without at least thirty calendar days prior written notice to the State. The latest A.M. Best's Key Ratings Guide and the A.M. Best's Company Reports (which include the A.M. Best's Ratings) are found at: <http://www.ambest.com>. The Contractor must not perform any part of the Work unless the Contractor has all the required insurance in full force and effect.

- 3.2 The Contractor is required to provide proof of the minimum levels of insurance coverage as indicated below. The purpose of this coverage must be to protect the State from claims which may arise out of or result from the Contractor's performance of services under the terms of this Contract, whether such services are performed by the Contractor, or by any subcontractor, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable.

The Contractor waives all rights against the State for recovery of damages to the extent these damages are covered by the insurance policies the Contractor is required to maintain pursuant to this Contract. The Contractor also agrees to provide evidence that all applicable insurance policies contain a waiver of subrogation by the insurance company.

All insurance coverages provided relative to this Contract/Purchase Order is PRIMARY and NON-CONTRIBUTING to any comparable liability insurance (including self-insurances) carried by the State.

The Insurance must be written for not less than any minimum coverage herein specified or required by law, whichever is greater. All deductible amounts for any of the required policies are subject to approval by the State.

The State reserves the right to reject insurance written by an insurer the State deems unacceptable.

BEFORE THE CONTRACT IS SIGNED BY BOTH PARTIES and BEFORE THE PURCHASE ORDER IS ISSUED BY THE STATE, THE CONTRACTOR MUST FURNISH TO THE DIRECTOR-DCD CERTIFICATE(S) OF INSURANCE VERIFYING INSURANCE COVERAGE. THE CERTIFICATE MUST BE ON THE STANDARD "ACCORD" FORM. THE CONTRACT OR PURCHASE ORDER NUMBER MUST BE SHOWN ON THE CERTIFICATE OF INSURANCE TO ASSURE CORRECT FILING. All such Certificate(s) are to be prepared by the Insurance Provider and not by the Contractor. All such Certificate(s) must contain a provision indicating that coverages afforded under the policies WILL NOT BE CANCELLED, MATERIALLY CHANGED, OR NOT RENEWED without THIRTY days prior written notice, except for 10 days for non-payment of premium, having been given to the Director-DCD. Such NOTICE must include the CONTRACT NUMBER affected and be mailed to the Project Director.

The Contractor is required to provide the type and amount of insurance below:

- (a) Commercial General Liability Insurance with a limit of not less than \$1,000,000 each occurrence. If such CGL insurance contains a general aggregate limit, it must apply separately to this project.

The Contractor must list the State, its departments, divisions, agencies, offices, commissions, officers, employees, and agents as ADDITIONAL INSUREDS on the Commercial General Liability policy.

- (b) Vehicle Liability Insurance for bodily injury and property damage as required by law on any auto including owned, hired, and non-owned vehicles used in the Contractor's business.

The Contractor must list the State, its departments, divisions, agencies, offices, commissions, officers, employers, and agents as ADDITIONAL INSUREDS on the vehicle liability policy.

- (c) Worker's disability compensation, disability benefit or other similar employee benefit act with minimum statutory limits.

NOTE:

- (i) If coverage is provided by a State fund or if Contractor has qualified as a self-insurer, separate certification must be furnished that coverage is in the state fund or that Contractor has approval to be a self-insurer.
- (ii) Any citing of a policy of insurance must include a listing of the States where that policy's coverage is applicable; and
- (iii) This provision must not be applicable where prohibited or limited by Michigan law.

- (d) Employer's Liability Insurance with the following minimum limits:

\$1,000,000 each accident  
\$1,000,000 each employee by disease  
\$1,000,000 aggregate disease

- (e) Pollution Liability Insurance in the amounts of not less than \$1,000,000 per occurrence is required.

3.3 **Liability Insurance:** Liability insurance must be endorsed to list as additional insureds the Professional's consultants and agents. Worker's Compensation, Employer's Liability Insurance and all other liability insurance policies must be endorsed to include a waiver of rights to recover from the Owner, Professional and the other additional insureds. The Contractor's liability insurance must remain in effect through the Correction Period and through any special correction periods. For any employee of the Contractor who is resident of and hired in Michigan, the Contractor must have insurance for benefits payable under Michigan's Worker's Compensation Law. For any other employee protected by Worker's Compensation Laws of any other state, the Contractor must have insurance or participate in a mandatory state fund, where applicable, to cover the benefits payable to any such employee. These requirements must not be construed to limit the liability of the Contractor or its insurers. The Owner does not represent that the specified coverage or limits of insurance are sufficient to protect the Contractor's interests or liabilities.

3.4 **Builder's Risk Insurance:** Unless indicated otherwise in the bid document, the Contractor will purchase and maintain property insurance for 100% of actual cash replacement value of the insurable Work while in the course of construction, including foundations, additions, attachments, and all fixtures, machinery and equipment belonging to and constituting a permanent part of the building structures. The property insurance also will cover temporary structures, materials and supplies to be used in completing the Work, only while on the building site premises or within five hundred feet of the site. The property insurance insures the interests of the Owner, Contractor and all Subcontractors and Suppliers at any tier as their interest may appear. The property insurance insures against "all risk" of physical loss or damage to the extent usually provided in policy forms of insurers authorized to transact this insurance in Michigan. A copy of the master insurance policy will be available for review by the State, upon request. Any deductible shall be both the option and responsibility of the **Contractor**.

3.5 The Owner and Contractor intend that the required policies of property insurance must protect all the parties insured and provide primary coverage for all losses and damages caused by the perils covered. Accordingly, to the extent that the insurance company pays claims, the Owner and the Contractor and its Subcontractors/Suppliers waive all rights against each other for any such losses and damages and waive all such rights against the Professional and all other persons named as insureds or additional insureds.

#### 4. **Prosecutions; Substantial Completion:**

4.1 The Contractor must not start the Work at the site before the first day established by the Notice to Proceed and/or before all insurance is in effect. A pre-construction conference will be held with the Contractor to review its Progress Schedule, qualifications of its key personnel, its proposed access to the site, traffic and parking, procedures for submittal, change orders, etc., and to exchange emergency contact information. The Contractor must use its accepted Progress Schedule when making proposals or claims for adjustment in Contract Time/Price.

4.2 Except in an Emergency, all Work at the site must take place during normal working hours; 6:00 AM to 6:00 PM, during Business Days and in accordance with the special working conditions for the Agency. If the Contract Documents allow work outside the normal hours, the Contractor must provide a written notice to the Owner twenty-four hours before performing such Work and must reimburse the Owner any related increase in the costs incurred by the Owner such as overtime charges of the Professional and payments for custodial and security personnel.

4.3 If, upon inspection and completion of all pre-requisite testing of the Work, the Contractor considers that a portion of the work or all the Work is substantially completed, it must provide a list of items to be corrected or completed to the Owner and the Professional for joint inspection. Within ten Calendar Days of this joint inspection, the Professional will deliver to the Owner and Contractor a list of incomplete/Defective work or a Certificate of Substantial Completion with a Punch List. The certificate must:

- (a) fix a reasonable date of Substantial Completion,
- (b) fix a date for completion of the Punch List, and
- (c) recommend the division of responsibilities between the Owner and Contractor for utilities, security, safety, insurance, maintenance, etc.

Upon issuing the Certificate of Substantial Completion, the Owner will pay for the completed Work subject to (a) withholding of two hundred percent of the value of any uncompleted Work, as determined by the Professional, and (b) any other deductions as the Professional may recommend or may withhold to cover Defective work, liquidated damages and the fair value of any other items entitling the Owner to a withholding. Prerequisites for Substantial Completion, over and above the extent of Work completion required, include (a) receipt by the **Owner** of operating and maintenance documentation, (b) all systems have been successfully tested and demonstrated by the **Contractor** for their intended use, and (c) the **Owner** having received all required certifications and/or occupancy approvals from the State and those Political Subdivisions having jurisdiction over the Work. Receipt of all certifications and/or occupancy approvals from those Political Subdivisions with jurisdiction in and of itself does not necessarily connote Substantial Completion. The Contractor must provide all related operating and maintenance (O&M) documentation to the Owner before training if training is required and not later than Substantial Completion otherwise. The Contractor must give the Owner the final O&M documentation (with revisions made after Substantial Completion) before the request for final payment.

4.4 The Owner may decide to use, at its sole option, any functioning portion of the Work and will inform the Contractor in writing of the decision. The portion of Work to be used must be jointly inspected to determine the extent of completion if it has not undergone the inspection for Substantial Completion. The Professional must prepare a list of items to be corrected/completed and the Owner will allow the Contractor reasonable access to correct/complete the listed items and finish other work.

#### 5. **Warranty; Tests, Inspections and Approvals; Corrections of Work:**

5.1 **Warranty:** The Contractor must furnish the State with a written guarantee to remedy any defects due to faulty materials or labor which appear in the Work within one year from the date of final acceptance by the State. This warranty excludes defect or damage caused by (a) abuse, modification by others, insufficient or improper operation or maintenance, or (b) normal wear and tear under normal usage. Manufacturer warranties for materials and equipment received by the Contractor must be assigned and promptly delivered to the Owner at Substantial Completion. The warranties period starts from the date of the substantial completion and must be in full force and effect for the entire duration of the Correction Period.

**Roof Warranty:** For roofing systems, the following warranties are required as minimum:

- (a) A two-year contractor's warranty against any defects due to faulty materials or labor.
- (b) A fifteen-year manufacturer's total system warranty; and
- (c) A twenty-year membrane/shingles/tiles warranty.

**5.2 Tests, Inspections and Approvals:** The Owner will perform or retain a professional/agency to perform inspections, tests or approvals for those materials required to meet quality control standards specified in the Contract Documents except for those inspections, tests or approvals specifically designated to the Contractor in the Contract Documents. However, the Contractor must assume full responsibility for any testing, inspection, or approval.

- (a) required to meet code requirements, as promulgated by code inspecting authorities.
- (b) required by Law.
- (c) indicated or required by the Contract Documents as designated to the Contractor.
- (d) required for the Professional's acceptance of a Supplier, materials or equipment or mix designs submitted for prior approval by the Contractor; or
- (e) Defective work, including an appropriate portion of the Delay and costs occasioned by discovery of Defective work. The Contractor must (a) pay all related costs; (b) schedule related activities; and (c) secure and furnish to the Professional the required certificates of inspection, testing or approval. The Contractor must provide proper and safe access to the site for inspection, testing or approval. The Contractor must provide the Professional a timely notice whenever any Work is ready for inspection, testing or approval. If the Contractor covers any Work without proper approval by the Professional as required by the Contract Documents, the Contractor must, at its own expense, uncover, expose, or otherwise make available, when requested by the Professional or Owner, for testing, inspection, or approval of the covered Work.

**5.3 Correction of Work:** If any testing, inspection, or approval reveals Defective Work and the Work is rejected by the Professional, the Contractor, at its sole expense, must promptly, as directed, correct, or remove the Defective Work from the site and replace it with non-Defective Work within the Correction Period. The Contractor must bear responsibility for its proportionate share of the Delay and costs resulting from the correction and/or removal and replacement of Defective Work. If the Contractor, within reasonable and agreed upon time after receipt of written notice, (a) fails to correct Defective Work or remove and replace rejected Work, or (b) fails to correct or complete items on any Punch List, or (c) fails to perform Work in accordance with the Contract Documents, or (d) fails to comply with any other provision of the Contract Documents, the Owner, directly or through others, after seven Calendar Days from the date of the written notice to the Contractor, may correct and remedy the Defective Work. To the extent necessary to correct and remedy such Defective Work, the Owner must be allowed to exclude the Contractor from all or part of the site; take possession of all or part of the Work and stop related operations of the Contractor; take possession of the Contractor's tools, plant and office and construction equipment at the site; and incorporate into the Work materials and equipment for which the Owner has paid the Contractor. The Contractor must allow the Owner and the Professional easy access to the site to correct such Defective Work. The Owner must be entitled to an appropriate decrease in Contract Price for all claims, costs, losses, damages, and Delay incurred or sustained by the Owner which are attributable to the Contractor. Such costs may include, but not limited to, costs of correction or removal and replacement of Defective Work, costs of repair and replacement of other work destroyed or damaged by the action and related charges of the Professional. If the discovery of the Defective Work takes place after final payment and the Contractor fails to correct and pay the Owner any of these costs, the Owner must demand due performance under the Performance Bond. Until the period of limitation provided by Michigan Law, the Contractor must promptly, and upon receipt of written notice from the Owner, correct Defective Work. In the event of an Emergency or unacceptable risk of loss or damage or if appropriate under the circumstances, the Owner, directly or through others under contract with the Owner, may correct or remove and replace the Defective Work. The specified correction of Work requirements has no limitation on the rights of the Owner to have Defective Work corrected or removed and replaced, if rejected, except as otherwise provided by the Michigan Law.

**5.4 Special Correction Period Requirements:** Whenever the Owner undertakes any portion of the Work because the Contractor's act or omission Delays completion of the Work or it is eligible for Partial Use, the warranties for all materials and equipment incorporated into that portion of the Work must remain in full force and effect between the start of such Partial Use and the date when the Correction Period starts. The Correction Period for any Defective Work that is corrected or rejected and replaced within the last three months of the Correction Period must be extended by an additional six months, starting on the date such Work was made non-Defective.

**5.5 Special Maintenance Requirements:** If the Contract Documents specify that the entire Work, or a portion of the Work, upon reaching Substantial Completion, must not be placed in use by the Owner, the Contractor must maintain the Work, or specified part of the Work, in good order and proper working condition and must take all other actions necessary for its protection between the certified date of Substantial Completion and the date when the Work, or designated part of the Work, is placed in use. If no separate price for such special maintenance period was requested and made part of the Contract Documents, the Owner will amend the Contract Documents to appropriately increase the Contract Price.

## **6. Changes:**

**6.1 Changes in the Work:** The Owner may, at any time, without notice to sureties, make any changes bilaterally or unilaterally, by a written Change Order, in the Work within the general scope of the Contract, including but not limited to changes in the

Specifications, materials, or Contract Time. In a bilateral change order, the Owner may direct the Professional to prepare a Bulletin describing the change being considered. Upon receiving the Bulletin, the Contractor establishes the cost and returns it to the Professional for review within 15 calendar days. The Contractor's proposal must be irrevocable for 60 Calendar Days after it is submitted to the Professional. If the Professional recommends acceptance of the Bulletin and the Owner agrees with the changes, the Owner issues a written bilateral Contract Change Order to amend the Contract Documents. However, the Owner may issue a unilateral Change Order if the Owner and Contractor are unable to agree on the adjustment in Contract Price or Time. If the Contractor disagrees with such unilateral Contract Change Order, the Contractor must complete the Work and may deliver notice of a claim in accordance with the claim submittal process.

**6.2 Differing Site Condition:** The Owner does not warrant that any technical data, including the Project reference points, provided by the Owner is necessarily sufficient and complete for the purpose of selecting Means and Methods, initiating, maintaining, and supervising safety precautions and programs or discharging any other obligation assumed by the Contractor under the Contract Documents. If different or unknown site conditions are discovered, the Contractor must notify the Owner in writing before the conditions are disturbed or before proceeding with the affected Work. Upon review, if the Owner decides to agree with the differing site conditions, with the Professional's advice, the Owner may issue a written Contract Change Order to amend the Contract Price or Time through the Bulletin authorization process. If the Owner decides to disagree with the Contractor and the Contractor disagrees with the Owner's decision, the Contractor must complete the Work and may deliver notice of a claim in accordance with the claim submittal process. No proposal or claim by the Contractor due to differing site conditions will be allowed (a) if the Contractor knew of their existence before submitting its Bid or if those conditions could have been discovered by any reasonable examinations for which the Contractor, as Bidder, was made responsible under the Bidding Requirements and/or (b) unless the Contractor's written notice is provided within not more than 21 days after the contractor first recognizes the condition giving rise to the proposal or claim and gives the Owner adequate opportunity to investigate the asserted differing site conditions. A full and detailed breakdown of cost and time requested, with supporting documentation, if not provided with the initial notice shall be delivered to the Professional and Owner within 15 days of the notice, unless otherwise agreed in writing, by the Owner prior to expiration of such time.

**6.3 Responsibilities for Underground Utilities:** The Contractor must comply with the 1974 PA 53, as amended, MCL 460.701 et seq., and all other Laws concerning Underground Utilities. Before performing site Work, all Underground Utilities, lines, and cables (public and private) must be located and marked. The Contractor must notify MISS DIG to locate and mark utilities on properties that are not State properties. In addition, the Contractor must be responsible for immediately notifying the Owner of any contact with or damage to Underground Utilities, and for the safety, protection of and repairing any damage done to any Work, surface, and subsurface facilities. If the Contractor encounters Underground Utilities that inaccurately located by the Contract Documents or not previously located/located, which could not be reasonably have been seen, the Owner may issue a written Contract Change Order to amend the Contract Price or Time through the Bulletin authorization process.

**6.4 Hazardous Material Conditions:** If the Contractor encounters material reasonably believed to be Hazardous Material, which was not described in the Drawings and/or Specifications and was not generated or brought to the site by the Contractor, the Contractor shall immediately stop all affected work, give written notice to the Owner of the conditions encountered, and take appropriate health and safety precautions in accordance with all federal, state, and local laws. Upon receipt of the notice, the Owner will investigate the conditions and (a) may stop the Work and terminate the affected Work or the Contract for convenience; (b) may contract others to have the Hazardous Material removed or rendered harmless or (c) issue a written Contract Change Order to amend the Contract Price/Time through the Bulletin authorization process. If the Hazardous Material is brought to site by the Contractor or as a result in whole or in part from any of its violation of any Law covering the use, handling, storage, disposal of, processing, transport and transfer or from any other act or omission within its control, the Contractor is responsible for the Delay and costs to clean up the site, remove and render harmless the Hazardous Material to the satisfaction of the Owner, State and all Political Subdivisions with jurisdiction.

**6.5 Incidents with Archaeological Features:** The Contractor must immediately notify the Owner in writing of any Archeological Feature deposits encountered at the site and must protect the deposits in a satisfactory manner. If the Contractor encounters such features, which result in an anticipated change to the Contract Price/Time, the Owner may issue a written Contract Change Order through the Bulletin authorization process.

**6.6 Unit Price Work:** Quantities as listed have been carefully estimated but are not guaranteed. The Owner reserves the right to increase or decrease the quantities of the Work to be performed at the Unit Price by amounts up to 20 percent of the listed estimated quantities. For Unit Price Work, the Contractor must promptly inform the Professional in writing if actual quantities differ from the estimated quantities for any item. For quantities over 120% or below 80% of the estimated quantity, the Owner may negotiate a Unit Price with the Contractor, or direct a unilateral change, or bid that Work under separate contract. Any adjusted Unit Price agreed upon by the Owner will only apply to the actual quantities above 120% or below 80% of the estimated quantity. No adjustment due to quantity variations must be allowed (a) unless the Contractor met the notice requirements, or (b) if any Unit Price increase results in whole or in part from any act or omission within the control of the Contractor (errors in the Contractor's Bid, unbalanced Unit Prices, etc.). If a dispute arises between the Owner and the Contractor on the adjusted Unit Price, the Contractor must carry on the Work with due diligence during the disputes/disagreements.

**6.7 Cash Allowances; Provisionary Allowances:** The Contractor must obtain the Professional's and Project Director's written acceptance before providing materials, equipment, or other items covered by Cash Allowance. Work authorized under any



Provisionary Allowance may consist of (a) changes required by actual conditions, as determined by the **Professional**, and (b) any other Work authorized and completed under the pertinent provisions of the Contract Documents.

## **6.8 Changes in Contract Price:**

- 6.8.1 The Contractor's proposals or claims for Work Involved must detail all affected items of Work, whether increased, revised, added, or deleted, and must be fully documented and itemized as to (a) individual adds and deducts in Work quantities and labor man-hours; (b) corresponding itemized cost of Work Involved; (c) materials and equipment cost including transportation, storage, and suppliers' field services; and (d) Fee.
- 6.8.1.1 No proposal or claim by the Contractor on account of any asserted change not issued as a Bulletin by the PSC or Owner, shall be allowed unless initiated by written notice of such proposal or claim to the Professional and Owner within 21 days after the occurrence of the event giving rise to the proposal or claim. A full and detailed breakdown of cost and time requested, with supporting documentation, if not provided with the initial notice shall be delivered to the Professional and Owner within 15 days of the notice, unless otherwise agreed in writing, by the Owner prior to expiration of such time.
- 6.8.2 For Contractor's proposals or claims for adjustments in Contract Price arising from Delays, the Contractor's estimates must be as comprehensive and detailed as may be appropriate to support the proposal or claim. Examples of related information include labor manpower levels, production data and Progress Schedule revision.
- 6.8.3 If the Contract Documents use lump sum or Unit Prices for the Work Involved, those prices must be used in estimating the price change. Otherwise, the Owner may direct the Contractor to proceed (a) on a negotiated lump sum; or (b) on an actual cost basis with or without a guaranteed maximum; or (c) through a unilateral Change Order on a lump sum basis or a not-to-exceed basis, based on the Professional's estimate of the anticipated Cost of the Work Involved and a fee. Items making-up the Cost of the Work Involved must be allowable to the extent (a) consistent with those prevailing in the Project locality, (b) necessary, reasonable, and clearly allocable to the Work Involved, and (c) limited to labor costs, subcontract costs, material and equipment costs, construction equipment costs and general conditions costs.
- 6.8.4 In estimating any additional cost by the Contractor or its Subcontractor, the rates for the craft labor man-hour used in estimating changes in Contract Price must not exceed the rates in Means Cost Data (Means) or other cost guide acceptable to the Owner. If the rates exceed the acceptable cost guides, the Contractor must provide proper justifications acceptable to the Professional and the Owner. The payroll costs may be used to quote a Bulletin. However, the payroll costs must include wages, labor burdens and a factor for field supplies and purchase costs (less market values if not consumed) of tools not owned by the workers. Labor burdens must be certified by an authorized financial representative of the Contractor and may include social security, unemployment, taxes, workers' compensation, health and retirement benefits, vacation, and holiday pay. The factor for field supplies and tools (individually valued at less than \$1,000.00) must not exceed 4% of the wages without burdens, unless detailed data, which supports higher costs, is provided. Rates for owned, rented, or leased construction equipment must be in accordance with the contract price rates. Otherwise, the appropriate hourly, daily, weekly, or monthly rates listed in Means must be used. However, if the total rental or lease cost of an item to the Project exceeds the reasonable purchase price of the rented or leased item, the Owner reserves the right to pay only the purchase price of the item and take title to the item. Operating cost must not exceed the hourly operating rate in Means and for multiple shifts, rates must not exceed the shift work adjustments recommended in the cost guide.
- 6.8.5 The cost of any Work Involved may include necessary general conditions costs to the extent those costs increase or decrease on account of, or are directly attributable to, the performance of the furnishing and/or performance of the additional Work Involved or are required due to an extension in Contract Times or Delays. Such costs may include payroll costs of personnel, temporary facilities at the site, liability insurance and bond premiums, Subcontractors, royalty payments and fees for permits and licenses and taxes on the Work Involved.
- 6.8.6 A contractor or subcontractor who performs the Work may charge a fee of up to 15% of the cost of Work involved for overhead and profit. Contractor may charge a mark-up fee of up to 5% of its Subcontractor's cost excluding fees if the Work is performed by the Subcontractor. If Work is to be performed by lower tier subcontractor(s), intermediate subcontractors and the Contractor must share a fee of up to 5% of the lowest tier subcontractor's cost excluding fees. The total mark-up fees for the Work must not exceed 20% of the lowest tier subcontractor's cost excluding fees. If the adjustment to the Contract Price incorporates a contractor reservation of rights to claim additional adjustments, the fees must be reduced by one-third. Contractor's administrative costs and home office overhead must be non-reimbursable expenses covered by the Fee for the Work.

## **6.9 Changes in Contract Time:**

- 6.9.1 If a justified extension beyond the Contract Time is not reasonably anticipatable under the circumstances, the Owner may approve an extension to the Contract Time through the Bulletin authorization process at no additional cost to the Owner. Examples of events that may justify an extension in the Contract Time include acts of God; acts of the public enemy; fires; floods; and strikes.
- 6.9.2 If, at any time during the life of this Contract, the Contractor finds that for reasons beyond its control, it will be impossible to complete the Work on or before the Contract completion date, a written request for a change to the Contract extending the time of completion must be submitted. Such a request must set forth in precise detail the reasons believed to justify an extension and must be in such format as the State may require.

- 6.9.3 When submitting a quotation for a Contract change authorization for extra work or change in plans, the Contractor must include as part of the quotation, a statement requesting any extra time necessary to complete the related Work. Lack of such a statement will serve as notification that the extra time will not be required to complete the Contract work and will waive the right to a later claim. The Owner will not pay additional compensation to the Contractor for performing Contract Work during any extension period granted.
- 6.9.4 If the Progress Schedule and the funding allow for an early completion date, the Contractor may submit to the Owner for approval, a request to shorten the Contract Time. If approved by the Owner, the new Contract Time applies to the Project and liquidated damages, if any, will be assessed for any delays after the new completion date.
- 6.10 Price Reduction for Defective Cost or Pricing Data:** Whenever the Contractor signs a proposal for a change in the Contract or claim settlement, the Contractor will be deemed to have certified on behalf of itself, Subcontractors and Suppliers, to its best knowledge and belief that the proposal and its contents (a) were made in good faith and are consistent with the facts and the provisions of the Contract; and (b) are current, complete, and accurate. If the Contract Price/Time is increased by any Change Order, claim or dispute settlement because the Contractor, Subcontractor or Supplier, at any tier, represented or furnished cost or pricing data of any kind that were false, contained math errors or were incomplete, the Contract Price must be correspondingly reduced by Change Order. If there is a good cause to doubt the Contractor's compliance with the Defective cost and pricing data requirements, the Owner must be entitled to make an appropriate withholding from any payment otherwise owed to the Contractor.

## 7. Payments

- 7.1 **Schedule of Values:** The Schedule of Values must be approved by the Professional and accepted by the Owner and must divide the Work into pay items for significant Sections and areas, facilities, or structures, with subtotals for first tier Subcontractors. As required or as noted in Division 1, the accepted Schedule of Values must be supported by a more detailed breakdown allocating the pay items to the Progress Schedule Activities. It must tabulate labor costs, Subcontract costs and material and equipment costs. Labor costs must include appropriate sums for construction equipment costs, general conditions costs, administrative costs, and profit, unless separate pay items are itemized for those costs. The Schedule of Values must include two percent of the Contract Price for each of the following close-out pay items: (a) fire safety inspection, certificate of occupancy and other code approvals, as specified in the Contract Documents, (b) manufacturer warranties, finalized operating and maintenance documentation, Owner training documentation, and test and balance reports, and (c) finalized as built/Record Documents.
- 7.2 **Requests for Payment:** Not more than once every thirty Calendar Days, the Contractor may submit to the Professional a Request for Payment on the Owner's form signed by the Contractor certifying Work completed and enclosing all supporting documentation. A draft copy of the payment request must be submitted to the Owner Field Representative for review and comments. For projects under \$50,000, the Contractor may not submit more than two requests in addition to the final payment request. Each Request for Payment must certify that all monies owed by the Contractor to Subcontractors and Suppliers for which payment previously has been sought has been paid from payments received and include a sworn statement. No Request for Payment must include amounts for a Subcontractor or Supplier if the Contractor does not intend to use the payments requested, when received, to reduce the Contractor's outstanding obligations on the Work. The Owner will pay the Contractor within thirty Calendar Days after the Owner receives and approves a certified Request for Payment from the Professional. The Contractor will provide a certification in writing that the payment request submittal is true and accurate. If payment is requested based on materials and equipment stored at the site or at another location agreed to in writing, the Request for Payment also must be accompanied by (a) consent of surety, (b) a bill of sale, invoice or other documentation warranting that the Owner has received the materials and equipment free and clear of all liens, and (c) evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect them and the Owner's interests. The Contractor warrants and guarantees that title to all Work, materials and equipment covered by any Request for Payment, whether incorporated in the Work or not, will pass to the Owner free and clear of all liens no later than at the time of payment by the Owner to the Contractor.
- 7.2.1 **Electronic Funds Transfer:** The State will only disburse payments under this Contract through Electronic Funds Transfer (EFT). Contractor must register with the State at <http://www.michigan.gov/SIGMAVSS> to receive electronic fund transfer payments. If Contractor does not register, the State is not liable for failure to provide payment. Without prejudice to any other right or remedy it may have, the State reserves the right to set off at any time any amount then due and owing to it by Contractor against any amount payable by the State to Contractor under this Contract.
- 7.3 **Review of Request for Payment; Intent of Review:** Within ten Calendar Days after receipt of a Request for Payment, the Professional must certify to the Owner the amount the Professional determines to be due or must return the Request for Payment to the Contractor indicating the reasons for withholding certification. The Professional's certification of any Request for Payment constitutes a representation to the Owner that the Work has progressed to the point indicated; that to the best of the Professional's 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. In the case of final payment, the Professional's certification of final payment and recommendation that the Work is acceptable must be a further representation that conditions governing final payment to the Contractor have been met.

- 7.4 **Refusal to Make or to Recommend Payment:** The Owner may withhold from any payment an amount based on the (a) Professional's refusal to recommend payment or (b) Owner's estimate of the fair value of items included in the payment request. The Owner will give the Contractor reasonably prompt written notice supporting such action. The Professional may refuse to recommend any part of any payment, or because of subsequently discovered evidence, inspections or tests or the value of the Punch List, nullify all or any portion of any payment previously recommended, as the Professional may consider necessary to protect the Owner from loss because:
- (a) the Work is Defective or completed Work has been damaged requiring correction or replacement,
  - (b) the Contract Price has been reduced by Change Order,
  - (c) it has been necessary that the Owner correct Defective Work or complete Work,
  - (d) reasonable evidence exists that all or a part of the Work will not be completed within the corresponding Contract Time,
  - (e) the Contractor failed to comply with any material requirements of the Contract, including, but not limited to the failure to submit Progress Schedule Submittals or as built/Record Documents when due,
  - (f) stored materials for which payment has been made or is sought has been determined by the Professional or the Owner Field Representative to be damaged or missing, or
  - (g) the Professional reasonably believes or knows of the occurrence of an event justifying termination for cause.
- 7.5 **Request for Final Inspection:** The Contractor must complete the Substantial Completion Punch List within the Contract Time and date. The Contractor must assemble all required documentation before requesting final inspection in writing. The Contractor may request final inspection of the entire Work, or the part of the Work for which final payment is specified in the Contract Documents. Upon this written notice, and if deemed appropriate by the professional, the Professional will make a final completion inspection with the Owner and Contractor and notify the Contractor of all incomplete or Defective Work revealed by the Final Inspection. The Contractor must immediately correct and complete the Work.
- 7.6 **Close-out Documents:** The Contractor must prepare and submit the following documentation before requesting final inspection or final payment: final operating and maintenance documentation (with revisions made after Substantial Completion), warranties, inspection certificates, as built/Record Documents, release of payment claim forms, and all other required documents.
- 7.7 **Request for Final Payment:** The Contractor may request final payment after correcting or completing the Work to the satisfaction of the Professional and delivering close-out documentation (7.6). The Contractor's request for final payment must also enclose:
- (a) evidence of completed operations insurance and an affidavit certifying that the insurance coverage will not be canceled, materially changed, or renewal refused,
  - (b) an affidavit certifying that the surety agrees that final payment does not relieve the surety of any of its obligations under the Performance Bond and Payment Bond,
  - (c) a completed DTMB-0460 Form close out checklist,
  - (d) a list of all pending insurance claims arising out of or resulting from the Work being handled by the Contractor and/or its insurer
  - (e) Contractor's 'Guarantee and Statement' (DTMB-0437) containing a statement of guaranteed indebtedness acceptable to the Owner in the full amount of the Contract Price, or a release of payment claims in the form of a release of liens, or a Bond or other security acceptable to the Owner to indemnify the Owner against any payment claim.
- 7.8 **Final Payment and Acceptance:** If the Professional is satisfied that the entire Work, or the part of the Work for which final payment is specified in the Contract Documents, is complete and the Contractor's other obligations under the Contract Documents has been fulfilled, the Professional will furnish to the Owner and Contractor the Professional's certification of final payment and acceptance within thirty Calendar Days after receipt of the final payment request. If the Professional is not satisfied, the Professional will return the request to the Contractor indicating in writing the reasons for not certifying final payment. If the final payment request is returned, the Contractor must correct the deficiencies and re-request final payment. If the Owner concurs with the Professional's certification of final payment the Owner will, within thirty Calendar Days after receipt of the Professional's certification of final payment, pay the balance of the Contract Price subject to those provisions governing final payment specified in the Contract Documents. If the Owner does not concur with the Professional's determination, the Owner will return the request for final payment to the Contractor with written reasons for refusing final payment and acceptance.
- 7.9 **Contractor's Continuing Obligation:** The following does not constitute acceptance of the Work in the event the Work or any Work is not in accordance with the Contract Documents, and therefore does not release the Contractor from its obligation to perform and furnish the Work in accordance with the Contract Documents:
- (a) a certification by the Professional of any Request for Payment or final payment.
  - (b) the issuance of a Substantial Completion certificate.
  - (c) any payment by the Owner to the Contractor.
  - (d) any Partial Use.
  - (e) any act of acceptance by the Owner or any failure to do so.
  - (f) any review and approval of a Shop Drawing, sample, test procedure or other Submittal.
  - (g) any review of a Progress Schedule.

- (h) any On-Site Inspection.
- (i) any inspection, test, or approval.
- (j) any issuance of a notice of acceptability by the Professional; or
- (k) any correction of Defective Work or any completion of Work by the Owner.

7.10 **Waiver of Claims:** The making of final payment does not constitute a waiver by the Owner of any rights as to the Contractor's continuing obligations under the Contract Documents, nor will it constitute a waiver of any claims by the Owner against the Contractor still unsettled, or arising from unsettled payment claims, Defective Work appearing after final inspection or failure by the Contractor to comply with the Contract Documents or the terms of any special warranties provided by the Contract Documents or by Law. The acceptance of final payment will constitute a waiver of all claims by the Contractor against the Owner, other than those claims previously made in writing, on a timely basis.

8. **Other Work:** During the Contract Time, the Owner may self-perform or Contract for other work at the site. By doing so, the Owner or its representative will coordinate the operations of the Contractor and the other work. Whenever the other work interfaces with the Contractor's Work on site, the Contractor must coordinate its activities with the interfacing work, inspect the other work and promptly report to the Professional in writing if the other work is unavailable or unsuitable. The Contractor's failure to do so will constitute an acceptance of such other work as fit and proper for integration with the Work except for latent or non-apparent defects and deficiencies in the other work. The Contractor must provide proper and safe access to the site for handling, unloading and storage of their materials and equipment and for the execution of the other work. The Contractor must do all cutting, fitting, patching, and interfacing of the Work that may be required to make any part of the Work come together properly and integrate with other work. If the Contractor becomes party to a dispute or claim due to damages caused to its Work/property or other work/their property, the Contractor must promptly attempt, without involving the Owner or the Professional or their agents, to settle with the other party by agreement or otherwise resolve the claim. If the Owner determines that the other work resulted in a delay to the Work to be performed by the Contractor and such delay justifies a Change Order, the Owner will authorize the necessary adjustment in Contract Price and/or Time.

9. **Stop Work Orders and Suspension of Work:** The Owner may order the Contractor in writing to defer, stop, suspend, or interrupt all or part of the Work, in the event any of the following situations:

- (a) any Work is Defective,
- (b) any Work, when completed, will not conform to the Contract Documents,
- (c) any materials or equipment are unsuitable,
- (d) any workers are insufficiently skilled,
- (e) failure of the Contractor to implement appropriate measures for the SESC, or
- (f) as the Owner may determine appropriate for its convenience. The Contractor is responsible for the Delays and any additional costs if at fault. Any justified increase in Contract Price/Time due to suspension of Work must be submitted within twenty-one Calendar Days of knowing the extent of Delays and before submitting the final payment.

## 10. Termination:

10.1 **Termination for Breach:** The Owner may elect to terminate all or any part of the Work if:

- (a) the Contractor fails to complete the Work, or a specified part of the Work, within the corresponding Contract Time; fails or refuses to supply sufficient management, supervision, workers, materials, or equipment; or otherwise fails to prosecute the Work, or any specified part of the Work, with the diligence required to comply with the Contract Time(s).
- (b) the Contractor persistently disregards the authority of the Professional or violates or disregards a provision of the Contract Documents or the Laws of any Political Subdivision with jurisdiction.
- (c) the Contractor admits in writing, or the Owner otherwise establishes, the Contractor's inability or refusal to pay the Contractor's debts generally as they become due.
- (d) in response to the Owner's demand, the Contractor fails to provide adequate, written assurance that the Contractor has the financial resources necessary to complete the Work within the Contract Time.
- (e) the Contractor fails to comply with the Michigan Residency requirements (1984 PA 431, as amended, MCL 18.1241a); or is found to be in violation of Section 4 of 1980 PA 278 concerning unfair labor practices, or any nondiscrimination requirements imposed by Law.
- (f) at any time, the Contractor, Subcontractor or Supplier is in violation of unfair labor practices prohibited by Section 8 of Chapter 327 of the National Labor Relations Act, 29 U.S.C. 158; or
- (g) the Contractor violates or breaches any material provision of the Contract Documents, which provides contractually for cause termination or rescission of the Contract or of the Contractor's right to complete the Work.

Within seven Calendar Days after the Contractor receives a notice requiring assurance of due performance for any of the above occurring non-conformances, the Contractor must meet with the Owner and present the Contractor's plan to correct the problems. If the Owner determines that the Contractor's plan provides adequate assurance of correction, that determination does not waive the Owner's right to subsequently default the Contractor or affect any rights or remedies of the Owner against the Contractor and/or surety then existing or that may accrue in the future. The Owner, after giving the Contractor and surety seven Calendar Days' written notice of intent to default, may declare the Contractor in default and terminate the services of the Contractor for cause. Unless otherwise agreed between the Owner and Contractor, at the expiration of the Seven-Calendar

Day (intent to default) period, the Contractor must immediately stop all Work and proceed in accordance with the Owner's instructions. Following the expiration of the Seven-Calendar Day (intent to default) notice, the Contractor will be sent a default letter – notice of termination for cause. The Owner will issue a Contract Change Order to revise the name of the contract party to the name of the surety company. The surety company must undertake to perform and complete the Work, in accordance with the Contract Documents, in place of the Contractor, either through the surety's agents or by executing agreements with qualified contractors (excluding the Contractor and any of the Contractor's affiliates), or both.

The Owner may issue a fifteen-Calendar Day notice of intent to default the surety company if they fail to execute in a timely manner the completion of the Contract Work. Without an adequate plan of correction, the Owner may issue a notice of termination for cause letter to the surety. If a termination of the contract with the surety occurs, the Owner reserves the right to complete the Work.

If the Owner has terminated the Contractor, any such termination will not affect any rights or remedies of the Owner against the Contractor or surety, or both, then existing or that may accrue after termination. All provisions of the Contract Documents that, by their nature, survive final acceptance of the Work must remain in full force and effect after a termination for cause of the Contractor or default of the surety, or both. The Owner may, in its sole discretion, permit the Contractor to continue to perform Work when the Contractor is in default or has been defaulted. Such decision by the Owner in no way operates as a waiver of any of the Owner's rights under the Contract Documents or Performance Bond, nor in the event of a subsequent default, entitle the Contractor or surety to continue to perform or prosecute the Work to completion.

- 10.2 **Termination on Non-Bonded Project:** For non-bonded projects, the Owner will follow the termination protocol in Paragraph 10.1 without involving a surety.
- 10.3 **Termination for Convenience of the Owner:** Upon fifteen Calendar Days' written notice to the Contractor and surety, or sooner if reasonable under the circumstances, the Owner may, without cause and without prejudice to any other right or remedy it may have, elect to terminate any part of the Work, or the Contract in whole or in part, as the Owner may deem appropriate for its convenience. Upon receipt of any such termination notice, the Contractor must immediately proceed in accordance with any specific instructions, protect and maintain the Work, and make reasonable and diligent efforts to mitigate costs associated with the termination. In such termination, the Contractor must be paid in accordance with the terms of this Contract for only services rendered before the effective date of termination. Upon termination for convenience, the Contractor must be released from any obligation to provide further services and the Owner must have full power and authority to take possession of the Work, assume any agreements with Subcontractors and Suppliers that the Owner selects, and prosecute the Work to completion by Contract or as the Owner may deem expedient.
- 10.4 **Termination for Lack of Funding:** If expected or actual funding is withdrawn, reduced, or limited in any way before the completion date set forth in this Contract or in any amendment, the State may, upon written notice to the Contractor, terminate this Contract in whole or in part in accordance with Paragraph 10.3.
11. **Disputes:** All claims, counterclaims, disputes, and other matters in question between the Owner and Contractor arising out of or relating to the Contract Documents must be submitted in writing to the Professional and otherwise processed and resolved as provided in this Article. *Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker (Professional/PSC). Claims by either party must be initiated within 21 days after the occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognized the condition giving rise to the claim. Provided such timely notice is delivered, a full and detailed breakdown of cost and time requested, with supporting documentation, if not provided with initial notice shall be delivered to Professional and Owner within 15 days of the notice, unless otherwise agreed in writing, by the Owner prior to expiration of such time.* The Contractor must carry on the Work with due diligence during all disputes or disagreements. Work must not be delayed or postponed pending resolution of any disputes or disagreements. The Contractor must exercise reasonable precautions, efforts, and measures to avoid situations that would cause delay.
- 11.1 **Notice of Claim:** Except for Owner claims for liquidated damages, no claim is valid unless it is based upon written notice delivered by the claimant to the other party and the Professional/PSC within 21 days of the event giving rise to the claim. The notice must state the nature of the dispute, the amount involved, if any, and the remedy sought. The claim submittal with all supporting data must be delivered within thirty (30) Calendar Days after the initial notice unless the Professional allows an extension by written approval. A claim by the Contractor must be submitted to the Professional and Project Director for a recommendation or decision from the Professional. A claim by the Owner must be submitted to the Contractor and the Professional for a written recommendation or decision by the Professional. The Owner reserves the right to audit any Contractor claim (or claim package) that the Contractor values at more than \$50,000.00. Pending final resolution of any claim under this Article, the Contractor must proceed diligently with the Work and comply with any decision of the Owner and/or Professional. For all Contractor claims seeking an increase in Contract Price or Contract Time, the Contractor must submit an affidavit, certifying that the amount claimed accurately reflects any Delay and all costs that the Contractor is entitled from the occurrence of the claimed event and that supporting cost and pricing data are current, accurate, complete and represent the Contractor's best knowledge and belief. The affidavit must be signed in the same manner as required in Item 6 of Section 00100.
- 11.2 **Recommendations or Decisions from the Professional:** For claims under \$100,000.00, if requested in writing by the Contractor, the Professional will render a recommendation or decision within thirty Calendar Days after the request and the

Owner will issue, if necessary, a determination within thirty Calendar Days after the Professional's recommendation or decision. For claims exceeding \$100,000.00, the Professional will issue its recommendation or decision and the Owner, if necessary, will issue its determination, within sixty Calendar Day.

If the Professional denies a Contractor claim or agrees with an Owner claim, that decision must be final and binding on the Contractor, without any determination by the Owner, unless the Contractor files a request for a presentation with the Director-DCD within thirty Calendar Days. To the extent that any recommendation from the Professional is partly or wholly adverse to a claim from the Owner, that determination must be final and binding on both the Owner and Contractor unless either party files a request for a presentation with the Director-DCD within thirty Calendar Days. If the Professional recommends payment of any Contractor claim which increases the Contract Price, that recommendation is subject to the Owner's written approval. In the event any such determination from the Owner is partly or wholly adverse to the preceding recommendation from the Professional, that determination must be final and binding on the Contractor unless the Contractor files suit in the Michigan Court of Claims within thirty Calendar Days after receipt of such determination. The claim is waived if not made in accordance with these requirements.

If either the Contractor or Owner is not satisfied with any decision of the Professional on a claim, that party must, within thirty Calendar Days of receiving that decision, file a written appeal with complete supporting documentation with the Director-DCD. The Director-DCD has discretion concerning the allowability of evidence submitted and is not bound to any rules of evidence. If the right to a presentation is waived or if a presentation is conducted and the dispute remains unresolved, the Director-DCD, at the Director-DCD's sole option, must specify in which forum the dispute must be conducted by issuing a written determination to the Contractor that the dispute if the Contractor so elects, be submitted in writing to the Michigan Court of Claims. The Director-DCD's determination on the dispute is final and binding on the Contractor unless the Contractor files a lawful action in the Michigan Court of Claims within thirty Calendar Days after receiving the Director-DCD's determination. After settlement or final adjudication of any claim, if payment by the Contractor is not made to the Owner, the Owner may offset the appropriate amounts against (a) payments due to the Contractor under any other Contract between the Owner and the Contractor, or (b) any amounts for which the Owner may be obligated to the Contractor in any capacity. The Director-DCD may designate someone to fulfill the Director-DCD's duties under these terms and conditions.

#### **END OF SECTION 00700**

### **SECTION 00750 SPECIAL WORKING CONDITIONS**

1. The Work is for the Department of State Police and their special working conditions are included in Appendix II. Contractor must comply with all security regulations. Access to and egress from the buildings and State Agency grounds must be via routes specifically designated by the State Agency. Whenever the Contractor has caused an operating security or fire system to go out of service or left unsecured openings in existing facilities or security fences, the Contractor must furnish a security guard or fire watch acceptable to the Owner to maintain security of the facility outside of normal working hours and will be held responsible for any losses from the facility.
2. The Contractor must maintain, at all times, dust control measures to the satisfaction of the Owner.

#### **END OF SECTION 00750**

### **SECTION 00800 SUPPLEMENTARY CONDITIONS**

1. The following conditions must supplement the general conditions:

#### **STATE-FUNDED PROJECT PREVAILING WAGE REQUIREMENTS**

1. The Contractor (and its Subcontractors) represents and warrants that it pays all mechanics and laborers employed directly on the site of the work, unconditionally and at least once a week, and without subsequent deduction or rebate on any account, the full amounts accrued at time of payment, computed at wage rates not less than those stated in the advertised specifications as prevailing wages based on locality, regardless of any contractual relationship which may be alleged to exist between the Contractor or subcontractor and the laborers and mechanics.
2. The Contractor represents and warrants that Contractor will post the scale of wages to be paid in a prominent and easily accessible place at the site of the work.

#### **END OF SECTION 00800**

**SECTION 00900 ADDENDA**

1. Each Bid submittal must include acknowledgement of receipt and review of all Addenda issued during the Bidding period.

**END OF SECTION 00900**



**DIVISION 01**

**GENERAL REQUIREMENTS**

## SECTION 01010 SUMMARY OF WORK

### 1. General

1.1 General information covering the "Scope of Work" is specified on the Invitation to Bid. Additional information is as follows:

(a). Not applicable

1.2 The Agency will provide the following Work:

(a) State Salvage: The State reserves the right to salvage certain items and equipment and those salvaged items will be identified to the Bidder at the time of their inspection of the proposed Work. The State will remove salvaged items before commencement of the Work.

(b) Moving Furnishings and Equipment: The Contractor must give timely notice to the State Agency representative identified in the pre-construction meeting of all furnishings, window covering and movable equipment that will interfere with the Work or which the Contractor cannot protect with coverings of paper, plastic, drop cloths or clean tarpaulin. The Contractor must furnish, install, maintain, and remove all coverings used to protect furnishings, window coverings and movable equipment.

### END OF SECTION 01010

## SECTION 01020 ALLOWANCES

### 1. Allowances

#### 1.1 ~~Cash Allowances:~~

~~\_\_\_\_\_ (a) Bidders must include in their Base Proposal Sum an allowance of \$\*\*\* to cover \*\*\* specified in Section \*\*\*. The base bid shall include bonds and insurance on the value of the allowance.~~

~~\_\_\_\_\_ (b) Monies in the allowance will be used only if directed in writing by the Project Director and Professional.~~

~~\_\_\_\_\_ (c) Payments under a Cash Allowance must be on actual cost and exclude cost for supervision, handling, unloading, storage, installation, testing, fee, premiums for bond and insurance, etc.~~

~~\_\_\_\_\_ (c) Unused allowances will be deducted from the contract amount through contract change order.~~

#### 1.2 Provisional/Contingency Allowances:

(a) Bidders must include in their Base Proposal Sum a contingency allowance of \$30,000. The base bid shall include bonds and insurance on the value of the allowance.

(b) Monies will be used in the contingency allowance only if directed in writing by the Project Director and Professional.

(c) Payments under a Provisionary Allowance will include not only the purchase/furnished cost of the materials and equipment involved, but also all related labor costs, subcontract costs, construction equipment costs, general conditions costs and Fee, provided they are calculated in accordance with the requirements of the contract documents.

(c) Unused allowances will be deducted from the contract amount through contract change order.

### END OF SECTION 01020

## SECTION 01025 MEASUREMENT AND PAYMENT

1. **Schedule of Values:** Unless noted otherwise, before mobilization and start of construction, the Contractor must submit a Schedule of Values to the Professional for review and approval, of the various tasks that must be performed to complete all the Work. The schedule must show each task and the corresponding value of the task, including separate monies allocated for General Condition items and Project close-out. The aggregate total value for all tasks must be equal to the total Contract sum.

### END OF SECTION 01025

## SECTION 01030 ALTERNATES

1. **Use of Alternates:** Determination of the lowest three Bidders shall be based on the sum of the Base Bid and any additive and deductive Alternates the Owner accepts, in the order in which they are listed only. The Owner will accept an Alternate only if all other previously listed Alternates are also accepted unless acceptance by the Owner of Alternates in a different order does not affect determination of the lowest three bidders in any way.

2. **Execution:** (a) Coordinate pertinent related Work and modify surrounding work as required to complete the Project for each alternate.

(b) Description of Alternates: Not Applicable

## END OF SECTION 01030

### SECTION 01040 COORDINATION

#### 1. Project Coordination:

- (a) Before beginning Work the Contractor must coordinate with the State Agency representative to implement the schedule for the Project. Once the Project is started, it must be carried to completion without delay. (b) Any building utility service interruptions or outages including security required by the Contractor in performing the Work must be prearranged with the staff of the State Agency and must occur only during those scheduled times. (c) The Contractor is not responsible for removing room furnishings unless is required by the Contract Documents.

#### 2. Cutting and Patching:

- (a) The Contractor must do all cutting, fitting, or patching of the Work that may be required to make its several parts fit together properly or make new Work join with the existing structure. The Contractor must take proper precautions so as not to endanger any existing Work. The Contractor must not cut or alter existing structural members or foundations unless specifically required by the Contract Documents.
- (b) Holes or openings cut in exterior walls and roofs for installation of materials or equipment must be waterproofed by appropriate, approved materials and methods.
- (c) All adjacent finished surfaces that are damaged by the new Work must be patched with materials matching existing surfaces. Joints between patched and existing material must be straight, smooth, and flush. Workers skilled in its installation must apply all patching material.

## END OF SECTION 01040

### SECTION 01050 FIELD ENGINEERING

1. When applicable, the Contractor must employ a surveyor who must establish and maintain all lines and levels required for laying out and constructing the Work. The Contractor agrees to assume all responsibility due to inaccuracy of any Work of the surveyor, and including incorrect benchmarks, their loss or disturbance. Upon completion of the Project, the Contractor must submit two copies of site layout Drawings prepared for the Project and certified by the surveyor.

## END OF SECTION 01050

### SECTION 01060 REGULATORY REQUIREMENTS

1. **Laws:** The Contractor and its Subcontractors/Suppliers must comply with all Federal, State, and local Laws applicable to the Work and site.
2. **Codes:** All Works must be provided in accordance with the State Construction Code Act, 1972 PA 230, as amended, MCL 125.1501 et seq., International Building and Residential Codes and all applicable Michigan construction codes and fire safety including but not limited to: Michigan Building Code, Michigan Residential Code, Michigan Uniform Energy Code, Michigan Electrical Code, Michigan Rehabilitation Code for Existing Buildings, Michigan Mechanical Code, Michigan Elevator Code and Michigan Plumbing Code. If the Contractor observes that any Contract Document conflicts with any Laws or the State Construction Code or any permits in any respect, the Contractor must promptly notify the Professional in writing. If the Contractor provides any Work knowing or having to reason to know of such conflict, the Contractor must be responsible for that performance.
3. **Permits:** All required construction permits must be secured and their fees including inspection costs must be paid by the Contractor. The time incurred by the Contractor in obtaining construction permits must constitute time required to complete the Work and does not justify any increases to the Contract Time or Price, except when revisions to the Drawings and/or Specifications required by the permitting authority cause the Delays. The Contractor must pay all charges of Public Utilities for connections to the Work, unless otherwise provided by Cash Allowances specific to those connections.
4. **Taxes:** The Contractor must pay all Michigan sales and use taxes and any other similar taxes covering the Work that are currently imposed by legislative enactment and as administered by the Michigan Department of Treasury, Revenue Division. If the Contractor is not required to pay or bear the burden or obtains a refund of any taxes deemed to have been included in the Bid and Contract Price, the Contract Price must be reduced by a like amount and that amount, whether as a refund or otherwise, must ensure solely to the benefit of the State of Michigan.
5. **Safety and Protection:** The Contractor and its Subcontractors/Suppliers must comply with all applicable Federal, State, and local Laws governing the safety and protection of persons or property, including, but not limited to the Michigan Occupational Safety and Health Act (MIOSHA), 1974 PA 154, as amended, MCL 408.1001 et seq., and all rules promulgated under the Act. The

Contractor is responsible for all damages, injury or loss to the Work, materials, equipment, fines, penalties as a result of any violation of such Laws, except when it's due to the fault of the Drawings or Specifications or to the Act, error, or omission of the Owner or Professional. The Contractor is solely responsible for initiating, maintaining, and supervising all safety precautions and programs and such responsibility must continue until such time as the Professional is satisfied that the Work, or Work inspected, is completed and ready for final payment. In doing the Work and/or in the event of using explosives, the Contractor must take all necessary precautions for the safety of, and must erect and maintain all necessary safeguards and provide the necessary protection to prevent damage, injury or loss to: (a) all employees on the Work and other persons who may be affected by the Work, (b) all the Work and materials and equipment to be incorporated into the Work, whether stored on or off the site, and (c) other property at or adjacent to the site, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and Underground Utilities not designated for removal, relocation or replacement. In the event of severe weather, the Contractor must inspect the Work and the site and take all reasonably necessary actions and precautions to protect the Work and ensure that public access and safety are maintained.

**6. Fire Hazard Conditions:**

- (a). The fire hazard classification of finish materials where used in the specification must be in accordance with the current Michigan Building Code.
- (b) Classification must be determined by tunnel test in accordance with National Fire Protection Association (NFPA-255), American Society for Testing Materials (ASTM E-84) or Underwriters' Laboratories, Inc. (UL-723).

**7. Flame/Smoke Resistance Standards:** The Contractor must provide carpeting complying with "Class B" requirements as set forth in Michigan Department of State Police State Fire Safety Board "Health Care Facilities Fire Safety Rules" R29.1243, Rule 243, when tested in accordance with the following procedures:

- (a) Tunnel Test: Test for surface burning characteristics, with ratings for flame spread, fuel contribution, and/or smoke density; ASTM E 84, UL 723, or NFPA No. 255.
- (b) Pill Test: Test for flammability; ASTM D 2859, or DOC FF-1-70.
- (c) Floor Radiant Panel Test: Test for burning under varying radiant energy levels; ASTM E 648, with minimum average radiant flux ratings not less than 0.45 watts/sq. cm.
- (d) Smoke Density Test: Test in radiant heat chamber, with and without flame, for density of smoke generated; ASTM E 662, or NFPA No. 258, also known as NBS Smoke Density Chamber Test.

**8. Michigan Right-To-Know Law:** The Contractor and its Subcontractors/Suppliers must comply with MIOSHA, Michigan Right-to-Know Law (Public Act 80 of 1986) and the rules promulgated under it. The Act places certain requirements on employers to develop a communication program designed to safeguard the handling of hazardous chemicals through labeling of chemical containers and development and availability of Safety Data Sheets (SDS), and to provide training for employees who work with these chemicals and develop a written hazard communications program. The Act also provides for specific employee rights, including the right to be notified of the location of SDS and to be notified at the site of new or revised SDS within five Business Days after receipt and to request SDS copies from their employers. The Contractor, employer or Subcontractor must post and update these notices at the site.

**9. Environmental Requirements:** The Contractor and its Subcontractors/Suppliers must comply with all applicable Federal, State and local environmental Laws, standards, orders or requirements including but not limited to the National Environmental Policy Act of 1969, as amended, Michigan Natural Resources and Environmental Protection Act, P.A. 451 of 1994, as amended, the Clean Air Act, as amended, the Clean Water Act, as amended, the Safe Drinking Water Act, as amended, Pollution Prevention Act, as amended, Resource Conservation and Recovery Act, as amended, National Historic Preservation Act, as amended and Energy Policy and Conservation Act and Energy Standards for Buildings Except Low-Rise Residential Buildings, ANSI/ASHRAE/IESNA Standard 90.1-1999.

**10. Nondiscrimination:** For all State Contracts for goods or services in amount of \$5,000 or more, or for Contracts entered into with parties employing three or more employees; in connection with the performance of Work under this Contract, the Contractor and its Subcontractors and Suppliers must comply with the following requirements:

- 10.1 Not to discriminate against any employee or applicant for employment because of race, color, religion, national origin, age, sex (as defined in Executive Directive 2019-09), height, weight or marital status and take affirmative action to ensure that applicants are employed, and the employees are not subject to such discrimination. Such action must include, but is not limited to, the following: employment, upgrading, demotion or transfer; recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training.
- 10.2 To state in all solicitations or advertisements for employees that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, age, sex, height, weight, or marital status.
- 10.3 To send, or have its collective bargaining representative send, each labor union or representative of workers with which there is a collective bargaining agreement or other contract or understanding, a notice advising the labor unions or workers' representative of the commitments under this provision.

- 10.4 To comply with the Elliot-Larsen Civil Rights Act, 1976 PA 453, as amended , MCL 37.2201 et seq.; the Michigan Persons with Disability Civil Rights Act, 1976 PA 220, as amended, MCL 37.1101 et Seq.; *Executive Directive 2019-09*; and all published rules, regulations, directives, and orders of the Michigan Civil Rights Commission (MCRC) which may be in effect on or before the date of Bid opening.
- 10.5 The Contractor must furnish and file compliance reports within the times, and using the forms prescribed by the MCRC. Compliance report forms may also elicit information as to the practices, policies, programs, and employment statistics of the Contractor and Subcontractors. The Contractor must permit access to Records by the MCRC and its agent for purposes of ascertaining compliance with the Contract and with rules, regulations, and orders of the MCRC.
- 10.6 If, after a hearing held under its rules, the MCRC finds that the Contractor has not complied with the Elliott-Larson requirements of the Contract Documents, MCRC may, as part of its order, certify its findings to the Administrative Board of the State of Michigan, which may order the cancellation of the Contract and/or declare the Contractor ineligible for future contracts with the State until the Contractor complies with the MCRC's order.
11. **Michigan Residency for Employees:** Fifty percent of the persons employed on the Work by the Contractor must have been residents of the State of Michigan for not less than one year before beginning employment on the Work. This residency requirement may be reduced or waived to the extent that Michigan residents are not available or to the extent necessary to comply with the federal funds used for the Project. This requirement does not apply to employers who are signatories to collective bargaining agreements that allow for the portability of employees on an interstate basis.

### END OF SECTION 01060

### SECTION 01090 REFERENCES

1. References will be made in an abbreviated alpha numeric form to specific standard specifications, reference publications and building codes of federal or state agencies, manufacturers, associations, or trade organizations. Such references will be identified by the alphabetic abbreviation which identifies the government agency, the association or organization followed by the rule, section or detail number that are to form a part of these specifications, the same as if fully set forth herein, and must be of latest issued date in effect three months before the Bid opening date shown on the Proposal and Contract. The abbreviations used are referred to as follows:

<u>Abbreviation</u>	<u>Agency, Association or Organization</u>
ACI	American Concrete Institute
AISC	American Institute of Steel Construction, Inc.
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute, Inc.
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society of Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
BOCA	Building Officials and Code
CDA	Copper Development Assn., Inc.
CLFMI	Chain Link Fence Manufacturer's Institute
CISPI	Cast Iron Soil Pipe Institute
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard
F/M	Factory Mutual Research Corporation
FS	Federal Specifications
HEW	United States Department of Health Education and Welfare
MDOT	Michigan Department of Transportation
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation Testing Laboratory, Inc
NSWMA	National Solid Waste Management Association
PCA	Portland Cement Association
PDI	Plumbing and Drainage Institute
SMACNA	Sheet Metal & Air Conditioning Contractors
UL	Underwriters Laboratories, Inc.
USBM	United States Bureau of Mines
USDC	United States Department of Commerce

### END OF SECTION 01090

## SECTION 01100 PROJECT PROCEDURES

1. **Signage and Safety:** The Contractor must post appropriate construction signs to advise the occupants and visitors of occupied facilities of the limits of construction work areas, hardhat areas, excavations, construction parking and staging areas, etc. Advertising signage by contractors, subcontractors, or suppliers is not allowed. The Contractor must maintain safe and adequate pedestrian and vehicular access to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, hospitals, fire, and police stations and like establishments. The Contractor must obtain written approval from the Owner ten Calendar Days before connecting to existing facilities or interrupting the services on site.
2. **Required Project Sign:** For projects costing in excess of \$500,000, the Contractor must provide and install a project sign conforming to the requirements shown in Appendix IV. The Project Director will designate the wording for the sign.
3. **Barrier and Enclosures:**
  - (a) The Contractor must furnish, install, and maintain as long as necessary and remove when no longer required adequate barriers, warning signs or lights at all dangerous points throughout the Work for protection of property, workers, and the public. The Contractor must hold the State of Michigan harmless from damage or claims arising out of any injury or damage that may be sustained by any person or persons as a result of the Work under the Contract.
  - (b) **Temporary Fence:** The Contractor must entirely enclose the Contract area by means of woven wire or snow fence having minimum height of four feet. Gates must be provided at all points of access. Gates must be closed and secured in place at all times when Work under the Contract is not in progress. The fence must be removed, and grounds restored to original condition upon completion of the Work.
  - (c) **Street Barricades:** The Contractor must erect and maintain all street barricades, signal lights and lane change markers during the periods that a traffic lane is closed for their operations. There must be full compliance with rules and ordinances respecting such street barricading and devices must be removed when hazard is no longer present.
4. **Construction Aids:**
  - (a) The Contractor must furnish, install, and maintain as long as necessary and remove when no longer required, safe and adequate scaffolding, ladders, staging, platforms, chutes, railings, hoisting equipment, etc., as required for proper execution of the Work. All construction aids must conform to Federal, State, and local codes or Laws for protection of workers and the public.
  - (b) **Debris Chute:** The Contractor must use a chute to lower debris resulting from their Work. The chute must be the enclosed type with its discharge directly into the truck or approved container.
  - (c) **Pumping and Drainage:** The Contractor must provide all pumping necessary to keep excavations and trenches free from water the entire period of Work on the Contract. The Contractor must construct and maintain any necessary surface drainage systems on the Work site so as to prevent water entering existing structures or to flow onto public or private property adjacent to the Agency's land, except for existing drainage courses or into existing drainage systems. The Contractor must prevent erosion of soils and blockage of any existing drainage system.

**END OF SECTION 01100**

## SECTION 01200 PROJECT MEETINGS

1. **Pre-Construction Conferences:** The Project Director will schedule a pre-construction conference to be attended by the Professional, State Agency staff, and the Contractors. A project procedure as outlined in Form DTMB-0460, will be established for the Work during the pre-construction meeting. When no organizational meeting is called, the Contractor, before beginning any Work, must meet with the staff of the Agency and arrange a Work schedule for the Project. Once the Project has been started, the Contractor must carry it to completion without delay.
2. **Progress Meetings:** The Professional will schedule progress meetings to be held on the job site whenever needed to supply information necessary to prevent job interruptions, to observe the Work or to inspect completed Work. The Contractor must be represented at each progress meeting by persons with full authority to act for the Contractor in regard to all portions of the Work.

**END OF SECTION 01200**

## SECTION 01300 SUBMITTALS

### 1. Shop Drawings, Samples and Technical Submittals:

#### 1.1 Contractor's Review:

Before each submission, the Contractor must:

- (a) determine and verify all field measurements, quantities, dimensions, instructions for installation and handling of equipment and systems, installation requirements (including location, dimensions, access, fit, completeness, etc.), materials, color, catalog numbers and other similar data as to correctness and completeness, and
- (b) have reviewed and coordinated that technical Submittal with other technical submittals and the requirements of the Contract Documents.

#### 1.2 Notice of Variation:

The Contractor must give the Professional specific written notice of any variation from the requirements of the Contract Documents.

#### 1.3 Contractor's Approval:

The Contractor shall not submit unapproved submittals. Each submittal shall be stamped/certified to indicate that the submittal satisfies the requirements of the Contract Documents before submission to the Professional.

#### 1.4 Responsibility and Authority:

Neither the Owner's authority to review any of the Submittals by the Contractor, nor the Owner's decision to raise or not to raise any objections about the Submittals, creates or imposes any duty or responsibility on the Owner to exercise any such authority or decision for the benefit of the Contractor/Subcontractor/Supplier, any surety to any of them or any other third party. The Contractor is not relieved of responsibility for errors or omissions in shop drawings, product data, samples, or similar submittals just because the Professional approved them for general design intent.

#### 1.5 Final As-Built/Record Documents and Submittals:

The approved Submittals are a part of the final As-Built/Record Documents required for processing final payment to the Contractor.

#### 1.6 Submissions:

Contractor must submit to the Professional:

- (a) an organized and indexed .pdf electronic file(s) of the drawing(s).
- (b) all required samples; and
- (c) all other technical submittals (test, results, test and safety procedures, O&M manuals, etc.) that are required by the Contract Documents

#### 1.7 Professional's Review and Return:

Professional's Review and Return: Submittals will be returned to the Contractor within fifteen Calendar Days. The Contractor is responsible for any time Delay and any cost incurred by the Professional, Contractor or Subcontractors/Suppliers as a result of resubmissions and re-reviews of a particular Submittal. The Contractor shall revise, and correct submittals returned for revision and resubmittal until approval by the Professional is achieved. All time consumed by the resubmissions and rereviews of a particular Submittal shall constitute time required to furnish that Submittal or shall represent Delays not justifying any increase in Contract Time or Contract Price, or both.

### 2. Progress Schedule:

#### 2.1 SUMMARY

A. The **Contractor** will submit CPM Progress Schedules to the **Owner** depicting its approach to prosecution of the Work. This includes but is not limited to the **Contractor's** approach to recovering schedule and managing the effect of changes, substitutions, and Delays on Work sequencing.

B. The Progress Schedule will include the Rev. 0 Submittal (par. 2.14), Update Submittals (par. 2.15) and Revision Submittals (par. 2.16). Each Submittal will be assigned a unique number. For a resubmission, the initial number will be modified by the letter A, B, C, etc., as appropriate.

C. Through the Progress Schedule, the **Owner** will seek to stay current on progress, updated Activity and Milestone Dates, and the **Contractor's** approach to Work remaining.

D. References to the Critical Path Method (CPM) are to CPM construction industry standards that are consistent with the requirements of this Section.

#### 2.2 RELATED SECTIONS

A. Section 00700 General Conditions; and Section 00800 Supplementary Conditions.

B. Section 01 3300 Submittal Procedures (PSC provided spec).

#### 2.3 GLOSSARY OF TERMS

A. Capitalized terms not already defined in any Division 0 Specification have the following intent and meanings:

1. Milestone—A key point of progress, designating interim targets toward the Contract Times. They may pinpoint critical path foundations, key deliveries, building framing, start of MEP rough-in, building enclosure, partitions, interior finishes, conditioned space, commissioning stages, Substantial Completion, and other events of like import.
2. Official Schedule—The most recent Revision Submittal returned to the **Contractor** as Resubmittal Not Required. The Rev. 0 Official Schedule is the *As-Planned* Schedule.
3. Revision 0 Submittal—Progress Schedule submitted by the **Contractor** depicting the entire Work as awarded.
4. Update Submittal—A monthly Progress Schedule update reflecting progress and minor adjustments on the Activities, sequencing and restraints for Work remaining.

## 2.4 QUALITY ASSURANCE

A. The **Contractor** will obtain a written interpretation from the **Professional**, if the **Contractor** believes the selection of Activities, logic ties or restraints requires an interpretation of the Contract Documents. With each submission, the **Contractor** will point out by specific, written notation, any Progress Schedule feature that may reflect variations from any requirements of the Contract Documents.

B. The **Contractor** is responsible to obtain information from each Subcontractor and Supplier when scoping their respective Activities, Values, logic ties and restraints

C. No review of any Progress Schedule by or on behalf of the **Owner** will relieve the **Contractor** from complying with the Contract Times and any required sequence of Work or from completing Work omitted from the Progress Schedule. No review will imply approval of any variation from or interpretation of the Contract Documents, unless approved by the **Professional** through a written interpretation or by means of a separate, written notation.

## 2.5 ALLOWANCES

A. Work covered by Cash Allowances will be completed within the Contract Times. To the extent reasonable and consistent with the **Contractor's** plan, Work authorized by provisional contingency allowances will be completed within the Contract Times. The Progress Schedule will incorporate the **Contractor's** best estimate of the Activities, logic and restraints required, using the information in the Contract Documents, or as indicated by the **Professional** in writing.

## 2.6 "OR EQUALS" AND SUBSTITUTIONS

A. Activities in the Rev. 0 Progress Schedule will be based on materials and equipment required by the Contract Documents and will not reflect any "or equal" or substitute materials or equipment, even if the **Contractor** intends to pursue "or equal" and substitution proposals. This limitation also applies to any Means and Methods indicated in or required by the Contract Documents.

## 2.7 MEASUREMENT AND PAYMENT

A. The Schedule of Values will include a Progress Schedule *pay item*. Fifteen percent (15%) of this *pay item* will be eligible for payment upon delivery of the *complete* Rev. 0 Submittal. The balance of this *pay item* will be eligible for payment, on a prorated basis, with each Request for Payment attaching an Update Submittal.

## 2.8 PROGRESS SCHEDULE SUBMITTALS

A. Each Progress Schedule Submittal will consist of an electronic copy the **Contractor's file**, a narrative and a PDF file of the project schedule report and plots, each file appropriately titled for the schedule version and date of publishing.

B. The CPM scheduling software will be Primavera Project Planner®, SureTrak® or Microsoft Project®.

C. In addition to the monthly update schedule submittal, **Contractor** shall provide prior to each Progress Meeting, a 2-week look ahead schedule extracted from the current overall schedule and providing sufficient additional activity detail to appropriately define the expected activity during the upcoming 2-week period.

## 2.9 PRINTOUTS

A. Schedule Reports will include Activity (ID) code and description, duration, calendar, Early Dates, Late Dates and Total Float, all of which will comport with the requirements of paragraph 8.3.4 of Section 00700 General Conditions.

1. Late Finish Date for an Activity pinpointing a Contract Time will equal that Contract Time. Early Start Date for an Activity designating a Contract restraint will equal the proper Notice to Proceed date. Schedule Reports may or may not append CPM Plots (time-scaled Activity/logic).

2. For Precedence Diagram Method, separate Schedule Reports will tabulate, for each Activity, all preceding and succeeding logic types and lead times, whether CPM Plots displaying vertical logic ties are appended or not.

B. CPM Schedule Plots will be plotted on a suitable time scale and identify the Contract Times, Critical Paths, and sub-Critical Paths. Activities will be shown on the Early Dates with Total Floats noted by Late Date flags.

c. Line of Balance Plots will reflect industry practice for repetitive construction and will segregate the production lines for all trades within the hammock Activities.

## 2.10 NARRATIVE REQUIREMENTS

A. In general, a narrative will describe the **Contractor's** approach to prosecution of the Work, subject to the requirements of the Contract Documents. Further, each narrative will list the Critical Path Activities and compare Early and Late Dates with Contract Times and Milestone Dates. The basis for restraint dates will be explained.

B. For each Update Submittal, the narrative will compare current Dates to the respective Milestone Dates, describe changes in crewing and construction equipment and identify new Delays. For each Revision Submittal, the narrative also will itemize changes in Activities, logic ties and restraint dates made necessary by each change, Delay, schedule recovery, substitution and **Contractor**-initiated revision occurring since the previous Submittal.

## 2.12 ACTIVITY REQUIREMENTS

A. The Progress Schedule will detail Work sequencing only to the extent necessary to allow the **Owner** to correlate percent complete, compare actual dates with Milestones and Contract Times and the data in Requests for Payment.

B. Separate Activities will designate permits, construction, Submittal preparation/review (and resubmission and re-review, for same); MEP coordination drawings; deliveries; commissioning; and Punch List. Separate Activities will designate **Owner**-furnished items, interface with other work and the **Owner** and **Professional's** responsibilities.

C. Activities will be detailed only to the extent required to show the transition of trade Work. Activities will detail the progression through site/excavation, foundations, building framing, start/completion of interior partitions, MEP rough-in, building enclosure, interior finishes, conditioned space, and commissioning.

1. Submittal Activities will segregate long-lead items, any item requiring structural access and other procurements that, in the **Contractor's** judgment, may bear on the rate of progress. Separate MEP coordination drawing Activities will be used for each floor. Beyond these requirements, it is not necessary to burden the Progress Schedule with Activities for less significant Submittals and deliveries.

2. For multiunit Work (e.g., rough-in overhead MEP for each floor, etc.), detailed Activities will be shown for a typical (often, the first) unit). Other or follow-on units may be replicated, as appropriate, or modeled with a hammock Activity combining the sum



total of the typical detailed Activities. Separate Activities, as may be suitable to the Divisions of Work involved, will be identified for single-unit Work. This requirement applies to such scope as Work in mechanical rooms, building framing, commissioning, etc.

3. Activities will not combine separate or non-concurrent items of Unit Price or lump sum Work, Work in separate structures and Work in distinct areas, locations or floors within an area or structure; or rough-in and finish Work.

D. Activity durations will equal the Business Days required to sufficiently complete the Work designated by the Activity (i.e., when finish-to-start successors may start, even if the Activity is not quite 100% complete). Installation Activities will last from twenty (20) to forty (40) Days.

E. Activities will be assigned consistent descriptions and identification codes. Sort codes will group Activities by building or structure, floor or area, Change Order and Change Authorization and other meaningful schemes.

#### 2.13 FLOAT TOLERANCES

A. Any Progress Schedule with Early Dates after a Contract Time will yield negative Total and Contract Floats, whether shown/calculated or not. Any Revision Submittal with less than negative twenty (20) Days of Float will be returned as "Revise and Resubmit," unless a time extension is requested, or the **Owner** withholds liquidated damages or asserts intent to do so in the event schedule is not recovered.

B. Floats calculated from the definitions given in Section 00020 Glossary supersede any conflicting Float values calculated within any early completion Progress Schedule.

#### 2.14 REVISION 0 (Rev. 0) SUBMITTAL

A. The complete Revision 0 Submittal will be due with the first Request for Payment. The Rev. 0 Submittal will show the Work as awarded, without Delays, "or equal" or substitutions, Change Orders or Change Authorizations.

1. The Rev. 0 narrative will detail the **Contractor's** management of the site (lay down, parking, etc.). Further, the Rev. 0 narrative will identify shifts, weekend Work, Activity calendars, Delays since award and all pending and anticipated "or equal" and substitution proposals.

B. Once endorsed by the **Owner** and returned as "Resubmittal Not Required," the Rev. 0 Progress Schedule (or Rev. 0A, etc.) will be the As-Planned Schedule and the basis for Update Submittals until the Rev. 1 Official Schedule is established. Once the As-Planned Schedule is established, the **Owner** will select Milestones and note Milestone Early and Late Dates. As the Official Schedule evolves, Milestone Dates will be revised accordingly.

D. If the **Owner** refuses to endorse the Rev. 0 Submittal (or Rev. 0A, for a resubmission) as "Resubmittal Not Required," the As-Planned Schedule will not be established. In that event, the **Contractor** will continue to submit Update and Revision Submittals reflecting progress and the **Contractor's** approach to remaining Work. The **Owner** will rely on the available Update and Revision Submittals, subject to whatever adjustments it determines appropriate.

#### 2.15 UPDATE SUBMITTALS

A. Update Submittals with progress up to the closing date and updated Early and Late Dates for progress and remaining Activities will be due with each Request for Payment. As-built data will consist of actual start dates, percent complete, actual finish dates, changes, Delays, and other significant events occurring before the closing date.

#### 2.16 REVISION SUBMITTALS

A. Progress Schedule Revisions will be submitted with the third Request for Payment and every two (2) months after that, or more often, if necessary due to schedule recovery or other Progress Schedule revisions. Revisions will revise the Update Submittal attached to the prior Request for Payment.

B. Progress Schedule revisions will detail all impacts on pre-existing Activity scope, logic ties and restraint dates and reflect the Contractor's current approach to Work remaining. Revisions may be required because of changes in the Work, substitutions, schedule recovery and Delays.

C. Once endorsed by the **Owner** and returned as "Resubmittal Not Required," a Revision Submittal becomes the Rev. 1, Rev. 2, etc. Official Schedule and the basis for subsequent Update Submittals until a more current Official Schedule is established. If the **Owner** refuses to endorse a Revision Submittal as "Resubmittal Not Required," the **Contractor** will continue to submit Update and Revision Submittals when and as required in this Section.

#### 2.17 RETROSPECTIVE DELAY ANALYSIS

A. If the **Owner** refuses to endorse any Revision Submittal as "Resubmittal Not Required," the **Contractor** and **Owner** will use the latest Official Schedule when evaluating the effect of Delays on Contract Time and/or Contract Price. The procedure will consist of progressively revising the latest Official Schedule at key Revision Submittal closing dates. For each Progress Schedule iteration, slippage between actual Milestone Dates and Rev. 0 Milestone Dates will be correlated to Delays occurring solely in that iteration. Revisions affecting Work after any iteration will be included only to the extent consented by the **Owner** at that time and/or if confirmed by as-built progress.

3. **Shop Drawings:** The Contractor shall deliver shop drawings of products, materials, assemblies, or equipment to the Professional as indicated in the technical specifications.

4. **Samples:** The Contractor must deliver all samples of material or equipment to the job site for examination by the State Agency and the Professional. Samples will be examined by the Professional for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The Contractor must furnish all Work in accordance with approved samples. The following general classifications of material and equipment require submission of samples. Samples of other items may be requested by the Professional at any time.

## END OF SECTION 01300

## SECTION 01400 QUALITY CONTROL

1. **Testing Laboratory Services:** All tests required by the Owner must fulfill ASTM, ANSI, Commercial and other Standards for testing. The Contractor must submit a minimum of three copies of each test report to the Professional for evaluation and subsequent distribution. The following general classifications of Work require submission of test reports and/or certificates of inspection. Additional submissions may be requested by the Professional at any time.

<u>Item of Work</u>	<u>Test Type</u>	<u>Section Number</u>
Miscellaneous Cast-in-place Concrete	Compression Tests	033053

2. **Tests:**

- (a) ~~Paid by Owner:~~
- (b) Paid by Contractor:

3. **Concrete/Asphalt Materials:** Before placement of any concrete, the Contractor must submit for the Professional's approval complete data on the trial concrete mix formulation and a testing laboratory report for ASTM C94, twenty-eight-day standard cylinder test for compressive strength of a sample of the concrete mix. For asphalt paving, the Contractor must submit the data and testing reports for ASTM D946, AC-5. The mix must have 4.5 to 6 percent of asphalt cement by weight for binder course and 5 to 7 percent of asphalt cement by weight for surface course in accordance with Asphalt Institute Manual MS-4, MS-13, and the current Michigan Department of Transportation (MDOT) Standard Specifications for Construction.

- (a) The Contractor must furnish to the Professional tickets showing mix formulation, Contractor's name, Project name, mix identification for each load of concrete/asphalt delivered and installed. If the technical specifications allow added water to the concrete mix after leaving the batch plant, the delivery ticket must reflect the added water. The Owner Field Representative must receive a copy of each delivery ticket for transmittal to the Professional for evaluation.
- (b) The Professional may require the Contractor to core drill questionable cast-in-place concrete/asphalt for laboratory testing. Should the laboratory analysis indicate the concrete/asphalt fails to meet specification requirements, the Contractor must pay all costs for core drilling and testing in the laboratory and replace the concrete/asphalt found to fail meeting the specification requirements. Should the laboratory analysis confirm that the concrete/asphalt meets specification requirements, the Owner will pay the Contractor for their costs for core drilling, concrete/asphalt patching and the laboratory fee for testing of the concrete/asphalt core samples.

## END OF SECTION 01400

## SECTION 01500 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1. The Contractor must furnish and install all temporary facilities and controls required by the Work, must remove them from State property upon completion of the Work, and the grounds and existing facilities must be restored to their original condition.
2. If water or electricity is available in the area where Work will be performed, the Contractor will not be charged for reasonable use of these services for construction operation. The Contractor must pay costs for installation and removal of any temporary connections including necessary safety devices and controls. Use of services must not disrupt or interfere with operations of the State Agency.
3. **Temporary Sanitary Facilities:**
  - (a) **Portable Toilets:** Not Allowed
  - (b) **State Toilets:** If available, the State Agency will designate a permanent toilet facility on the premises for use by personnel employed in the Work. The Contractor must repair any damage to the toilet facility caused by their employees and maintain it in a clean and sanitary condition.
4. **Field Office:**
  - (a) On site trailers are not allowed.

## END OF SECTION 01500

### SECTION 01600 MATERIAL AND EQUIPMENT

1. The Contractor must furnish and be responsible for all materials, equipment, facilities, tools, supplies and utilities necessary for completing the Work. All materials and equipment must be provided as described in the Contract Documents and of good quality, free of defect and new and must be applied, installed, connected, erected, used, cleaned and conditioned following the manufacturer's and Suppliers' instructions.
2. **Delivery, Storage, and Handling:** All materials and equipment delivered to and used in the Work must be suitably stored and protected from the elements. The areas used for storage must only be those approved by the State Agency. The Owner assumes no responsibility for stored material. The ownership and title to materials will not be vested in the Owner before materials are incorporated in the Work unless payment is made by the Owner for stored materials and equipment. After delivery, before and after installation, the Contractor must protect materials and equipment against theft, injury, or damage from all causes. For all materials and equipment, the Contractor must provide complete information on installation, operation, and preventive maintenance.
  - (a) The Contractor must cover and protect bulk materials while in storage which are subject to deterioration because of dampness, the weather or contamination. The Contractor must keep materials in their original sealed containers, unopened, with labels plainly indicating manufacturer's name, brand, type, and grade of material and must immediately remove from the Work site containers which are broken, opened, watermarked and/or contain caked, lumpy, or otherwise damaged materials.
  - (b) The Contractor must keep equipment stored outdoors from contact with the ground, away from areas subject to flooding and covered with weatherproof plastic sheeting or tarpaulins.
  - (b) The Contractor must certify that any materials stored off-site are:
    - a) Stored on property owned or leased by the Contractor or owned by the agency.
    - b) Insured against loss by fire, theft, flood, or other hazards.
    - c) Properly stored and protected against loss or damage.
    - d) In compliance with the plans and specifications.
    - e) Specifically allotted, identified, and reserved for the project.
    - f) Itemized for tracking and payment.
    - g) Subject to these conditions until the items are delivered to the project site.

## END OF SECTION 01600

### SECTION 01650 FACILITY START-UP

1. **Tests:** The complete installation consisting of the several parts of equipment and systems installed according to the requirements of the Contract Documents must be ready in all respects for use by the State Agency and must be subjected to a test at full operating conditions and pressures for normal conditions of use.
2. **Adjustments:** Contractor must adjust and replace the Work which is necessary to fulfill the requirements of the Contract Documents and to comply with the directions and recommendations of the manufacturer of the several parts of equipment, and to comply with all provisions of architectural and/or engineering drawings/specifications and all codes and regulations which may apply to the entire installation.
3. **Demonstration:** Contractor must provide an on-site demonstration and training of all systems operations to the Owner when it is substantially completed.

## END OF SECTION 01650

### SECTION 01700 CONTRACT CLOSE-OUT

1. **Substantial Completion:** The Contractor must notify the Professional, the Project Director and the Agency when the Work will be substantially complete. If the Professional, Owner, and Agency agree that the project is Substantially Complete, the Professional and Project Director will inspect the Work. The Professional, upon determining that the Work, or a portion of the Work inspected, is substantially complete, will prepare a Punch List and will attach it to the respective Certificate of Substantial Completion. The Contractor must be represented on the job site at the time this inspection is made and thereafter must complete all Work by the date set for final acceptance by the Owner.

2. **Cleaning:**

- (a) **Regular Cleaning:** The Contractor must remove all scrap or removed material, debris, or rubbish from the Project work site at the end of each working day and more frequently whenever the Owner Field Representative deems such material to be a hazard. The Contractor cannot discard materials on the grounds of the State Agency without the express permission of the Project Director. No salvage or surplus material may be sold on the premises of the State Agency. No burning of debris or rubbish is allowed. Any recyclable materials must be recycled, and the Contractor will be required to provide recycling plan.
- (b) **Final Cleaning:** Before final acceptance by the State, the Contractor must clean all Work and existing surfaces, building elements and contents that were soiled by their operations and make repairs for any damage or blemish that was caused by the Work.

**END OF SECTION 01700**

**SECTION 01800 MAINTENANCE**

- 1. The Contractor is responsible for maintaining the following parts of Work in good order and proper working conditions and must take all necessary actions for their protection until they are placed for use by the Owner:

**END OF SECTION 01800**

**APPENDIX I**

**GLOSSARY**

## GLOSSARY

**Activity**– An element in the Progress Schedule establishing a requisite step, or the time and resources required, for completing the part of the Work associated with that Activity.

**Addenda**– Written instruments that are used by the Owner and/or Professional to incorporate interpretations or clarifications, modifications, and other information into the Bidding Documents. An Addendum issued after Bid opening to those Bidders who submitted a Bid, for the purpose of re-bidding the Work without re-advertising, is referred to as a **post-Bid Addendum**.

**Agency**– Any unit, section, division, department, or other instrumentality of the State that benefits from the Work.

**Alternate**– Refers to work specified in the Bidding Documents for which the Bidder must bid a Bid Price.

**Apparent Low Bidders**: Those Bidders whose Base Bid, when added to those specific Alternates the Owner intends to accept, yields the three lowest sums of Bid and Alternates. Additional Bidders may be considered Apparent Low Bidders if their Bid, when added to those specific Alternates the Owner intends to accept, yields a sum within 10% of the lowest of the Apparent Low Bidder's sum. If a qualified disabled veteran meets the requirements of the contract solicitation, provides acceptable responses to both Part One and Part Two of the Best Value Construction Bidder Evaluation to achieve a Best Value recommendation and with the veteran's preference is the lowest responsive, responsible, best value Bidder it is considered the Apparent Low Bidder.

**Archaeological Feature**– Any prehistoric or historic deposit of archaeological value, as determined by a representative of a State Agency that is duly authorized to evaluate such findings and render such judgments. An Archaeological Feature deposit may include, but is not limited to Indian habitations, ceremonial sites, abandoned settlements, treasure trove, artifacts, or other objects with intrinsic archaeological value and that relate to the history and culture of the State of Michigan. The Archaeological Features are listed under Section 00800 Supplementary Conditions.

**Authorized Technical Data**– Information and data contained in a report of exploration and tests of subsurface conditions. Also, any physical data (dimension, location, conditions, etc.) contained in those Drawings of physical conditions of existing surface and subsurface facilities.

**Best Value**– The bids will be evaluated for best value based on price and qualitative components that may include but are not limited to technical design, technical approach, quality of proposed personnel, and management plans, per PA 430 of 2012.

**Bid**– Written offer by a Bidder for the Work, as specified, which designates the Bidder's Base Bid and Bid Prices for all Alternates. The term *Bid* includes a *re-bid*.

**Bidder**– The Person acting directly, or through an authorized representative, who submits a Bid directly to the **Owner**.

**Bidding Documents**– The proposed Contract Documents as advertised, and all Addenda issued before execution of the Contract.

**Bid Price**– The Bidder's price for a lump sum item of work, or the product of the Bidder's unit price for an item of Unit Price Work times the quantity given on the Bid Form for that item.

**Bid Security**– A security serving as a guarantee that the Bidder will conform to all conditions.

**Bidding Requirements**–The Advertisement, Instructions to Bidders, Supplementary Instructions, Information for Bidders, Bid Form, Bid Form Attachments, and qualification submittals, as advertised and as modified by Addenda, and any other Section included within Division 0 of the Bidding Documents for the purpose of governing bidding and award of the Contract.

**Board**– The Administrative Board of the State of Michigan.

**Bond**– Security furnished by the **Contractor**, as required by the Contract Documents.

**Business Day**– Any Day except Saturdays, Sundays and holidays observed by the **Owner**.

**Bulletin**– A request used by the **Owner** to describe a change in the Work under consideration by the **Owner** and to request the **Contractor** to submit a proposal for the corresponding adjustment in Contract Price and/or Contract Time, if any.

**Calendar Day**– Every day shown on the calendar, Saturdays, Sundays, and holidays included.

**Cash Allowance**– An **Owner**-specified sum included within the Contract Price to reimburse the **Contractor** for the actual purchase/furnished cost of materials and/or equipment or other designated items, as specifically provided in the Contract Documents. Although the scope (e.g., the required quantity) of any Work covered by a Cash Allowance is sufficiently detailed in the Contract

Documents for the purposes of bidding the required labor costs, Subcontract costs, construction equipment costs and general conditions costs and Fee, it is understood that the required materials, equipment or other designated items are of uncertain purchase cost at the time of Bid or are yet to be specified in more detail by the **Professional** as to quality, appearance, durability, finish and such other necessary features affecting purchase price.

**Change Order**– A written order issued and signed by the **Owner**, which amends the Contract Documents for changes in the Work or an adjustment in Contract Price and/or Contract Time, or both.

**Contract Award**– The official action of the **Board**, the **Director-SFA** or the **Director-DCD** awarding the Contract to the **Contractor**.

**Contract Documents**– Written and graphic documents that form the legal agreement between the **Owner** and the **Contractor**, consisting of this document, completed Bid and Contract forms, terms and conditions of the contract, specifications, drawings, addenda, Notice of Award, Notice-to-Proceed and contract change orders.

**Contract Price**– The total compensation, including authorized adjustments, payable by the **Owner** to the **Contractor** (subject to provisions for Unit Price Work).

**Contract Times**–The Contract Times for the entire Work are the periods allowed, including authorized adjustments, for Substantial Completion and final completion of the Work. The Contract Times for a designated portion of the Work are the periods allowed for Substantial Completion and final completion of any such portion of the Work, as specified in the Contract Documents.

**Contractor**– Business enterprise with which the **Owner** has entered into the Contract.

**Correction Period**– A period during which the **Contractor** must, in accordance with the Contract Documents, (a) correct or, if rejected, remove, and replace Defective Work, and (b) maintain warranties for materials and equipment in full force and effect.

**Cost of the Work Involved**– The sum of all costs that would be, or were, necessarily incurred by the **Contractor** in providing any Work Involved with the related change, less the costs that would be, or would have been, incurred by the **Contractor** to provide such Work without the related change.

**Defective**– As determined by the Professional, an adjective which when referring to or when applied to the term “Work” refers to (a) Work not conforming to the Contract Documents or not meeting the requirements of an inspection, test, or approval, or (b) Work itemized in a Punch List which the **Contractor** fails to complete or correct within a reasonable time after issuance of the Punch List by the **Professional**.

**Delay**– Any act or omission or other event that in any manner adversely affects or alters the schedule, progress or completion of all or any part of the Work. Delay is a generic term intended to include deferral, stoppage, slow down, interruption and extended performance, and all related hindrance, rescheduling, disruption, interference, inefficiency and productivity and production losses.

**Department (DTMB)**– Department of Technology, Management and Budget of the State of Michigan.

**Director**- The Director of the **Department**.

**Director-SFA**- The Director of **DTMB** State Facilities Administration.

**Director-DCD**- The Director of **DTMB** State Facilities Administration, Design and Construction Division.

**Division**– Each of the numbered, distinct parts (starting with Division 0) into which the Specifications are divided.

**Drawings**– Part of the Contract Documents showing the Work. Drawings must neither serve nor be used as Shop Drawings.

**Emergency**– A condition affecting the safety or protection of persons, or the Work, or property at or adjacent to the site.

**State Facilities Administration (SFA)**-Entity in the **Department** responsible for design, construction, and operations and maintenance of facilities.

**Fee for the Work Involved (Fee)**– An established, percentage mark-up on the Cost of the Work Involved which is allowed to the **Contractor** for (a) reasonable administrative costs, and (b) negotiated, reasonable profit on the Cost of the Work Involved.

**Hazardous Material**– Asbestos containing materials (ACMs), Polychlorinated biphenyls (PCBs), petroleum products, such construction materials as paint thinners, solvents, gasoline, oil, etc., and any other like material the manufacture, use, treatment, storage, transportation, or disposal of which is regulated by federal, state, or local Laws governing the protection of public health, natural resources, or the environment.

**Invitation To Bid (ITB)** - The solicitation document presenting the terms and conditions that will become part of the Contract when the Bid is accepted.

**Law(s)**– Means federal, state, and local statutes, ordinances, orders, rules and/or regulations.

**MCL**– The Michigan Compiled Laws of the State of Michigan.

**Means and Methods**– Includes means, methods, techniques, sequences and/or procedures applicable to the Work.

**Notice of Award**– Written notice accepting the Bid to the lowest responsive, responsible Bidder and designating the Contract Price (and establishing the Alternates accepted by the **Owner**).

**Notice-to-Proceed**– Written notice issued by the Project Director directing the Contractor to commence the construction activities and establishing the start date of the Contract Time.

**On-Site Inspection**– The **Professional's** on-site examination of the **Contractor's** completed or in progress Work to determine and verify to the Project Director that the quantity and quality of all Work complies with the requirements of the Contract Documents.

**Owner**– The State of Michigan, with whom the **Contractor** has entered into the Contract and for whom the Work is to be provided.

**Owner Field Representative**– A State employee or consultant, acting collaboratively with the Project Director, providing on-site, periodic observation and documentation of the Work for compliance with the Contract Documents.

**Partial Use**– The use, by the **Owner**, of a designated portion of the Work before accomplishing Substantial Completion of the entire Work. Partial Use does not mean Substantial Completion of the portion of the Work placed in use by the **Owner**.

**Person**–Individuals, partnerships, corporations, receivers, trustees, joint ventures or any other legal entity and any combinations of any of them.

**Political Subdivision**– Any county, city, village, or other local unit of the State, including any agency, department, or instrumentality of any such county, city, village, or other local unit.

**Post-Bid Submittal**– A Qualification Submittal required of the Bidder selected under Section 00100 - 22 before Contract Award, and which is used by the Owner in the evaluation of the Bid of the selected Bidder.

**Professional Services Contractor (PSC or Professional)**– The individual or business entity who has the authority to practice the design disciplines required by the Contract Documents. An Agency with appropriate licensing may replace the PSC in their role if a consultant is not used.

**Project**– The total construction, which includes the Work and possibly other work completed by others, as indicated in the Contract Documents.

**Project Director**- Designated State employee(s) (a) Responsible for directing and supervising the **Professional's** services during the period allowed for completion of the Work; and/or (b) Acting as representative for the **Owner** and for the enforcement of the Contract Documents, approving payment to the **Contractor** and coordinating the activities of the State, **Owner**, **Professional** and **Contractor**.

**Project Schedule**– Work Schedule that shows the **Contractor's** approach to planning, scheduling, and execution of the Work and that accurately portrays completed Work as to sequencing and timing, as provided in the Contract Documents.

**Project Specifications**– The Contract Documents organized into Divisions. "Technical Specifications" means Divisions of the Specifications consisting of technical descriptions of materials, equipment, construction systems, standards, and workmanship.

**Provisionary Allowance**– An amount included within the Contract Price to reimburse the **Contractor** for the cost to furnish and perform Work that is uncertain because, for example, it is indeterminate in scope and may not be shown or detailed in the Contract Documents.

**Punch List**– A list of minor items to be completed or corrected by the **Contractor**, any one of which do not materially impair the use of the Work for its intended purpose.

**Qualified Disabled Veteran (QDV)**- QDV as defined by Public Act 22 of 2010, MCL 18.1241.3 and supported by a DD214 Proof of Service and Discharge, a Veterans Administration rating decision letter, proof of disability (if the disability is not indicated on the DD214), and appropriate legal documents setting forth the 51% natural persons QDV ownership.

**Record Documents**– Drawings, Specifications, Addenda, Change Orders, Change Authorizations, Bulletins, inspection, test and approval reports, photographs, written clarifications and interpretations and all other documents recording, or annotated to show, all revisions and deviations between the as-built installation and the Contract Documents, all approved Submittals and all clarifications and interpretations.

**Records**– Books, reports, documents, electronic data, and other evidence relating to the bidding, award and furnishing and performance of the Work.

**Recycled Material**– Recycled paper products, structural materials made from recycled plastics, re-refined lubricating oils, reclaimed solvents, recycled asphalt and concrete, recycled glass products, re-treaded tires, ferrous metals containing recycled scrap metals and all other materials that contain (a) waste materials generated by a business or consumer, (b) materials that have served their intended purpose, and/or (c) materials that have been separated from solid waste for collection, recycling and disposition in the percentage determined by the State as provided by Law.

**Request for Payment**– The form provided by the **Owner** (Payment Request DTMB-0440) to be used by the **Contractor** in requesting payment for Work completed, which must enclose all supporting information required by the Contract Documents.

**Schedule of Values**– A schedule of pay items, which subdivides the Work into its various parts and which details, for each itemized part, cost and pricing information required for making payments for Work performed. The sum of all pay item costs in the Schedule of Values must equal the Contract Price for the Work.

**Shop Drawings**– Includes drawings, diagrams, illustrations, standard schedules, performance charts, instructions and other data prepared by or for the **Contractor** to illustrate some part of the Work, or by a Supplier and submitted by the **Contractor** to illustrate items of material or equipment.

**Soil Erosion and Sedimentation Control**– The planning, design and installation of appropriate Best Management Practices designed and engineered specifically to reduce or eliminate the off-site migration of soils via water runoff, wind, vehicle tracking, etc. Soil erosion and sedimentation control in the State of Michigan is regulated under The Natural Resources Environmental Protection Act; Soil Erosion and Sedimentation Control, 1994 PA 451, Part 91, as amended, MCL 324.9101 et seq. Soil erosion and sedimentation control associated with this Contract is monitored and enforced by the DTMB-SFA.

**State**– The State of Michigan in its governmental capacity, including its departments, divisions, agencies, boards, offices, commissions, officers, employees, and agents. Non-capitalized references to a state refer to a state other than the State of Michigan.

**State Construction Code**– The Michigan State Construction Code Act, 1972 PA 230, as amended, MCL 125.1501 et seq.

**Subcontractor**– A Person having an agreement with the Contractor to provide labor at the site and furnishing materials and/or equipment for incorporation into the Work.

**Submittals**– Includes technical Submittals, Progress Schedules and those other documents required for submission by the Contract Documents. The term "technical Submittal" includes Shop Drawings, brochures, samples, Operation and Maintenance (O&M) Manuals, test procedures and any other Submittal the Contract Documents require the **Contractor** to submit to demonstrate how the items covered, after installation or incorporation into the Work, will conform to the information given in the Contract Documents and be compatible with the design of the completed Work as a functioning whole as indicated in the Contract Documents.

**Substantial Completion**– The Work, or a portion of the Work designated in the Contract Documents as eligible for separate Substantial Completion, has been completed in accordance with the Contract Documents as determined by the PSC, to the extent that the **Owner** can use or occupy the entire Work, or the designated portion of the Work, for the use intended without any outstanding, concurrent Work at the site, except as may be required to complete or correct Punch List items.

**Supplier**– A manufacturer or fabricator, or a distributor, material man or vendor representing a manufacturer or fabricator, who has an agreement with the Contractor to furnish materials and/or equipment.

**Underground Utilities**– Pipelines, piping, conduit, duct, cables, wells, tanks, tunnels and appurtenances, or other similar facilities, installed underground to convey or support conveyance of potable water, sprinkler or irrigation water, fire protection systems, electricity, gases, steam, petroleum products, sewerage and drainage removal, telephone, communications, cable TV, traffic, or control systems.

**Unit Price Work**– The work involving specified quantities (i.e., related Work quantities) which, when performed, is measured by the **Professional** and paid using the measured quantities and unit prices contained in the Contract Documents. Performance of Unit Price Work for undefined quantities is contingent upon conditions encountered at the site, as determined, and authorized by the **Professional**.



**Unit Price Work, Specific**– Work of specified and defined quantities (i.e., quantities are detailed in, and can be taken-off from, the Contract Documents) that when performed is measured by the **Professional** and paid based on the measured quantities and unit prices contained in the Contract Documents.

**Work**- (as in “*the Work*,” “*the entire Work*”)– The entire *completed Construction* required by the Contract Documents. The Work results from furnishing and performing all services, obligations, responsibilities, management, supervision, labor, materials, equipment, construction equipment, general conditions, permits, taxes, patent fees and royalties, testing, inspection and approval responsibilities, warranties, temporary facilities, small tools, field supplies, Bonds, insurance, mobilization, close-out, overhead and all connections, devices and incidental items of any kind or nature required and/or made necessary by the Contract Documents.

**Work Involved, any Work Involved**– Existing or prospective Work (a) reflected in any notice, proposal, or claim, or (b) reflected in changes ordered or in process, or (c) affected by Delay.

**APPENDIX II**  
**SPECIAL WORKING CONDITIONS**

**DTMB State Facilities Administration  
Security Clearance Request**

**Contractor Instructions**

The purpose of this document is to establish security and supervision requirements for contract personnel requiring access to Department of Technology, Management and Budget (DTMB) facilities.

A *DTMB Security Clearance form* must be completed before an individual is granted access to a facility. Access approval will be in effect for one year from date of DTMB Facility Services approval or until estimated project completion date (whichever occurs first).

Contract personnel agree to adhere to all DTMB rules and regulations which in DTMB facilities. Access will only be granted for normal business hours. (Monday-Friday, 8:00 a.m.-5:00 p.m. except State holidays). DTMB State Facilities Administration, Facility Services section must clear any exception in advance.

Contract personnel will be required to submit the following to DTMB Facility Services Manager or Regional Manager before entering a DTMB facility:

**Procedure for submitting form electronically (preferred and recommended)**

1. Complete a *DTMB Security Clearance form* (using Microsoft Excel) and include the following:
  - Company name
  - Company Contact name and phone number
  - Complete name (**last name first**) and date of birth for all employees requiring access.
2. Email completed form to DTMB Facility Manager for an individual building or DTMB Regional Facility Manager for multiple building requests.

**Procedure for submitted in person or mail delivery**

1. Complete a *DTMB Security Clearance form* (using Microsoft Excel) and include the following:
  - Company name
  - Company Contact name and phone number
  - Complete name (**last name first**) and date of birth for all employees requiring access.
2. Return completed form to DTMB Facility Manager for an individual building or DTMB Regional Facility Manager for multiple building requests.

**Note: This request must be received a minimum of 48 hours before entering a DTMB Facility.**

**DTMB Facility Access Criteria:**

1. Present pictured ID.
2. Name must appear on the clearance list.
3. Sign-in and wear a dated visitor's pass (*must be visibly displayed at all times*).
4. Return visitor pass to security desk at days end.

**Note: Individuals whose name does not appear on the clearance list are required to be signed in by a member of the DTMB Facility Services staff.**

Failure to comply with the above procedure will result in the individual(s) being delayed and may be cause for denying access to DTMB facilities.

Department of State Police Northville Forensic Lab Elevator Replacement

File No. 551/21167.TYC

**DEPARTMENT OF STATE POLICE**

The work comprising this Project will be performed at a State Police Post, and the contractor must comply with the following special working rules:

1. Contractor/Professional must submit a BACKGROUND AUTHORIZATION form (CJIS-008) for all employees providing names, driver's license numbers, birth dates, and additional information when requested on all persons expected to be employed on the Project site. Such form (CJIS-008) must be submitted directly to the Michigan State Police designee for name and fingerprint background check approval before any person's appearance at the site for work assignments.
2. Contractor will be allowed to work within or on State Police Post confines from 8:00 a.m. to 5:00 p.m. No work may be performed on Saturdays or Sundays without written permission from the Post Commander. The Post Commander or their designee may arrange other time schedules.
3. All employees of the contractor may be subject to individual body search each time they enter the Post. Packages or containers of any kind may be opened for inspection. Lunch boxes are not permitted inside the security perimeter. All employees of the contractor will be required to have identification cards or badges furnished by the contractor.
4. All trucks and other mobile equipment may be subject to inspection both on arrival and departure from the Post. Absolutely no fraternization between State Police personnel and contractor's employees will be tolerated.
5. Contractor must follow rules pertaining to security and parking as established by the Post Commander. Contractor must observe all off-limit restricted areas beyond which no unauthorized personnel may trespass. The contractor and their workers may leave the assigned work areas.
6. There will be no exchange, loaning, or borrowing of tools, equipment, or manpower between Post personnel and the contractor.
7. The assigned gate through which materials, equipment, and vehicles must be transported will be opened upon request between 8:00 a.m. and 5:00 p.m.
8. Sanitary facilities will be assigned by the Post Commander for the use of the contractor's employees.
9. Security personnel may be assigned to the working areas. They may inspect and search areas under construction at any time, including the contractor's equipment.
10. Areas for contractor's employee parking must be assigned only by the Post Commander. Remove all firearms, weapons, alcoholic beverages, or explosives from vehicles before enter Post property. Lock vehicles when not attended.
11. The Post Commander retains the right to revise these "Special Working Conditions" as required to meet Post needs.

**APPENDIX III**  
**SPECIAL PROJECT PROCEDURES**

**DEMOLITION/REMODELING PROJECT PROCEDURES**

Furnish all equipment, materials, labor, and services necessary to complete all building demolition required in connection with the existing building, in order to permit the installation of new Work. The goal of the Owner is to generate the least amount of waste or debris possible. However, inevitable waste and debris that are generated shall be reused, salvaged, or recycled, and disposal in landfills shall be minimized to the extent economically feasible. The Contractor will be required to prepare waste management plan for the collection, handling, storage, transportation, and disposal of the waste generated at the construction site for the Owner's review and approval. The Contractor will be required to produce waste management progress reports.

1. Locations: Notations are made in various places on the Drawings to call attention to building demolition which is required; however, these Drawings are not intended to show every item to be removed. The Contractor and the Subcontractors for the various trades must remove the materials related to their respective trades as required to permit the construction of the new Work as shown.
2. Permits: The Contractor must secure from the appropriate agencies all required permits necessary for proper execution of the work before starting work on the project site. All fees for securing the permits must be paid by the Contractor, including all inspection costs which may be legally assessed by the Bureau of Construction Codes in accordance with the authority granted under the Public Act 1980 PA 371, as amended.
3. Enclosures: Where it is necessary to make alterations to walls, floors or roof of the existing building, the Contractor must provide and maintain dustproof partitions to separate the parts where Work is being done from the adjoining parts occupied by the State Agency. Where any parts are opened and exposed to the elements, the Contractor must provide weather tight enclosures to fully protect the structure and its contents.
4. Waste Management Plan: The management plan must address waste source identification and separation, returns, reuse and salvage, recycling, landfill options, alternatives to landfilling, materials handling procedures and transportation.
5. Preparation: Protect all existing Work that is to remain and restore in an approved manner any such Work that becomes damaged.
  - 5.1 Rubbish and debris resulting from the Work must be removed immediately from the site by the Contractor. However, any recyclable materials must be recycled; the Contractor will be required to use alternatives to landfills for waste disposal such as reuse or recycle of asphalt, bricks, concrete, masonry, plastics, paint, glass, carpet, metals, wood, drywall, insulation, and any other waste materials to the extent practical.
  - 5.2 Unless otherwise specified, the Agency will remove existing furniture, drapery tracks, draperies, window blinds, and other equipment items, which might interfere with the new construction.
6. Coordination: Demolition work, in connection with any new unit of Work, must not be commenced until all new materials required for completion of that new item of Work are at hand.
7. Waste Management Plan Progress Reports: Submit an updated report with the payment requests. The progress reports shall include:
  - a. The amount of waste sent to a landfill, tipping fees paid and the total disposal cost. Include supporting documents such as manifests, weight tickets, receipts and/or invoices.
  - b. Records for each material recycled/reused/salvaged from the project including the amount, date removed from the job site, destination, transportation cost, recycled materials, and the net cost/ savings.
  - c. Breakdown of waste by type generated to date.
  - d. Recycling/salvage/landfill rates.
  - e. Percent of waste recycled/salvaged to date.

## **HAZARDOUS MATERIALS PROJECT PROCEDURES**

1. The Contractor must use, handle, store, dispose of, process, transport and transfer any material considered a Hazardous Material in accordance with all federal, state, and local Laws. If the Contractor encounters material reasonably believed to be a Hazardous Material and which may present a substantial danger, the Contractor must immediately stop all affected work, give written notice to the Owner of the conditions encountered, and take appropriate health and safety precautions.
2. This project has been identified by the DTMB-SFA as having a possibility of containing Hazardous Waste materials to be legally removed from the Project job site to complete the Work as described in the Proposal and Contract. If removal of friable asbestos material is required, the Contractor must contact the Air Quality Division, Department of Environment, Great Lakes, and Energy, at **(517) 284-6773**, for a permit and furnish all training, labor, materials, services, insurance, and equipment necessary to carry out the removal operations of all Hazardous Materials from the Project job site, as identified by the Scope of Work, or encountered on the Project job site, in accordance with State and Federal Hazardous Waste Codes. A Contract Change Order will be written to modify the existing Contract to pay for the additional cost.
3. Environmental Hazards (air, water, land and liquid industrial) are handled by the Waste and Hazardous Materials Division, Michigan Department of Environment, Great Lakes, and Energy (EGLE) in carrying out the requirements of the Federal Environmental Protection Agency (EPA). For general information and/or a copy of the latest regulations and publications call (517) 335-2690.
4. The Michigan Occupational Safety and Health Administration (MIOSHA) provides protection and regulations for the safety and health of workers. The Department of Licensing and Regulatory Affairs provides for the safety of workers. The Department of Community Health provides for the health of workers (517/373-3740) (TDD 517/373-3573).
  - 4.1 Contractor must post any applicable State and/or Federal government regulations at the job site in a prominent location.
  - 4.2 Contractor must be responsible for training their workers in safe work practices and in proper removal methods when encountering hazardous chemicals.
5. Applicable Regulations:
  - 5.1 Natural Resources and Environmental Protection Act – PA 451 of 1994, as amended, including Part 111 – Hazardous Waste Management, Part 121 – Liquid Industrial Waste and Part 147 – PCB compounds.
  - 5.2 RCRA, 1976 - Resource Conservation and Recovery Act: This federal statute regulates generation, transportation, treatment, storage, or disposal of hazardous wastes nationally.
  - 5.3 TSCA, 1979 – Toxic Substances Control Act: This statute regulates the generation, transportation, storage, and disposal of industrial chemicals such as PCBs.
6. Definitions: Hazardous substances are ignitable, corrosive, reactive, and/or toxic, based on their chemical characteristics.
  - 6.1 Under Federal and Michigan Law, a Small Quantity Generator of hazardous waste provides from 220 to less than 2,000 lbs./month or never accumulates 2,200 lbs. or more.
  - 6.2 A Generator size provider of hazardous waste provides 2,200 lbs. or more/month or accumulates above 2,200 lbs.
7. Disposals: To use an off-site hazardous waste disposal facility, the Contractor must use the Uniform Hazardous Waste Manifest (shipping paper). Small quantities of hazardous waste may not be disposed of in sanitary landfills used for solid waste.
8. Federal, state, and local Laws and regulations may apply to the storage, handling and disposal of Hazardous Materials and wastes at each State Agency. Contact the **Environmental Assistance Center** of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) at **1-800-662-9278**, Fax to: 517-241-0673 or e-mail to: [DEQ-EAD-env-assist@michigan.gov](mailto:DEQ-EAD-env-assist@michigan.gov) for general EGLE information including direct and referral assistance on air, water and wetlands permits; contaminated site clean-ups; underground storage tank removals and

Department of State Police Northville Forensic Lab Elevator Replacement

File No. 551/21167.TYC

remediation; hazardous and solid waste disposal; pollution prevention and recycling; and compliance-related assistance. The Center provides businesses, municipalities, and the public with a single point of access to EGLE's environmental programs.



## **ASBESTOS ABATEMENT PROJECT PROCEDURES**

Should this Work require the renovation or demolition of a building or structure initially constructed on or prior to 1980, the Contractor will use the attached copy of a Comprehensive Asbestos Building Survey for those portions of the building or structure being impacted and must plan his or her work to minimize disturbance of any known or assumed asbestos containing materials (ACM). In addition, if this building or structure was constructed on or prior to 1980, the Contractor's On-Site Superintendent and all Subcontractor On-Site Superintendents for trades that could potentially disturb known or assumed ACM, must, as a minimum, have and provide documentation of current Asbestos Awareness Training.

If the Comprehensive Asbestos Building Survey identifies known or assumed ACM that will potentially be disturbed as a part of the Contractor's renovation or demolition activities, the Contractor must remove, transport, and dispose of these materials at no additional cost to the Owner and prior to any other work taking place within the immediate vicinity of said material. If required, the Contractor must provide the Owner a minimum of 10 working day notification prior to the start of any asbestos abatement activities with abatement in occupied buildings being completed even if they will be conducted during off hours (nights, weekends, and state holidays).

If the Contractor encounters a suspected ACM that was not previously identified within the Comprehensive Asbestos Building Survey, the Contractor must immediately stop all affected work, give written notice to the Owner of the conditions encountered, and take appropriate health and safety precautions. If, after providing Owner notification, the Contractor is directed to sample and/or remove the suspected ACM in question, a Contract Change Order will be written to modify the existing Contract to pay for the additional cost. Any abatement shall be completed in accordance with the requirements of this Section.

If removal of ACM is required, removal must be completed by a contractor currently licensed to remove asbestos by the State of Michigan, Department of Licensing and Regulatory Affairs (DLARA) Asbestos Program and abatement must be performed in accordance with all federal, state, and local Laws and Regulations. Prior to commencing any asbestos abatement activities, the licensed abatement contractor must submit, as required by Federal, State and Local Laws and Regulations, a "Notification of Intent to Renovate/Demolish" to both the State of Michigan, Department of Environment, Great Lakes, and Energy (EGLE), Air Quality Division and to the DLARA, Asbestos Program, to comply with National Emission Standards for Hazardous Air Pollutants (NESHAP), and the Clean Air Act (CAA). All regulated ACM must be disposed of at an approved Type II (general refuse) landfill and must be in leak-tight wrapping or containers. ACM that is non friable and is not in poor condition or will not become regulated ACM at any time can be disposed of in a Type III (construction debris) landfill.

At the completion of each abatement activity, the Contractor must perform clearance testing in accordance with National Institute for Occupational Safety and Health (NIOSH) 582 "Sampling and Evaluating Airborne Asbestos Dust". All air samples shall indicate concentrations of less than 0.01 fibers/cc for clearance to be met. Clearance testing shall be performed by a third-party Asbestos Consultant. The Asbestos Consultant selected by the Contractor shall be experienced and knowledgeable about the methods for asbestos air sampling and be able to select representative numbers and locations of samples. It is mandatory that the Asbestos Consultant's on-site hygienist performing sampling and analysis have certification that he/she has passed a NIOSH 582 or equivalent course.

The NESHAP asbestos regulations, notification form, guidelines and fact sheets are available on EGLE's web site [www.michigan.gov/egle](http://www.michigan.gov/egle) under heading Air; then click on Compliance; then click on Asbestos NESHAP Program. For guidelines on submitting notifications pursuant to the Asbestos Contractors Licensing Act, contact the DLARA, Occupational Health Division, Asbestos Program at (517) 322-1320 or visit DLARA's web site [www.michigan.gov/asbestos](http://www.michigan.gov/asbestos).

## **LEAD ABATEMENT PROJECT PROCEDURES**

Should this Work require the renovation or demolition of a building or structure, the workers are assumed to be exposed to lead or materials containing lead above acceptable levels until proven otherwise through personal air sampling and analysis. The Contractor shall take all steps necessary to assure that his/her employees, are not exposed to lead at concentrations greater than the Permissible Exposure Limit as per the State of Michigan Department of Licensing and Regulatory Affairs Occupational Health Standards Part 603 "Lead Exposure in Construction". In addition, the Contractor shall convey this same requirement to all subcontractors that may be under his/her control.

The employer shall comply with the Michigan Lead Abatement Act, as amended, and the Lead Hazard Control rules and must communicate information concerning lead hazards according to the requirements of Michigan Occupational Safety and Health Administration (MIOSHA) Part 603 and the Occupational Safety and Health Administration's (OSHA's) Hazard Communication Standard for the construction industry, 29 CFR 1926.59, including but not limited to safety equipment (e.g. personal fit-tested and approved respirators and protective clothing), worker rotation (on a short-cycle and regular basis), working practices (e.g. sanding, cutting, grinding, abraded, burning and heat-gun stripping of lead based paint are not allowed), the requirements concerning warning signs and labels, Safety Data Sheets (SDS), and employee information and training. Employers shall comply with the requirements of 29 CFR 1926.62(l) - Employee Information and Training.

If lead or materials containing lead will be disturbed as a part of the work to be performed, the Contractor must remove, transport, and dispose of these materials at no additional cost to the Owner and prior to any other work taking place within the immediate vicinity of said material. The Contractor must provide the Owner a minimum 10 working day notification prior to the start of any lead abatement activities with abatement in occupied buildings being completed even if they will be conducted during off hours (nights, weekends, and state holidays). Abatement is defined as an activity specifically designed to permanently remove lead paint, lead-contaminated dust or other lead containing materials, the installation of a permanent enclosure or encapsulation of lead paint or other lead containing materials, the replacement of lead-painted surfaces or fixtures, the removal or covering of lead-contaminated soil, and any preparation, cleanup, disposal, and post-abatement clearance testing associated with these activities. Renovation, remodeling, landscaping, or other activity, that is not designed to permanently eliminate lead paint hazards, but is instead designed to repair, restore, or remodel a structure, or housing unit even though the activity may incidentally result in a reduction or elimination of a lead paint hazard is not considered abatement.

If abatement of lead or materials containing lead is required, abatement must be completed by a qualified Lead Abatement Contractor. In addition, Specifications for the Lead Abatement should be based upon a Lead Inspection/Risk Assessment report. The Lead Inspection/Risk Assessment report and clearance testing upon completion should be performed by a Certified Inspector or Risk Assessor. Lead abatement including clearance testing shall be performed in accordance with the State of Michigan, Lead Abatement Act, Part 54A Lead Abatement and with all other federal, state, and local Laws and Regulations that may apply.

For additional information about certifications, guidance, and regulations for lead hazard control activities, visit [www.michigan.gov/lead](http://www.michigan.gov/lead).

**APPENDIX V**

**STATE OF MICHIGAN PREVAILING WAGE SCHEDULES  
& WAGE RATE SCHEDULES**

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## STATE OF MICHIGAN

Wage and Hour Division

PO Box 30476

Lansing, MI 48909

517-284-7800

### ***Informational Sheet: Prevailing Wages on DTMB Projects***

#### **REQUIREMENTS**

The purpose of establishing prevailing rates is to provide minimum rates of pay that must be paid to workers on Department of Technology, Management and Budget (DTMB) construction projects that are financed or financially supported by the state. Prevailing rates are compiled from the rates contained in collectively bargained agreements which cover the locations of the state projects. While the DTMB prevailing wage rates are compiled through surveys of collectively bargained agreements, a collective bargaining agreement is not required for contractors to be on or be awarded state projects. The prevailing rate schedule provides an hourly rate which includes wage and fringe benefit totals for designated construction mechanic classifications. The overtime rates also include wage and fringe benefit totals. Please pay special attention to the overtime and premium pay requirements. The DTMB prevailing wage is satisfied when wages plus fringe benefits are equal to or greater than the required rate.

#### **State of Michigan responsibilities:**

- The department establishes the prevailing rate for each classification of construction mechanic requested by DTMB prior to contracts being let out for bid on a state project.

#### **DTMB responsibilities**

- If a contract is not awarded or construction does not start within 90 days of the date of the issuance of rates, a re-determination of rates must be requested by DTMB
- Rates for classifications needed but not provided on the DTMB Prevailing Rate Schedule, **must** be obtained **prior** to contracts being let out for bid on a state project.

#### **Contractor responsibilities:**

- Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing rates prescribed in a contract.
- Every contractor and subcontractor shall keep an accurate record showing the name and occupation of and the actual wages and benefits paid to each construction mechanic. This record shall be available for reasonable inspection by DTMB or the department.
- Each contractor or subcontractor is separately liable for the payment of the prevailing rate to its employees.
- The prime contractor is responsible for advising all subcontractors of the requirement to pay the prevailing rate prior to commencement of work.
- A construction mechanic *shall only* be paid the apprentice rate if registered with the United States Department of Labor, Bureau of Apprenticeship and Training and the rate is included in the contract.

#### **Enforcement:**

A person who has information of an alleged prevailing wage violation on a DTMB project may file a complaint with the State of Michigan. The department will investigate and attempt to resolve the complaint informally. During the course of an investigation, if the requested records and posting certification are not made available in compliance with contractual requirements, the State may consider the Contractor to be in material breach of the contract and may terminate the contract for cause at the States sole discretion.



**STATE OF MICHIGAN**  
**Informational Sheet: DTMB Prevailing Wages on State Projects**

**General Information Regarding Fringe Benefits**

**Certain** fringe benefits **may** be credited toward the payment of the Prevailing Wage Rate:

- If a fringe benefit is paid directly to a construction mechanic
- If a fringe benefit contribution or payment is made on behalf of a construction mechanic
- If a fringe benefit, which may be provided to a construction mechanic, is pursuant to a written contract or policy
- If a fringe benefit is paid into a fund, for a construction mechanic

When a fringe benefit is not paid by an hourly rate, the hourly credit will be calculated based on the annual value of the fringe benefit divided by 2080 hours per year (52 weeks @ 40 hours per week).

The following is an example of the types of fringe benefits allowed and how an hourly credit is calculated:

Vacation	40 hours X \$14.00 per hour = \$560/2080 =	\$0.27
Dental insurance	\$31.07 monthly premium X 12 mos. = \$372.84 /2080 =	\$.18
Vision insurance	\$5.38 monthly premium X 12 mos. = \$64.56/2080 =	\$.03
Health insurance	\$230.00 monthly premium X 12 mos. = \$2,760.00/2080 =	\$1.33
Life insurance	\$27.04 monthly premium X 12 mos. = \$324.48/2080 =	\$.16
Tuition	\$500.00 annual cost/2080 =	\$.24
Bonus	4 quarterly bonus/year x \$250 = \$1000.00/2080 =	\$.48
401k Employer Contribution	\$2000.00 total annual contribution/2080 =	\$.96
<b>Total Hourly Credit</b>		<b>\$3.65</b>

Other examples of the types of fringe benefits allowed:

- Sick pay
- Holiday pay
- Accidental Death & Dismemberment insurance premiums

The following are examples of items that **will not** be credited toward the payment of the Prevailing Wage Rate

- Legally required payments, such as:
  - Unemployment Insurance payments
  - Workers' Compensation Insurance payments
  - FICA (Social Security contributions, Medicare contributions)
- Reimbursable expenses, such as:
  - Clothing allowance or reimbursement
  - Uniform allowance or reimbursement
  - Gas allowance or reimbursement
  - Travel time or payment
  - Meals or lodging allowance or reimbursement
  - Per diem allowance or payment
- Other payments to or on behalf of a construction mechanic that are not wages or fringe benefits, such as:
  - Industry advancement funds
  - Financial or material loans



**STATE OF MICHIGAN**  
**Informational Sheet: DTMB Prevailing Wages on State Projects**

**OVERTIME PROVISIONS for MICHIGAN PREVAILING WAGE RATE COMMERCIAL SCHEDULE**

- Overtime is represented as a nine character code. Each character represents a certain period of time after the first 8 hours Monday thru Friday.

	Monday thru Friday	Saturday	Sunday & Holidays	Four 10s
First 8 Hours		<b>4</b>		
9th Hour	<b>1</b>	<b>5</b>	<b>8</b>	<b>9</b>
10th Hour	<b>2</b>	<b>6</b>		
Over 10 hours	<b>3</b>	<b>7</b>		

Overtime for Monday thru Friday after 8 hours:

the 1st character is for time worked in the 9th hour (8.1 - 9 hours)  
the 2nd character is for time worked in the 10th hour (9.1 - 10 hours)  
the 3rd character is for time worked beyond the 10th hour (10.1 and beyond)

Overtime on Saturday:

the 4th character is for time worked in the first 8 hours on Saturday (0 - 8 hours)  
the 5th character is for time worked in the 9th hour on Saturday (8.1 - 9 hours)  
the 6th character is for time worked in the 10th hour (9.1 - 10 hours)  
the 7th character is for time worked beyond the 10th hour (10.01 and beyond)

Overtime on Sundays & Holidays

The 8th character is for time worked on Sunday or on a holiday

Four Ten Hour Days

The 9th character indicates if an optional 4-day 10-hour per day workweek can be worked **between Monday and Friday without paying overtime after 8 hours worked, unless otherwise noted in the rate schedule. To utilize a 4 ten workweek, notice is required from the employer to employee prior to the start of work on the project.**

- Overtime Indicators Used in the Overtime Provision:

H - means TIME AND ONE-HALF due  
X - means TIME AND ONE-HALF due after 40 HOURS worked  
D - means DOUBLE PAY due  
Y - means YES an optional 4-day 10-hour per day workweek can be worked without paying overtime after 8 hours worked  
N - means NO an optional 4-day 10-hour per day workweek *cannot* be worked without paying overtime after 8 hours worked

- EXAMPLES:

HHHHHHHDN - This example shows that the 1½ rate must be used for time worked after 8 hours Monday thru Friday (characters 1 - 3); for all hours worked on Saturday, 1½ rate is due (characters 4 - 7). Work done on Sundays or holidays must be paid double time (character 8). The N (character 9) indicates that 4 ten-hour days is not an acceptable workweek at regular pay.

XXXHHHHDY - This example shows that the 1½ rate must be used for time worked after 40 hours are worked Monday thru Friday (characters 1-3); for hours worked on Saturday, 1½ rate is due (characters 4 – 7). Work done on Sundays or holidays must be paid double time (character 8). The Y (character 9) indicates that 4 ten-hour days is is an acceptable alternative workweek.





**STATE OF MICHIGAN**  
**Informational Sheet: DTMB Prevailing Wages on State Projects**

**ENGINEERS - CLASSES OF EQUIPMENT LIST**

**UNDERGROUND ENGINEERS**

**CLASS I**

Backfiller Tamper, Backhoe, Batch Plant Operator, Clam-Shell, Concrete Paver (2 drums or larger), Conveyor Loader (Euclid type), Crane (crawler, truck type or pile driving), Dozer, Dragline, Elevating Grader, End Loader, Gradall (and similar type machine), Grader, Power Shovel, Roller (asphalt), Scraper (self propelled or tractor drawn), Side Broom Tractor (type D-4 or larger), Slope Paver, Trencher (over 8' digging capacity), Well Drilling Rig, Mechanic, Slip Form Paver, Hydro Excavator.

**CLASS II**

Boom Truck (power swing type boom), Crusher, Hoist, Pump (1 or more 6" discharge or larger gas or diesel powered by generator of 300 amps or more, inclusive of generator), Side Boom Tractor (smaller than type D-4 or equivalent), Tractor (pneu-tired, other than backhoe or front end loader), Trencher (8' digging capacity and smaller), Vac Truck.

**CLASS III**

Air Compressors (600 cfm or larger), Air Compressors (2 or more less than 600 cfm), Boom Truck (non-swinging, non-powered type boom), Concrete Breaker (self-propelled or truck mounted, includes compressor), Concrete Paver (1 drum, ½ yard or larger), Elevator (other than passenger), Maintenance Man, Mechanic Helper, Pump (2 or more 4" up to 6" discharge, gas or diesel powered, excluding submersible pump), Pumpcrete Machine (and similar equipment), Wagon Drill Machine, Welding Machine or Generator (2 or more 300 amp or larger, gas or diesel powered).

**CLASS IV**

Boiler, Concrete Saw (40HP or over), Curing Machine (self-propelled), Farm Tractor (w/attachment), Finishing Machine (concrete), Firemen, Hydraulic Pipe Pushing Machine, Mulching Equipment, Oiler (2 or more up to 4", exclude submersible), Pumps (2 or more up to 4" discharge if used 3 hrs or more a day-gas or diesel powered, excluding submersible pumps), Roller (other than asphalt), Stump Remover, Vibrating Compaction Equipment (6' wide or over), Trencher (service) Sweeper (Wayne type and similar equipment), Water Wagon, Extend-a-Boom Forklift.

**HAZARDOUS WASTE ABATEMENT ENGINEERS**

**CLASS I**

Backhoe, Batch Plant Operator, Clamshell, Concrete Breaker when attached to hoe, Concrete Cleaning Decontamination Machine Operator, Concrete Pump, Concrete Paver, Crusher, Dozer, Elevating Grader, Endloader, Farm Tractor (90 h.p. and higher), Gradall, Grader, Heavy Equipment Robotics Operator, Hydro Excavator, Loader, Pug Mill, Pumpcrete Machines, Pump Trucks, Roller, Scraper (self-propelled or tractor drawn), Side Boom Tractor, Slip Form Paver, Slope Paver, Trencher, Ultra High Pressure Waterjet Cutting Tool System Operator, Vactors, Vacuum Blasting Machine Operator, Vertical Lifting Hoist, Vibrating Compaction Equipment (self-propelled), and Well Drilling Rig.

**CLASS II**

Air Compressor, Concrete Breaker when not attached to hoe, Elevator, End Dumps, Equipment Decontamination Operator, Farm Tractor (less than 90 h.p.), Forklift, Generator, Heater, Mulcher, Pigs (Portable Reagent Storage Tanks), Power Screens, Pumps (water), Stationary Compressed Air Plant, Sweeper, Water Wagon and Welding Machine.



**STATE OF MICHIGAN**  
**Informational Sheet: DTMB Prevailing Wages on State Projects**

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**CARPENTER CRAFT JURISDICTION**

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Michigan recognizes the Carpenters for any and all work related to weatherization that has historically been the work of the Carpenter. This work shall include, but not be limited to: all work defined under the Federal Weatherization Assistance Program.

The jurisdiction of Carpenters, as to all work that has historically and traditionally been performed consisting of the milling, fashioning, joining, assembling, erecting, fastening or dismantling of all materials of wood, plastic, metal, fiber, cork, or composition and all other substitute materials, as well as the handling, cleaning, erecting, installing and dismantling of all machinery, equipment and all materials used by Carpenters.

The jurisdiction, therefore, extends over the following divisions and subdivisions of the trade: Carpenters and Joiners, Millwrights, Pile Drivers, Bridge, Dock and Wharf Carpenters, Underpinners, Timbermen, and Core-drillers, Shipwrights, Boat Builders, Ship-hand, Stair-Builders, Millmen, Wood and Resilient Floor Decorators, Floor Finishers, Carpet-layers, Shinglers, Siders, Insulators, Acoustic and Drywall Applicators, Sharers and House Movers, Loggers, Lumber and Sawmill Workers, Reed and Rattan Workers, Shingle Weavers, Casket and Coffin Makers, Railroad Carpenters and Car Builders, regardless of material used and all those engaged in the operation of woodworking or other machinery required in fashioning, milling or manufacturing of products used in the trade, and the handling, erecting and installing materials on any of the above divisions or sub-divisions, burning, welding and rigging incidental to the trade. When the term "Carpenter and Joiner" is used, it shall mean all the subdivisions of the trade. The trade autonomy of Carpenters therefore extends over the divisions and subdivisions of the trade, which are set forth as follows:

- (a) The framing, erecting and prefabrication of roofs, partitions, floors and other parts of buildings of wood, metal, plastic or other substitutes; application of all metal flashing used for hips, valleys and chimneys; the erection of Stran Steel section or its equal. The building and setting of all forms and centers for brick and masonry. The fabrication and erection of all forms for concrete and decking, the dismantling of same (as per International Agreement) when they are to be re-used on the job or stored for re-use. The cutting and handling of all falsework for fireproofing and slabs. Where power is used in the setting or dismantling of forms, all signaling and handling shall be done by carpenters. The setting of templates for anchor bolts for structural members and for machinery, and the placing, leveling and bracing of these bolts. All framing in connection with the setting or metal columns. The setting of all bulkheads, footing forms and the setting of and fabrication of, screeds and stakes for concrete and mastic floors where the screed is notched or fitted, or made up of more than one member. The making of forms for concrete block, bulkheads, figures, posts, rails, balusters and ornaments, etc.
- (b) The handling and erecting of rough material and drywall, the handling, assembly, setting and leveling of all fixtures, display cases, all furniture such as tables, chairs, desks, coat racks, etc., all de-mountable or moveable partitions such as Von wall, E Wall, Steel Case, Herman Miller, Haworth, American Seating, Westinghouse, Lazy Boy, rosewood, etc. All rebuilding, remodeling and setting up of all kinds of partitions, finished lumber, metal and plastic trim to be erected by Carpenters shall be handled from the truck or vehicle delivering same to the job by Carpenters.



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**CARPENTER CRAFT JURISDICTION**

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- (c) The building and moving of all scaffolding runways and staging where carpenters' tools are used, the building from the ground up of all scaffolds over fourteen (14) feet in height including metal and specially designed scaffolding. The building and construction of all hoists and derricks made of wood; the making of mortar boards, boxes, trestles, all shoring, razing and moving of buildings. Lift type trucks are to be considered a tool of the trade. Metal siding and metal roofing fall within the scope of jurisdiction for the carpenters.
- (d) The cutting or framing and fireproofing of the openings for pipes, conduits, ducts, etc., where they pass through floors, partitions, walls, roofs or fixtures composed in whole or in part of wood. The laying out of making and installation of all inserts and sleeves for pipes, ducts, etc., where carpenters' tools and knowledge are required. The making and installing of all wooden meter boards, crippling and backing for fixtures. The welding of studs and other fastenings to receive material being applied by carpenters.
- (e) The installation of all grounds, furring or stripping, ceilings and sidewalks, application of all types of shingling and siding, etc.
- (f) The installation of all interior and exterior trim or finish of wood, aluminum, kalamein, hollow or extruded metal, plastic, doors, transoms, thresholds, mullions and windows. The setting of jambs, bucks, window frames of wood or metal where braces or wedges are used. The installation of all wood, metal or other substitutes of casing, molding, chair rail, wainscoting, china closets, base of mop boards, wardrobes, metal partitions as per National Decisions or specific agreements, etc. The complete laying out, fabrication and erection of stairs. The making and erecting of all fixtures, cabinets, shelving, racks, louvers, etc. The mortising and application of all hardware in connection with our work. The sanding and refinishing of all wood, cork or composition floors to be sanded or scraped, filled, sized and buffed, either by hand or power machines. The assembling and setting of all seats in theaters, halls, churches, schools, auditorium, grandstands and other buildings. All bowling alley work.
- (g) The manufacture, fabrication and installation of all screens, storm sash, storm doors and garage doors; the installation of wood, canvas, plastic or metal awnings or eye shades, door shelters, jalousies, etc. The laying of wood, wood block and wood composition in floors.
- (h) The installation of all materials used in drywall construction, such as plasterboard, all types of asbestos boards, transite and other composition board. The application of all material which serves as base for acoustic tile, except plaster. All acoustical applications as per National Agreement or specific agreement.
- (i) The building and dismantling of all barricades, hand rails, guard rails, partitions and temporary partitions. The erection and dismantling of all temporary housing on construction projects.
- (j) The installation of rock wool, cork and other insulation material used for sound or weatherproofing. The removal of caulking and placing of staff bead and brick mold and all Oakum caulking, substitutes, etc., and all caulking in connection with carpentry work.
- (k) The installation of all chalk boards/marker boards.



**STATE OF MICHIGAN**  
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**CARPENTER CRAFT JURISDICTION**

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- (l) The operation of all hand operated winches used to raise wooden structures.
- (m) The erection of porcelain enameled panels and siding.
- (n) The unloading and distribution of all furnished, prefabricated and built-up sections such as door bucks, window frames, cupboards, cabinets, store fixtures, counters and show cases or comparably finished or prefabricated materials, to the job sites or points of installation as used in the construction, alteration and remodeling industry.
- (o) The handling of doors, metal, wood or composite, partitions and other finished bulk materials used for trim from the point of delivery.
- (p) All processing of these materials and handling after processing.
- (q) The making up of panels and fitting them into walls, all bracing and securing, all removal of panels from the casting including all braces, walers, hairpins, etc.
- (r) The handling and setting of all metal pans and sections from the stock piles of reasonable distance as required by job needs shall be performed by carpenters. The stripping of such metal pans, panels or sections is to be performed by carpenters.
- (s) The sharpening of all carpenter hand or power tools, or those used by carpenters.
- (t) The layout, fabrication, assembling of and erection and dismantling of all displays made of wood, metal, plastic, composition board or any substitute material; the covering of same with any type of material, the crating and un-crating, the handling from the point of unloading and back to the point of loading of all displays and other materials or components.
- (u) The same shall apply to all other necessary component parts used for display purposes such as turntables, platforms, identification towers and fixtures, regardless of how constructed, assembled or erected or dismantled.
- (v) The make-up, handling, cutting and sewing of all materials used in buntings, flags, banners, decorative paper, fabrics and similar materials used in the display decorative industry for draperies and back drops. The decorative framing of trucks, trailers and autos used as floats or moving displays. The slatting of walls to hand fabrics and other decorative materials, drilling of all holes to accommodate such installations. Setting up and removal of booths constructed of steel or aluminum tubing as stanchions, railings, etc., handling and placing of furniture, appliances, etc., which are being used to complete the booth at the request of the exhibitor. Fabricating and application of leather, plastic and other like materials used for covering of booths. The handling of all materials, fabricating of same. The loading and unloading, erecting and assembling at the exhibit of show area, also in or out of storage when used in booth decorations.



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**CARPENTER CRAFT JURISDICTION**

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- (w) A display shall be construed as any exhibit or medium of advertising, open to private or public showing, which is constructed of wood, metal, plastic or any other substitute to accomplish the objectives of advertising or displaying.
- (x) Handling, fitting, draping, measuring and installation of fixtures and other hardwares for draperies, all manner of making, measuring, repairing, sizing, hanging and installation of necessary fixtures and hardware for shades and Venetian blinds.
- (y) Work consisting of cutting and/or forming of all materials in preparation for installing of floors, walls and ceilings; the installation of all resilient floor and base; wall and ceiling materials to include cork, linoleum, prefabricated, laminated, rubber, asphalt, vinyl, metal, plastic, seamless floors and all other similar materials in sheet, interlocking liquid or tile form; the installation of all artificial turf, the installation, cutting and/or fitting of carpets; installation of padding, matting, linen crash and all preformed resilient floor coverings; the fitting of all devices for the attachment of carpet and other floor, wall and ceiling coverings; track sewing of carpets, drilling of holes for sockets and pins, putting in dowels and slats; and all metal trimmings used; the installation of all underlayments, sealants in preparation of floors, walls and ceilings, the unloading and handling of all materials to be installed and the removal of all materials in preparing floors when contracted for by the employer, shall be done only by employees covered under this Agreement.
- (z) The installation of all sink-tops and cabinets, to include all metal trim and covering for same. All cork, linoleum, congo-wall, linewall, veos tile, plexiglass, vinawall tile, composition tile, plastic tile, aluminum tile and rubber in sheets or tile form and the application thereof. All bolta-wall and bolta-wall tile and similar products.
- (aa) The handling and placing of all pictures and frames and the assembly of bed frames and accessories. The hanging and placing of all signage.
- (bb) The installation of all framework partitions and trim materials for toilets and bathrooms made of wood, metal, plastics or composition materials; fastening of all wooden, plastic or composition cleats to iron or any other material for accessories.
- (cc) The erection of cooling towers and tanks.
- (dd) The setting, lining, leveling and bracing of all embedded plates, rails and angles. The setting of all stay in place forms.
- (ee) Environmental: Clean room, any type of environmental chamber, walk in refrigerated coolers and all refrigerated rooms or buildings.



**STATE OF MICHIGAN**  
***Informational Sheet: DTMB Prevailing Wages on State Projects***

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**CARPENTER CRAFT JURISDICTION**

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**PILE DRIVING AND CAISSON DRILLING**

(ff) All unloading, handling, signaling and driving of piles, whether wood, steel, pipe, beam pile, composite, concrete or molded in place, wood and steel sheeting, cofferdam work, trestle work, dock work, floating derricks, caisson work, foundation work, bridge work, whether old or new, crib work, pipe line work and submarine work. Cutting of all wood, steel or concrete pile, whether by machine or hand; welding and cutting, peeling, and heading of all wood pile, steel sheeting and wood sheeting. The erecting and dismantling of all pile driving rigs, also derricks whether on land or water; also the moving, shoring and underpinning of all buildings. The loading and unloading of all derricks, cranes and pile driving materials. The tending, maintenance and operation of all valves pertaining to the operation of driving of pile. All diving and tending essential to the completion of jurisdictional claims.

All work done in the established yards of the Company and all work not enumerated above, shall be handled and manned as the Employer decides.

The pile driver will unload all material shipped in by rail from the point that the rail car is spotted.

All cleaning and preparation of all piling prior to driving.

The welding and attachment of all boot plates, pile points, splice plates, connectors, rock crosses, driving crosses, driving rigs, point reinforcements and overboots.

The construction, reconstruction, repair, alteration, demolition and partial or complete removal of all marine work including, but not limited to, docks, piers, wharves, quays, jetties, cribs, causeways, breakwaters, lighthouses and permanent buoys, etc. (mixing and placing of concrete excepted).

The driving and pulling of all wood, steel and concrete foundation piles and sheet piling.

The heading, pointing, splicing, cutting and welding of all piles.

The placing of all wales, bolts, studs, lagging, rods and washers including the cutting, drilling, boring or breaking of all holes or openings thereof.

The removal of all materials and/or obstructions of any nature (rip-rap included) that retard or interfere with the driving of piles or with the placing of wales, bolts and rods.



**STATE OF MICHIGAN**  
***Informational Sheet: DTMB Prevailing Wages on State Projects***

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**CARPENTER CRAFT JURISDICTION**

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This is to be subject to the discretion of the contractor who may choose to use blasting specialists or other demolition specialists.

The handling on the job of all materials used in the work.

The manning of all floating equipment (towing equipment excepted) engaged in the work enumerated, including deck engines, except machinery manned by Operating Engineers.

The placing of all rip-rap, fill stone, bedding stone, cover stone and concrete blocks in connection with marine construction. Work normally performed by Employers, such as soil tests, shoring, underpinning of buildings, cribbing, driving of sheet piling, marine divers, tenders, underwater construction workers and similar operations shall continue to be included in the jurisdiction of this Agreement.

All burning, cutting, welding and fabrication of pipe, H-beams, sheet pile (metal or wood), done on the job site or in the yard of the Employer shall be done by pile drivers. The driving of bearing piles, sheet piling with heavy equipment, caissons, pile caps, auger drilling and boring, the setting up for load testing for any type of piling, all layout and spotting for piling, caisson and boring work, all earth retention, ditch boarding, installing tiebacks.

**ASBESTOS ABATEMENT CARPENTERS**

(gg) All erection and maintenance of barriers and partitions used in the removing of asbestos or any abatement work. The abatement of any materials previously installed by the carpenter such as transite, ceiling and floor tiles. All operating and maintaining of current equipment used in any abatement work.



**STATE OF MICHIGAN**  
***Informational Sheet: DTMB Prevailing Wages on State Projects***

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**ELECTRICIAN – SOUND AND COMMUNICATION / DATA/ VOICE JURISDICTION**

The installation, testing, service and maintenance, of systems which utilize the transmission and/or transference of voice, sound, vision or digital for commercial, education, security and entertainment purposes for the following: TV monitoring and surveillance, CATV and CCTV, background-foreground music, intercom and telephone interconnect, inventory control systems, microwave transmission, multi-media, multiplex, radio page, school intercom and sound, burglar alarms, low voltage fire alarm systems, low voltage master clock systems, distributed antenna systems (DAS), IP data networks, and all surface-mounted (non-power) telecommunications wiremold. Shall additionally include the installation of all raceway systems of unlimited length in telecommunications rooms, entrance facilities, equipment rooms, and similar areas. Energy management systems. Security systems; perimeter, vibration, card access, access control and sonar/infrared monitoring equipment. Communications systems that transmit or receive information and/or control systems that are intrinsic to the above listed systems; SCADA (Supervisory Control and Data Acquisition), PCM (Pulse Code Modulation), Digital Data Systems, Broadband and Baseband and Carriers, POS (Point of Sale systems), VSAT Data Systems, RF and Remote Control Systems, Fiber Optic Data Systems and Voice and Data Infrastructure and Backbone.



**State of Michigan**

**Official Request #:** 331

**Requestor:** Hobbs+Black Associates, Inc.

**Project Description:** MSP Northville Forensic Lab Elevator Replacement

**Project Number:** 551/21167.TYC

**Wayne County**

**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date:** 8/18/2023

**Contract must be awarded by:** 11/16/2023

**Page 1 of 30**

<u>Classification</u>		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Name	Description					

**Boilermaker**

BO169		12/13/2021				
Boilermaker			\$72.47	\$107.55	\$142.63	H H H H H H D Y

**Apprentice Rates:**

1st Period	\$53.53	\$79.15	\$104.75
2nd Period	\$55.14	\$81.56	\$107.97
3rd Period	\$56.73	\$83.94	\$111.15
4th Period	\$58.31	\$86.31	\$114.31
5th Period	\$59.85	\$88.62	\$117.39
6th Period	\$63.03	\$93.39	\$123.75
7th Period	\$66.17	\$98.10	\$130.03
8th Period	\$69.32	\$102.83	\$136.33

**Bricklayer**

BR2-B		12/3/2021				
Bricklayer			\$61.93	\$92.90	\$123.86	H H H H H H D Y

**Apprentice Rates:**

1st Period	\$40.60	\$60.90	\$81.20
2nd Period	\$42.47	\$63.71	\$84.94
3rd Period	\$44.33	\$66.49	\$88.66
4th Period	\$46.19	\$69.29	\$92.38
5th Period	\$48.05	\$72.07	\$96.10
6th Period	\$49.91	\$74.87	\$99.82
7th Period	\$51.78	\$77.67	\$103.56
8th Period	\$53.64	\$80.46	\$107.28

Official Request #: 331  
 Requestor: Hobbs+Black Associates, Inc.  
 Project Description: MSP Northville Forensic Lab Elevator Replacement  
 Project Number: 551/21167.TYC  
 County: Wayne

**Official Rate Schedule**  
**Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.**

**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

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**Page 2 of 30**

Classification	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Name	Description				

**Carpenter**

CA1045	8/4/2023											
Carpet and Resilient Floor Layer, (does not include installation of prefabricated formica & parquet flooring which is to be paid carpenter rate)		\$59.04	\$82.42	\$105.80	X	X	H	H	H	H	D	N

**Apprentice Rates:**

1st 6 months	\$30.46	\$41.20	\$51.93
2nd 6 months	\$34.04	\$45.73	\$57.44
3rd 6 months	\$36.52	\$50.29	\$64.05
4th 6 months	\$39.02	\$54.04	\$69.05
5th 6 months	\$41.52	\$57.75	\$74.05
6th 6 months	\$44.02	\$61.54	\$79.05
7th 6 months	\$46.53	\$65.31	\$84.07
8th 6 months	\$49.02	\$67.72	\$86.42

CA687Z1	8/4/2023												
Carpenter 4-10s allowed Mon-Sat; double time due when over 12 hours worked per day		\$65.99	\$83.94	\$101.89	X	X	H	X	X	H	H	D	Y

**Apprentice Rates:**

1st year	\$40.39	\$50.27	\$60.14
3rd 6 months	\$43.23	\$54.00	\$64.77
4th 6 months	\$46.08	\$57.75	\$69.42
5th 6 months	\$48.92	\$61.49	\$74.05
6th 6 months	\$51.78	\$65.25	\$78.71
7th 6 months	\$54.61	\$68.97	\$83.33
8th 6 months	\$57.47	\$72.73	\$87.99

*comment make up day allowed Saturdays*

Official Request #: 331  
 Requestor: Hobbs+Black Associates, Inc.  
 Project Description: MSP Northville Forensic Lab Elevator Replacement  
 Project Number: 551/21167.TYC  
 County: Wayne

**Official Rate Schedule**  
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**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

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<u>Classification</u>		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Name	Description					
CA687Z1P		8/4/2023				
Piledriver	4- 10s allowed Monday-Saturday; double time due when over 12 hours worked per day		\$65.99	\$83.94	\$101.89	X X HXh H H H D Y
	<b>Apprentice Rates:</b>					
	1st 6 months		\$40.39	\$50.27	\$60.14	
	2nd 6 months		\$46.08	\$57.75	\$69.42	
	3rd 6 months		\$51.78	\$65.25	\$78.71	
	4th 6 months		\$57.47	\$72.73	\$87.99	
<i>comment</i>	<i>make up day allowed Saturday</i>					

**Cement Mason**

BR2-CM		12/3/2021				
Cement Mason			\$58.90	\$84.12	\$109.33	X X H H H H H D Y
	<b>Apprentice Rates:</b>					
	1st Period		\$39.26	\$54.86	\$70.45	
	2nd Period		\$41.72	\$58.55	\$75.37	
	3rd Period		\$44.22	\$62.30	\$80.37	
	4th Period		\$46.73	\$66.06	\$85.39	
	5th Period		\$49.19	\$69.75	\$90.31	
	6th Period		\$51.71	\$73.53	\$95.35	

CE514-W		11/29/2021				
Cement Mason			\$52.82	\$74.60	\$96.37	H H D H H H D Y
	<b>Apprentice Rates:</b>					
	1st 6 Months		\$34.23	\$46.71	\$59.19	
	2nd 6 Months		\$36.30	\$49.82	\$63.33	
	3rd 6 Months		\$38.39	\$52.95	\$67.51	
	4th 6 Months		\$40.47	\$56.07	\$71.67	
	5th 6 Months		\$42.54	\$59.18	\$75.81	
	6th 6 Months		\$44.63	\$62.31	\$79.99	

Official Request #: 331  
 Requestor: Hobbs+Black Associates, Inc.  
 Project Description: MSP Northville Forensic Lab Elevator Replacement  
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 County: Wayne

**Official Rate Schedule**  
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**Official Commercial Prevailing Wage Rates for State Funded Projects**

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Classification	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Name Description					

**Class A Laborer**

L1076-Zone 2-A	8/15/2023				
Construction Laborer, Demolition Laborer, Mason Tender, Carpenter Tender, Drywall Handler, Concrete Laborer, Cement Finisher tender, concrete chute and concrete Bucket Handler, Concrete Laborer, Cement Finisher Tender		\$50.10	\$64.48	\$78.85	H H H H H H D Y

**Apprentice Rates:**

	\$48.66	\$62.31	\$75.97
	\$45.79	\$58.01	\$70.23
	\$44.35	\$55.85	\$67.35
	\$42.91	\$53.69	\$64.47

*comment make up day allowed Saturday*

**Diver**

CA 687 D	8/3/2023				
Diver 4-10s allowed M-Sat; double time due when over 12 hours worked per day		\$76.40	\$98.48	\$120.55	X X H X X H H D Y

**Apprentice Rates:**

5th 6 mo	\$25.13		
4th 6 mo	\$46.08	\$57.75	\$69.42
3rd 60 mo	\$43.23	\$54.00	\$64.77
1st/2nd 6 mo	\$40.39	\$50.27	\$60.14

*comment make up day allowed Saturday*

**Drywall**

CE514-DF	12/9/2021				
Drywall Finishers		\$51.86	\$67.66	\$83.46	H H H H H H D Y

**Apprentice Rates:**

1st period	\$39.22	\$48.70	\$58.18
2nd period	\$40.80	\$51.07	\$61.34
3rd period	\$43.96	\$55.81	\$67.66
4th period	\$48.70	\$62.92	\$77.14

Official Request #: 331

Requestor: Hobbs+Black Associates, Inc.

Project Description: MSP Northville Forensic Lab Elevator Replacement

Project Number: 551/21167.TYC

County: Wayne

**Official Rate Schedule**

**Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.**

**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

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Classification Name      Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
PT-22-D Drywall Taper    Four 10s allowed Monday-Thursday	8/25/2016	\$45.91	\$59.74	\$73.56	H H D H D D D D Y
<b>Apprentice Rates:</b>					
First 3 months		\$32.08	\$38.99	\$45.90	
Second 3 months		\$34.85	\$43.14	\$51.44	
Second 6 months		\$37.62	\$47.30	\$56.98	
Third 6 months		\$40.38	\$51.44	\$62.50	
4th 6 months		\$41.76	\$53.51	\$65.26	
<i>comment      make up day allowed</i>					
Friday make-up day for bad weather or holidays					

**Electrician**

EC-58-IW Inside Wireman	10/25/2016	\$71.28	\$98.14	\$121.40	H H H H H H H D N
<b>Apprentice Rates:</b>					
1st Period		\$45.69	\$59.77	\$70.23	
2nd Period		\$48.01	\$63.24	\$74.87	
3rd Period		\$50.34	\$66.74	\$79.53	
4th Period		\$52.66	\$70.22	\$84.17	
5th Period		\$54.99	\$73.71	\$88.83	
6th Period		\$59.65	\$80.70	\$98.15	

EC-58-SC Sound and Communication Installer	11/12/2021	\$44.79	\$60.31	\$75.82	H H H H H H H D Y
<b>Apprentice Rates:</b>					
Period 1		\$29.28	\$37.04	\$44.79	
Period 2		\$30.84	\$39.99	\$48.72	
Period 3		\$32.38	\$41.68	\$50.99	
Period 4		\$33.94	\$44.03	\$54.11	
Period 5		\$35.48	\$46.34	\$57.19	
Period 6		\$37.04	\$48.67	\$60.31	

EC-58-SCT Sound and Communication Technician I	11/12/2021	\$52.52	\$71.89	\$91.27	H H H H H H H D Y
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Official Request #: 331  
 Requestor: Hobbs+Black Associates, Inc.  
 Project Description: MSP Northville Forensic Lab Elevator Replacement  
 Project Number: 551/21167.TYC  
 County: Wayne

**Official Rate Schedule**  
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**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

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Classification	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
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**Elevator Constructor**

EL 36 8/7/2007  
 Elevator Constructor Mechanic \$96.27 \$151.73 D D D D D D D D Y

**Apprentice Rates:**

1st Year Apprentice	\$70.42	\$100.92
2nd Year Apprentice	\$75.97	\$112.02
3rd Year Apprentice	\$78.74	\$117.56
4th Year Apprentice	\$84.29	\$128.66

*make up day allowed*

**Glazier**

GL-357 12/9/2021  
 Glazier If 4 10 hour day workweek is scheduled, four 10s must be consecutive, M-F. \$53.55 \$70.10 \$86.65 H H H H H H H D Y

**Apprentice Rates:**

1st 6 months	\$37.00	\$45.27	\$53.55
2nd 6 months	\$37.75	\$46.40	\$55.05
3rd 6 months	\$41.97	\$52.73	\$63.49
4th 6 months	\$43.62	\$55.21	\$66.79
5th 6 months	\$45.27	\$57.68	\$70.09
6th 6 months	\$46.93	\$60.17	\$73.41
7th 6 months	\$48.59	\$62.66	\$76.73
8th 6 months	\$51.89	\$67.61	\$83.33

Official Request #: 331

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Project Number: 551/21167.TYC

County: Wayne

**Official Rate Schedule**

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**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

**Contract must be awarded by: 11/16/2023**

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Name	Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
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**Heat and Frost Insulator**

AS25		8/7/2023				
Heat and Frost Insulators and Asbestos Workers 4-10s must be worked a minimum of 2 weeks consecutively, Monday thru Thursday. Hours worked in excess of 10 will be paid at double time. Hours worked on the fifth day, Monday thru Friday @ time and half			\$62.65	\$78.41	\$94.16	H H H H H H D Y

**Apprentice Rates:**

1st Year		\$46.90	\$54.78	\$62.66
2nd Year		\$50.05	\$59.50	\$68.96
3rd Year		\$53.20	\$64.23	\$75.26
4th Year		\$56.35	\$68.96	\$81.56

*comment*

Four 10s must be worked for a minimum of 2 consecutive weeks. OVERTIME is different on a four 10 week. OT is 2x for hours beyond 10. All hours on fifth day, M-F require time and one half. Sat first 8 hours, 1.5, all hours after 8 require double time.

AS25S		6/2/2016				
Spray Insulation			\$25.29	\$36.51		X X X H H H H N

**Ironworker**

IR-25-RF		8/15/2023				
Reinforced Iron Work			\$69.51	\$85.85	\$102.19	H H D H H D D D N

**Apprentice Rates:**

Level 8		\$66.76	\$82.48	\$98.19
Level 7		\$66.76	\$82.48	\$98.19
Level 1		\$52.63	\$64.23	\$75.83
Level 2		\$54.68	\$66.77	\$78.86
Level 3		\$56.56	\$68.98	\$81.40
Level 4		\$59.41	\$72.65	\$85.88
Level 5		\$62.27	\$76.32	\$90.37
Level 6		\$66.76	\$82.48	\$98.19

*make up day allowed*

Official Request #: 331

Requestor: Hobbs+Black Associates, Inc.

Project Description: MSP Northville Forensic Lab Elevator Replacement

Project Number: 551/21167.TYC

County: Wayne

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**Issue Date: 8/18/2023**

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<u>Classification</u>	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Name    Description					

IR-25-RIG Rigging Work	8/15/2023	\$76.08	\$92.93	\$109.78	H H D H H H D D N
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**Apprentice Rates:**

Level 8		\$69.43	\$84.94	\$100.45	
Level 1		\$51.75	\$62.38	\$73.01	
Level 2		\$52.56	\$63.54	\$74.52	
Level 3		\$54.83	\$66.33	\$77.83	
Level 4		\$57.51	\$69.71	\$81.91	
Level 5		\$60.60	\$73.67	\$86.74	
Level 6		\$63.27	\$77.04	\$90.80	
Level 7		\$66.35	\$80.99	\$95.62	

IR-25-STR Structural, ornamental, welder and pre-cast If bad weather, Friday may be a make up day. If holiday celebrated on a Monday, 4 10s may be worked Tuesday thru Friday.	8/15/2023	\$76.21	\$102.75	\$129.29	H H D H H H D D Y
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**Apprentice Rates:**

Level 8		\$69.43	\$84.94	\$100.45	
Level 1		\$51.25	\$61.88	\$72.51	
Level 2		\$52.56	\$63.54	\$74.52	
Level 3		\$54.83	\$66.33	\$77.83	
Level 4		\$57.51	\$70.34	\$83.17	
Level 5		\$60.60	\$73.67	\$86.74	
Level 6		\$63.27	\$77.04	\$90.80	
Level 7		\$66.35	\$80.98	\$95.62	

*make up day allowed*

**Laborer**

L1076-A-B Signal man (on sewer & caisson work); air,electric or gasoline tool operator (including concrete vibrator operator,acetylene torch & air hammer operator); scaffold builder, caisson worker	8/15/2023	\$50.40	\$64.93	\$79.45	H H H H H H H D Y
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*comment    make up day allowed*  
Saturday

Official Request #: 331

Requestor: Hobbs+Black Associates, Inc.

Project Description: MSP Northville Forensic Lab Elevator Replacement

Project Number: 551/21167.TYC

County: Wayne

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# Official Commercial Prevailing Wage Rates for State Funded Projects

Issue Date: 8/18/2023

Contract must be awarded by: 11/16/2023

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Classification Name Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
L1076-A-C Lansing Burner, Blaster & Powder Man; Air, electric Gasoline Tool Operator (Blast furnace work or battery work) <i>comment make up day allowed</i> Saturday, If conditions beyond the employer/employee's control prevent one or more hours of working during Mon-Fri, the employer may choose to work up to 10 hour straight time weekdays.	8/15/2023	\$50.96	\$65.77	\$80.57	H H H H H H H D Y
L1076-A-D Furnance battery heater tender, burning bar & oxy-acetylene gun <i>comment make up day allowed</i> Saturday	8/15/2023	\$50.67	\$65.33	\$79.99	H H H H H H H D Y
L1076-A-E Cleaner/sweeper laborer, furniture laborer <i>comment make up day allowed</i> Saturday	8/15/2023	\$44.65	\$56.30	\$67.95	H H H H H H H D Y
L1076-A-F Expediter man, topman and/or bottom man (blast furnace work or battery work) <i>comment</i> Saturday	8/15/2023	\$51.51	\$66.69	\$81.87	H H H H H H H D Y
L1076-A-W Laborer -Wall and ceiling material handler, plasterer tender, mortar mixer and plastering machine operator  <b>Apprentice Rates:</b> 0-1,000 Hours 1,001-2,000 Hours 2,001-3,000 Hours 3,001-4,000 Hours  <i>comment make up day allowed</i> Saturday make up day due to conditions beyond control or holiday	7/28/2023	\$46.90	\$59.78	\$72.65	H H H H H H H D Y

**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

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Classification Name      Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
=====					
MITA-RZ1-C1	8/9/2023				
Laborer Road Class 1: asphalt shoveler or loader, yard man, fence erector tender, dumper, joint filling, form setting, form stripper, pavement reinforcing, waterproofing, seal coating, bridge painting, sandblasting, pressure grouting, RC equipment		\$47.44	\$61.38	\$75.31	H H H H H H D Y
<b>Apprentice Rates:</b>					
3,001-4,000 hours		\$46.05	\$59.29	\$72.53	
2,001-3,000		\$43.26	\$55.11	\$66.95	
1,001-2,000 hours		\$41.87	\$53.02	\$64.17	
0-1,000 hours		\$40.47	\$50.92	\$61.37	
-----					
MITA-RZ1-C2	1/5/2022				
Laborer Road Class 2: mixer operator, air or electric tool operator, spreader, boxman, concreter paddler, power chain saw operator, paving patch truck dumper, tunnel mucker, concrete saw operator, dry pack machine and roto-mill grounds person		\$47.57	\$61.57	\$75.57	H H H H H H D Y
<b>Apprentice Rates:</b>					
3,001-4,000 hours		\$46.17	\$59.47	\$72.77	
2,001-3,000 hours		\$43.37	\$55.27	\$67.17	
1,001-2,000 hours		\$41.97	\$53.17	\$64.37	
0-1,000 hours		\$40.57	\$51.07	\$61.57	
-----					
MITA-RZ1-C3	8/9/2023				
Laborer Road Class 3: tunnel miner, finish tenders, guard rail builder, median barrier installer, earth retention barrier and wall installer, fence erector, bottom man, powder man, wagon drill and air track operator, curb and side rail setter		\$47.75	\$61.84	\$75.93	H H H H H H D Y
<b>Apprentice Rates:</b>					
3,001-4,000 hours		\$46.34	\$59.73	\$73.11	
2,001-3,000 hours		\$43.52	\$55.49	\$67.47	
1,001-2,000 hours		\$42.11	\$53.38	\$64.65	
0-1,000 hours		\$40.71	\$51.28	\$61.85	
-----					

Official Request #: 331

Requestor: Hobbs+Black Associates, Inc.

Project Description: MSP Northville Forensic Lab Elevator Replacement

Project Number: 551/21167.TYC

County: Wayne

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**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

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Classification Name      Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
=====					
MITA-RZ1-C4 Laborer Road Class 4: asphalt raker	8/9/2023	\$47.83	\$61.46	\$75.59	H H H H H H D Y
<b>Apprentice Rates:</b>					
3,001-4,000 hours		\$46.42	\$59.35	\$72.77	
2,001-3,000 hours		\$43.59	\$55.10	\$67.11	
1,001-2,000 hours		\$42.18	\$52.99	\$64.29	
0-1,000 hours		\$40.77	\$50.87	\$61.47	
-----					
MITA-RZ1-C5 Laborer Road Class 5: pipe layers, oxy-gun	8/9/2023	\$48.04	\$62.28	\$76.51	H H H H H H D Y
<b>Apprentice Rates:</b>					
3,001-4,000 hours		\$46.62	\$60.15	\$73.67	
2,001-3,000 hours		\$43.77	\$55.87	\$67.97	
1,001-2,000 hours		\$42.35	\$53.74	\$65.13	
0-1,000 hours		\$40.92	\$51.59	\$62.27	
-----					
MITA-RZ1-C6 Laborer Road Class 6: line form setter for curb or pavement, asphalt screed checker/screw man on asphalt paving machines	8/9/2023	\$48.34	\$62.73	\$77.11	H H H H H H D Y
<b>Apprentice Rates:</b>					
3,001-4,000 hours		\$46.90	\$60.57	\$74.23	
2,001-3,000 hours		\$44.02	\$56.25	\$68.47	
1,001-2,000 hours		\$42.59	\$54.10	\$65.61	
0-1,000 hours		\$41.15	\$51.94	\$62.73	
-----					
MITA-RZ1-C7 Laborer Road Class 7: concrete specialist - including finishing and trowling, cast in place or precast by any method	8/9/2023	\$49.41	\$64.33	\$79.25	H H H H H H D Y
<b>Apprentice Rates:</b>					
2,001-3,000 hours		\$44.93	\$57.61	\$70.29	
3,001-4,000 hours		\$46.70	\$63.10	\$79.50	
1,001-2,000 hours		\$43.44	\$55.37	\$67.31	
0-1,000 hours		\$41.95	\$53.14	\$64.33	
=====					

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# Official Commercial Prevailing Wage Rates for State Funded Projects

Issue Date: 8/18/2023

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Classification Name      Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
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MLDC	8/2/2023				
Asbestos & Lead Abatement Laborer 4 ten hour days @ straight time allowed Monday-Saturday, must be consecutive calendar days		\$48.35	\$62.24	\$76.13	H H H X X X D Y
<b>Apprentice Rates:</b>					
Trainee 600 hours +1 year		\$34.07			

**Laborer - Hazardous**

LHAZ-Z1-A	12/14/2021				
Class A performing work in conjunction with site preparation and other preliminary work prior to actual removal, handling, or containment of hazardous waste substances not requiring use of personal protective equipment required by state or federal regulat		\$46.90	\$64.85	\$82.80	H H H H H H D Y
<b>Apprentice Rates:</b>					
0-1,000 work hours		\$40.46	\$55.19	\$69.92	
1,001-2,000 work hours		\$41.75	\$57.13	\$72.50	
2,001-3,000 work hours		\$43.04	\$59.07	\$75.08	
3,001-4,000 work hours		\$45.61	\$62.92	\$80.22	

*comment      make up day allowed*  
4 10s allowed M-Th or T-F; inclement weather makeup day Friday

LHAZ-Z1-B	8/9/2023				
Class B performing work in conjunction with the removal, handling, or containment of hazardous waste substances when the use of personal protective equipment levels "A", "B" or "C" is required.		\$47.90	\$66.35	\$84.80	H H H H H H D Y
<b>Apprentice Rates:</b>					
0-1,000 work hours		\$41.21	\$56.32	\$71.42	
1,001-2,000 work hours		\$42.55	\$58.33	\$74.10	
2,001-3,000 work hours		\$43.89	\$60.34	\$76.78	
3,001-4,000 work hours		\$46.56	\$64.35	\$82.12	

*comment      make up day allowed*  
4 10s allowed M-Th or T-F; inclement weather makeup day Friday

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Classification	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Name Description					

**-----**  
**-----**  
**Laborer - Landscape**  
**-----**

LLAN-Z1-A	8/9/2023				
Class B1: Landscape Operator includes air, gas, and diesel equipment operator, lawn sprinkler installer, skidsteer, mini excavators, backhoe loaders, ride and walk behind trenchers, off road dump vehicle, articulated haulers, hydroseeder, wheel loaders		\$32.40	\$42.43	\$52.95	X X H X X X H D Y

LLAN-Z1-B	8/9/2023				
Class B2: Skilled Landscape Laborer: small power tool operator, lawn sprinkler installers' tender, irrigation installers' tender, material mover		\$30.40	\$39.93	\$49.45	X X H X X X H D Y

**-----**  
**-----**  
**Laborer Underground - Tunnel, Shaft & Caisson**  
**-----**

LAUCT-Z1-1	8/8/2023				
Class I - Tunnel, shaft and caisson laborer, dump man, shanty man, hog house tender, testing man (on gas), and watchman.		\$41.17	\$51.66	\$62.14	X X X X X X X D Y

**Apprentice Rates:**

0-1,000 work hours	\$34.45	\$43.16	\$51.85
1,001-2,000 work hours	\$36.54	\$46.29	\$56.03
2,001-3,000 work hours	\$37.57	\$47.84	\$58.09
3,001-4,000 work hours	\$39.64	\$50.94	\$62.23

LAUCT-Z1-2	8/8/2023				
Class II - Manhole, headwall, catch basin builder, bricklayer tender, mortar man, material mixer, fence erector, and guard rail builder.		\$41.28	\$51.82	\$62.36	X X X X X X X D Y

**Apprentice Rates:**

0-1,000 work hours	\$35.58	\$44.85	\$54.11
1,001-2,000 work hours	\$36.62	\$46.41	\$56.19
2,001-3,000 work hours	\$37.66	\$47.97	\$58.27
3,001-4,000 work hours	\$39.74	\$51.09	\$62.43

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Classification Name Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
<hr/>					
LAUCT-Z1-3	8/8/2023				
Class III - Air tool operator (jack hammer man, bush hammer man and grinding man), first bottom man, second bottom man, cage tender, car pusher, carrier man, concrete man, concrete form man, concrete repair man, cement invert laborer, cement finisher, con		\$41.34	\$51.91	\$62.48	X X X X X X D Y
<b>Apprentice Rates:</b>					
0-1,000 work hours		\$35.63	\$44.92	\$54.21	
1,001-2,000 work hours		\$36.67	\$46.48	\$56.29	
2,001-3,000 work hours		\$37.71	\$48.04	\$58.37	
3,001-4,000 work hours		\$39.80	\$51.18	\$62.55	
<hr/>					
LAUCT-Z1-4	8/8/2023				
Class IV - Tunnel, shaft and caisson mucker, bracer man, liner plate man, long haul dinky driver and well point man.		\$41.52	\$52.18	\$62.84	X X X X X X D Y
<b>Apprentice Rates:</b>					
0-1,000 work hours		\$35.76	\$45.12	\$54.47	
1,001-2,000 work hours		\$36.82	\$46.71	\$56.59	
2,001-3,000 work hours		\$37.87	\$48.28	\$58.69	
3,001-4,000 work hours		\$39.97	\$51.44	\$62.89	
<hr/>					
LAUCT-Z1-5	8/8/2023				
Class V - Tunnel, shaft and caisson miner, drill runner, keyboard operator, power knife operator, reinforced steel or mesh man (e.g. wire mesh, steel mats, dowel bars)		\$41.77	\$52.56	\$63.34	X X X X X X D Y
<b>Apprentice Rates:</b>					
0-1,000 work hours		\$35.95	\$45.40	\$54.85	
1,001-2,000 work hours		\$37.02	\$47.01	\$56.99	
2,001-3,000 work hours		\$38.08	\$48.60	\$59.11	
3,001-4,000 work hours		\$40.21	\$51.80	\$63.37	
<hr/>					

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Classification Name      Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
<hr/>					
LAUCT-Z1-6 Class VI - Dynamite man and powder man.	8/8/2023	\$41.90	\$54.33	\$66.75	X X X X X X X D Y
<b>Apprentice Rates:</b>					
0-1,000 work hours		\$36.20	\$45.78	\$55.35	
1,001-2,000 work hours		\$37.28	\$47.40	\$57.51	
2,001-3,000 work hours		\$38.36	\$49.02	\$59.67	
3,001-4,000 work hours		\$40.52	\$52.26	\$63.99	
<hr/>					

LAUCT-Z1-7 Class VII - Restoration laborer, seeding, sodding, planting, cutting, mulching and topsoil grading and the restoration of property such as replacing mail boxes, wood chips, planter boxes and flagstones.	8/8/2023	\$35.58	\$43.17	\$50.76	X X X X X X X D Y
<b>Apprentice Rates:</b>					
0-1,000 work hours		\$31.39	\$38.56	\$45.73	
1,001-2,000 work hours		\$32.15	\$39.70	\$47.25	
2,001-3,000 work hours		\$32.91	\$40.84	\$48.77	
3,001-4,000 work hours		\$34.43	\$43.12	\$51.81	
<hr/>					

**Laborer -Underground Open Cut, Class I**

LAUC-Z1-1 Construction Laborer	8/8/2023	\$36.91	\$47.01	\$57.10	X X X X X X X D Y
<b>Apprentice Rates:</b>					
0-1,000 work hours		\$35.39	\$44.56	\$53.73	
1,001-2,000 work hours		\$36.42	\$46.11	\$55.79	
2,001-3,000 work hours		\$37.44	\$47.64	\$57.83	
3,001-4,000 work hours		\$39.49	\$50.72	\$61.93	
<hr/>					

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Classification	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Name Description					

**-----**  
**-----**  
**Laborer -Underground Open Cut, Class II**  
**-----**

LAUC-Z1-2	8/8/2023				
Mortar and material mixer, concrete form man, signal man, well point man, manhole, headwall and catch basin builder, guard rail builders, headwall, seawall, breakwall, dock builder and fence erector.		\$37.05	\$47.22	\$57.38	X X X X X X D Y
<b>Apprentice Rates:</b>					
0-1,000 work hours		\$35.47	\$44.68	\$53.89	
1,001-2,000 work hours		\$36.50	\$46.23	\$55.95	
2,001-3,000 work hours		\$37.54	\$47.79	\$58.03	
3,001-4,000 work hours		\$39.60	\$50.88	\$62.15	

**-----**  
**-----**  
**Laborer -Underground Open Cut, Class III**  
**-----**

LAUC-Z1-3	1/4/2022				
Air, gasoline and electric tool operator, vibrator operator, drillers, pump man, tar kettle operator, bracers, rodder, reinforced steel or mesh man (e.g. wire mesh, steel mats, dowel bars, etc.), cement finisher, welder, pipe jacking and boring man, wagon		\$40.68	\$52.50	\$64.31	X X X X X X D Y
<b>Apprentice Rates:</b>					
0-1,000 work hours		\$35.51	\$44.74	\$53.97	
1,001-2,000 work hours		\$36.54	\$46.29	\$56.03	
2,001-3,000 work hours		\$37.58	\$47.85	\$58.11	
3,001-4,000 work hours		\$39.65	\$50.96	\$62.25	

**-----**  
**-----**  
**Laborer -Underground Open Cut, Class IV**  
**-----**

LAUC-Z1-4	1/4/2022				
Trench or excavating grade man.		\$40.76	\$52.62	\$64.47	X X X X X X D Y
<b>Apprentice Rates:</b>					
0-1,000 work hours		\$35.57	\$44.84	\$54.09	
1,001-2,000 work hours		\$36.61	\$46.40	\$56.17	
2,001-3,000 work hours		\$37.65	\$47.96	\$58.25	
3,001-4,000 work hours		\$39.72	\$51.06	\$62.39	

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Name	Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
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**-----**  
**-----**  
**Laborer -Underground Open Cut, Class V**  
**-----**

LAUC-Z1-5		1/4/2022				
Pipe Layer (including crock, metal pipe, mulitplate or other conduits)			\$40.82	\$52.71	\$64.59	X X X X X X X D Y
	<b>Apprentice Rates:</b>					
	0-1,000 work hours		\$35.62	\$44.91	\$54.19	
	1,001-2,000 work hours		\$36.66	\$46.47	\$56.27	
	2,001-3,000 work hours		\$37.70	\$48.03	\$58.35	
	3,001-4,000 work hours		\$39.78	\$51.15	\$62.51	

**-----**  
**-----**  
**Laborer -Underground Open Cut, Class VI**  
**-----**

LAUC-Z1-6		1/4/2022				
Grouting man, top man assistant, audio visual television operations and all other operations in connection with closed circuit television inspection, pipe cleaning and pipe relining work and the installation and repair of water service pipe and appurtenan			\$38.27	\$48.88	\$59.49	X X X X X X X D Y
	<b>Apprentice Rates:</b>					
	0-1,000 work hours		\$33.70	\$42.03	\$50.35	
	1,001-2,000 work hours		\$34.62	\$43.41	\$52.19	
	2,001-3,000 work hours		\$35.53	\$44.78	\$54.01	
	3,001-4,000 work hours		\$37.36	\$47.52	\$57.67	

**-----**  
**-----**  
**Laborer -Underground Open Cut, Class VII**  
**-----**

LAUC-Z1-7		1/4/2022				
Restoration laborer, seeding, sodding, planting, cutting, mulching and topsoil grading and the restoration of property such as replacing mail boxes, wood chips, planter boxes, flagstones etc.			\$34.89	\$43.81	\$52.73	X X X X X X X D Y
	<b>Apprentice Rates:</b>					
	0-1,000 work hours		\$31.17	\$38.24	\$45.29	
	1,001-2,000 work hours		\$31.91	\$39.34	\$46.77	
	2,001-3,000 work hours		\$32.66	\$40.47	\$48.27	
	3,001-4,000 work hours		\$34.15	\$42.70	\$51.25	

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Classification	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Name Description					

**Landscape Laborer**

LLAN-Z1	8/9/2023				
Class A: Irrigation Foremen and Construction Foremen.		\$34.62	\$46.26	\$57.89	x X H X X x H D Y H

Subdivision of county      Zones 1 & 2

**Landscape Laborer**

LLAN-Z1	8/9/2023				
Class A: Irrigation Foremen and Construction Foremen.		\$34.62	\$46.26	\$57.89	X X H X X X X D Y

Subdivision of county      Zones 1 & 2

**Operating Engineer**

EN-324-A120	12/9/2021				
Crane with boom & jib or leads 120' or longer		\$65.71	\$86.00	\$106.28	X X H H D D D D Y
<i>comment</i>					
Double time after 12 hours M-F					

EN-324-A140	12/10/2021				
Crane with boom & jib or leads 140' or longer		\$66.53	\$87.23	\$107.92	X X H H D D D D Y
Work in excess of 12 per day M-F shall be paid at double time.					

EN-324-A220	12/10/2021				
Crane with boom & jib or leads 220' or longer		\$66.83	\$87.68	\$108.52	X X H H D D D D Y
Work in excess of 12 per day M-F shall be paid at double time.					

EN-324-A300	12/10/2021				
Crane with boom & jib or leads 300' or longer		\$68.33	\$89.93	\$111.52	X X H H D D D D Y
Work in excess of 12 per day M-F shall be paid at double time.					

EN-324-A400	12/10/2021				
Crane with boom & jib or leads 400' or longer		\$69.82	\$92.16	\$114.50	X X H H D D D D Y
Work in excess of 12 per day M-F shall be paid at double time.					

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<u>Classification</u>		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Name	Description					
EN-324-CW		12/10/2021				
	Compressor or welding machineWork in excess of 12 per day M-F shall be paid at double time.		\$54.86	\$69.72	\$84.58	X X H H D D D D Y
EN-324-FL		12/10/2021				
	Forklift, lull, extend-a-boom forkliftWork in excess of 12 per day M-F shall be paid at double time.		\$62.17	\$80.69	\$99.20	X X H H D D D D Y
EN-324-FO		12/9/2021				
	Fireman or oilerWork in excess of 12 per day M-F shall be paid at double time.		\$53.83	\$68.18	\$82.52	X X H H D D D D Y
EN-324-RC		12/10/2021				
	Regular crane, job mechanic, concrete pump with boomWork in excess of 12 per day M-F shall be paid at double time.		\$64.85	\$84.71	\$104.56	X X H H D D D D Y
EN-324-RE		12/10/2021				
	Regular engineer, hydro-excavator, remote controlled concrete breakerWork in excess of 12 per day M-F shall be paid at double time.		\$63.88	\$83.25	\$102.62	X X H H D D D D Y
	<b>Apprentice Rates:</b>					
	0-999 hours		\$46.35	\$58.48	\$70.61	
	1,000-1,999 hours		\$48.09	\$61.10	\$74.09	
	2,000-2,999 hours		\$49.82	\$63.68	\$77.55	
	3,000-3,999 hours		\$51.55	\$66.28	\$81.01	
	4,000-4,999 hours		\$53.29	\$68.90	\$84.49	
	5,000-5,999 hours		\$55.01	\$71.47	\$87.93	

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Classification Name      Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
OE-324-Statewide Journeyman - Class V	8/17/2023	\$38.25	\$49.62	\$60.99	X X X X X X X D Y
<b>Apprentice Rates:</b>					
		\$62.01	\$80.44	\$98.88	
		\$60.08	\$77.54	\$95.01	
		\$58.13	\$74.62	\$91.13	
		\$56.19	\$71.72	\$87.24	
		\$54.25	\$68.81	\$83.36	
		\$48.21	\$59.76	\$71.29	
<b>Apprentice Rates:</b>					
		\$62.01	\$80.44	\$98.88	
		\$60.08	\$77.54	\$95.01	
		\$58.13	\$74.62	\$91.13	
		\$56.19	\$71.72	\$87.24	
		\$54.25	\$68.81	\$83.36	
		\$48.21	\$59.76	\$71.29	
<b>Apprentice Rates:</b>					
		\$62.01	\$80.44	\$98.88	
		\$60.08	\$77.54	\$95.01	
		\$58.13	\$74.62	\$91.13	
		\$56.19	\$71.72	\$87.24	
		\$54.25	\$68.81	\$83.36	
		\$48.21	\$59.76	\$71.29	

# Official Commercial Prevailing Wage Rates for State Funded Projects

Issue Date: 8/18/2023

Contract must be awarded by: 11/16/2023

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Classification Name Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
<b>Apprentice Rates:</b>					
		31-36 months	\$62.01	\$80.44	\$98.88
		25-30 months	\$60.08	\$77.54	\$95.01
		19-24 months	\$58.13	\$74.62	\$91.13
		13-18 months	\$56.19	\$71.72	\$87.24
		7-12 months	\$54.25	\$68.81	\$83.36
		0-6 months	\$48.21	\$59.76	\$71.29
<hr/>					
<b>Operating Engineer - Marine Construction</b>					
<hr/>					
GLF D Diver/Wet Tender/Tender/Rov Pilot/Rov Tender	12/16/2021	\$52.81	\$78.57	\$104.32	H H H H H H D N
<hr/>					
GLF-1 Diver/Wet Tender, Engineer (hydraulic dredge) <i>make up day allowed</i>	1/7/2022	\$78.97	\$102.47	\$125.97	X X H H H H D Y
<i>Subdivision of county</i> all Great Lakes, islands therein, & connecting & tributary waters					
<hr/>					
GLF-2 Crane/Backhoe Operator, 70 ton or over Tug Operator, Mechanic/Welder, Assistant Engineer (hydraulic dredge), Leverman (hydraulic dredge), Diver Tender <i>make up day allowed</i>	1/7/2022	\$77.47	\$100.22	\$122.97	X X H H H H D Y
<i>Subdivision of county</i> All Great Lakes, islands therein, & connecting & tributary waters					
<hr/>					
GLF-2B Friction, Lattice Boom or Crane License Certification30 <i>make up day allowed</i>	1/7/2022	\$78.97	\$102.47	\$125.97	X X H H H H D Y
<i>Subdivision of county</i> All Great Lakes, islands, therein, & connecting & tributary waters					
<hr/>					
GLF-3 Deck Equipment Operator, Machineryman, Maintenance of Crane (over 50 ton capacity) or Backhoe (115,000 lbs or more), Tug/Launch Operator, Loader, Dozer on Barge, Deck Machinery <i>make up day allowed</i>	1/7/2022	\$72.92	\$93.40	\$113.87	X X H H H H D Y
<i>Subdivision of county</i> All Great Lakes, islands therein, & connecting & tributary waters					
<hr/>					

Official Request #: 331

Requestor: Hobbs+Black Associates, Inc.

Project Description: MSP Northville Forensic Lab Elevator Replacement

Project Number: 551/21167.TYC

County: Statewide

### Official Rate Schedule

**Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.**

**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

**Contract must be awarded by: 11/16/2023**

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Classification Name Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
GLF-4 Deck Equipment Operator, (Machineryman/Fireman), (4 equipment units or more), Off Road Trucks, Deck Hand, Tug Engineer, & Crane Maintenance 50 ton capacity and under or Backhoe 115,000 lbs or less, Assistant Tug Operator <i>make up day allowed</i>	1/7/2022	\$66.72	\$84.10	\$101.47	X X H H H H H D Y
<i>Subdivision of county</i> All Great Lakes, islands therein, & connecting & tributary waters					
<b>Operating Engineer Steel Work</b>					
EN-324-ef Forklift, 1 Drum Hoist <i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather	12/9/2021	\$59.30	\$76.43	\$93.56	H H D H H H D D Y
EN-324-SW120 Crane w/ 120' boom or longer <i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather	12/10/2021	\$68.61	\$90.40	\$112.18	H H D H H H D D Y
EN-324-SW120-O Crane w/ 120' boom or longer w/ Oiler <i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather	12/10/2021	\$69.61	\$91.90	\$114.18	H H D H H H D D Y
EN-324-SW140 Crane w/ 140' boom or longer <i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather	12/10/2021	\$69.79	\$92.17	\$114.54	H H D H H H D D Y
EN-324-SW140-O Crane w/ 140' boom or longer W/ Oiler <i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather	12/10/2021	\$70.79	\$93.67	\$116.54	H H D H H H D D Y
EN-324-SW220 Boom & Jib 220' or longer <i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather	12/10/2021	\$70.06	\$92.57	\$115.08	H H D H H H D D Y
EN-324-SW220-O Crane w/ 220' boom or longer w/ Oiler	12/10/2021	\$71.06	\$94.07	\$117.08	H H D H H H D D Y

Official Request #: 331

Requestor: Hobbs+Black Associates, Inc.

Project Description: MSP Northville Forensic Lab Elevator Replacement

Project Number: 551/21167.TYC

County: Wayne

**Official Rate Schedule**

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# Official Commercial Prevailing Wage Rates for State Funded Projects

Issue Date: 8/18/2023

Contract must be awarded by: 11/16/2023

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Classification Name Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
<i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather					
EN-324-SW300 Boom & Jib 300' or longer	12/10/2021	\$71.56	\$94.82	\$118.08	H H D H H H D D Y
<i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather					
EN-324-SW300-O Crane w/ 300' boom or longer w/ Oiler	12/10/2021	\$72.56	\$93.20	\$113.84	H H D H H H D D Y
<i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather					
EN-324-SW400 Boom & Jib 400' or longer	12/10/2021	\$73.06	\$97.07	\$121.08	H H D H H H D D Y
<i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather					
EN-324-SW400-O Crane w/ 400' boom or longer w/ Oiler	12/10/2021	\$74.06	\$98.57	\$123.08	H H D H H H D D Y
<i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather					
EN-324-SWCO Crane Operator, Job Mechanic, 3 Drum Hoist & Excavator	12/10/2021	\$68.25	\$89.86	\$111.46	H H D H H H D D Y
<b>Apprentice Rates:</b>					
		0-999 hours	\$49.22	\$62.96	\$76.70
		1,000-1,999 hours	\$51.18	\$65.90	\$80.62
		2,000-2,999 hours	\$53.15	\$68.85	\$84.56
		3,000-3,999 hours	\$55.11	\$71.80	\$88.48
		4,000-4,999 hours	\$57.07	\$74.74	\$92.40
		5,000 hours	\$59.04	\$77.69	\$96.34
<i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather					
EN-324-SWCO-O Crane Operator w/ Oiler	12/10/2021	\$69.25	\$91.36	\$113.46	H H D H H H D D Y
<i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather					
EN-324-SWCW Compressor or Welder Operator	12/10/2021	\$37.03	\$49.48	\$61.92	H H D H H H D D Y

Official Request #: 331

Requestor: Hobbs+Black Associates, Inc.

Project Description: MSP Northville Forensic Lab Elevator Replacement

Project Number: 551/21167.TYC

County: Wayne

### Official Rate Schedule

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**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

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Classification	Name	Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
		<i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather					
EN-324-SWHO		Hoisting Operator, 2 Drum Hoist, & Rubber Tire Backhoe	12/10/2021	\$67.61	\$88.90	\$110.18	H H D H H H D D Y
		<i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather					
EN-324-SWO		Oiler	12/10/2021	\$53.42	\$67.61	\$81.80	H H D H H H D D Y
		<i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather					
EN-324-SWTD50		Tower Crane & Derrick where work is 50' or more	12/10/2021	\$69.34	\$91.49	\$113.64	H H D H H H D D Y
		<i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather					
EN-324-SWTD50-O		Tower Crane & Derrick 50' or more w/ Oiler	12/10/2021	\$70.34	\$92.99	\$115.64	H H D H H H D D Y
		<i>comment make up day allowed</i> 4 10s allowed M-Th with Friday makeup day because of bad weather					

**Operating Engineer Underground**

EN-324A1-UC1		Class I Equipment	8/7/2023	\$64.39	\$81.49	\$98.59	X X X X X X X D Y
		<b>Apprentice Rates:</b>					
		0-999 hours		\$51.62	\$65.39	\$79.15	
		1,000-1,999 hours		\$53.59	\$68.34	\$83.09	
		2,000-2,999 hours		\$55.10	\$73.53	\$87.21	
		3,000-3,999 hours		\$57.52	\$74.23	\$90.95	
		4,000-4,999 hours		\$59.49	\$77.19	\$94.88	
		5,000-5,999 hours		\$61.45	\$80.14	\$98.82	
EN-324A1-UC2		Class II Equipment	8/7/2023	\$59.66	\$74.71	\$89.75	X X X X X X X D Y

Official Request #: 331  
 Requestor: Hobbs+Black Associates, Inc.  
 Project Description: MSP Northville Forensic Lab Elevator Replacement  
 Project Number: 551/21167.TYC  
 County: Wayne

**Official Rate Schedule**  
**Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.**



**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

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Classification Name Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
EN-324A1-UC3 Class III Equipment	8/7/2023	\$58.93	\$73.66	\$88.38	X X X X X X X D Y
EN-324A1-UC4 Class IV Equipment	8/7/2023	\$58.36	\$72.84	\$87.32	X X X X X X X D Y
<b>Painter</b>					
CE514-PT Painter	12/9/2021	\$50.12	\$64.80	\$79.73	H H H H H H H D Y
		<b>Apprentice Rates:</b>			
		1st period	\$35.19	\$42.41	\$49.87
		2nd period	\$38.18	\$46.89	\$55.85
		3rd period	\$41.16	\$51.36	\$61.81
		4th period	\$45.64	\$58.08	\$70.77
<b>Pipe and Manhole Rehab</b>					
TM247 General Laborer for rehab work or normal cleaning and cctv work-top man, scaffold man, CCTV assistant, jetter-vac assistant	4/17/2015	\$28.20	\$38.20		H H H H H H H N
TM247-2 Tap cutter/CCTV Tech/Grout Equipment Operator: unit driver and operator of CCTV; grouting equipment and tap cutting equipment	4/17/2015	\$32.70	\$44.95		H H H H H H H N
TM247-3 CCTV Technician/Combo Unit Operator: unit driver and operator of cctv unit or combo unit in connection with normal cleaning and televising work	4/17/2015	\$31.45	\$43.07		H H H H H H H N
TM247-4 Boiler Operator: unit driver and operator of steam/water heater units and all ancillary equipment associated	4/17/2015	\$33.20	\$45.70		H H H H H H H N

Official Request #: 331  
 Requestor: Hobbs+Black Associates, Inc.  
 Project Description: MSP Northville Forensic Lab Elevator Replacement  
 Project Number: 551/21167.TYC  
 County: Statewide

**Official Rate Schedule**  
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**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

**Contract must be awarded by: 11/16/2023**

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Classification	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Name Description					

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TM247-5	4/17/2015				
Combo Unit driver & Jetter-Vac Operator		\$33.20	\$45.70		H H H H H H H H N

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TM247-6	4/17/2015				
Pipe Bursting & Slip-lining Equipment Operator		\$34.20	\$47.20		H H H H H H H H N

**Pipefitter**

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PF-636	11/16/2021				
Pipefitter, Steamfitter, HVAC-R mechanic		\$77.06	\$100.47	\$118.67	H H D H H D D D Y

**Apprentice Rates:**

1st & 2nd periods	\$34.00	\$43.98	\$52.60
3rd period	\$35.25	\$45.85	\$55.10
4th period	\$36.25	\$47.35	\$57.10
5th period	\$36.98	\$48.44	\$58.56
6th period	\$38.23	\$50.32	\$61.06
7th period	\$39.48	\$52.20	\$63.56
8th period	\$40.48	\$53.70	\$65.56
9th period	\$41.48	\$55.20	\$67.56
10th period	\$42.91	\$57.34	\$70.42

*comment*  
Four 10s allowed during the week preceding, following and/or the week of a holiday.

**Plumber**

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PL-98	12/3/2021				
Plumber		\$74.14	\$91.76	\$109.38	H H D H D D D D Y

**Apprentice Rates:**

1st Year	\$27.71	\$36.50	\$45.29
2nd Year	\$31.66	\$41.44	\$51.22
3rd Year	\$33.19	\$43.71	\$54.23

*comment*  
4 tens allowed M-Th or T-F; OT of time and one half required on 11th & 12th hour of any ten hour days

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Official Request #: 331  
 Requestor: Hobbs+Black Associates, Inc.  
 Project Description: MSP Northville Forensic Lab Elevator Replacement  
 Project Number: 551/21167.TYC  
 County: Wayne

**Official Rate Schedule**  
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**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

**Contract must be awarded by: 11/16/2023**

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Classification	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Name Description					

**Roofer**

RO-149-WOM	1/18/2022				
Commercial Roofer		\$62.82	\$79.68	\$96.53	X X H X X H H D N
	<b>Apprentice Rates:</b>				
	new apprentice	\$48.68	\$58.47	\$68.25	
	Apprentice 1	\$48.74	\$58.55	\$68.37	
	Apprentice 2	\$49.25	\$59.32	\$69.39	
	Apprentice 3	\$50.76	\$61.59	\$72.41	
	Apprentice 4	\$52.26	\$63.83	\$75.41	
	Apprentice 5	\$53.77	\$66.10	\$78.43	
	Apprentice 6	\$55.18	\$68.21	\$81.25	
	Apprentice 7	\$56.79	\$70.63	\$84.47	
	Apprentice 8	\$58.27	\$72.85	\$87.43	

**Sewer Relining**

SR-I	12/10/2021				
Class I-Operator of audio visual CCTV system including remote in-ground cutter and other equipment used in conjunction with CCTV system.		\$49.71	\$67.42	\$85.13	H H H H H H H D N
	<b>Apprentice Rates:</b>				
	0-6 months	\$39.05	\$51.43	\$63.81	
	6-12 months	\$42.83	\$57.10	\$71.37	

SR-II	12/10/2021				
Class II-Operator of hot water heaters and circulation system; water jettors; and vacuum and mechanical debris removal systems and those assisting.		\$47.67	\$64.36	\$81.05	H H H H H H H D N

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 Requestor: Hobbs+Black Associates, Inc.  
 Project Description: MSP Northville Forensic Lab Elevator Replacement  
 Project Number: 551/21167.TYC  
 County: Statewide

**Official Rate Schedule**  
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**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

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Classification		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Name	Description					

**Sheet Metal Worker**

SHM-80		8/3/2023				
Journeyman - A 4 10 schedule may be worked, 4 consecutive days Monday thru Friday.			\$74.96	\$95.01	\$115.06	H H D H D D D D Y

**Apprentice Rates:**

1st & 2nd Periods	\$48.51	\$59.65	\$70.77
3rd & 4th Periods	\$50.74	\$62.99	\$75.23
5th & 6th Periods	\$52.96	\$66.32	\$79.67
7th & 8th Periods	\$55.19	\$69.67	\$84.13

**Sprinkler Fitter**

SP 704		8/9/2023				
Sprinkler Fitter Journeyman - 4 ten hour days allowed Monday-Friday Double time pay due after 12 hours worked M-F			\$78.57	\$102.66	\$126.74	H H D H D D D D N

**Apprentice Rates:**

1st Period	\$31.91	\$40.00	\$48.09
2nd Period	\$51.25	\$60.36	\$69.47
3rd Period	\$53.58	\$63.71	\$73.83
4th Period	\$55.91	\$67.04	\$78.17
5th Period	\$58.25	\$70.40	\$82.55
6th Period	\$60.58	\$73.73	\$86.89
7th Period	\$62.91	\$77.08	\$91.24
8th Period	\$65.25	\$80.44	\$95.62
9th Period	\$67.58	\$83.78	\$99.98
10th Period	\$69.91	\$87.12	\$104.33

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Project Description: MSP Northville Forensic Lab Elevator Replacement

Project Number: 551/21167.TYC

County: Wayne

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**Official Commercial Prevailing Wage Rates for State Funded Projects**

**Issue Date: 8/18/2023**

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Classification	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Name	Description				

**Tile, Marble and Terrazzo**

BR2-F	12/3/2021				
Tile, Marble and Terrazzo Finisher		\$51.67	\$66.51	\$81.34	H H D H D D D D Y

**Apprentice Rates:**

1st Period	\$34.76	\$44.41	\$54.05
2nd Period	\$36.24	\$46.63	\$57.01
3rd Period	\$37.72	\$48.85	\$59.97
4th Period	\$39.21	\$51.08	\$62.95
5th Period	\$40.69	\$53.30	\$65.91
6th Period	\$42.17	\$55.52	\$68.87

BR2-TMT	12/3/2021				
Tile, Marble Terrazzo Setter		\$58.80	\$77.20	\$95.60	H H D H D D D D Y

**Apprentice Rates:**

1st Period	\$38.77	\$49.81	\$60.85
2nd Period	\$40.61	\$52.57	\$64.53
3rd Period	\$42.45	\$55.33	\$68.21
4th Period	\$44.29	\$58.09	\$71.89
5th Period	\$46.13	\$60.85	\$75.57
6th Period	\$47.97	\$63.61	\$79.25
7th Period	\$49.81	\$66.37	\$82.93
8th Period	\$51.65	\$69.13	\$86.61

**Truck Driver**

TM-RB1	1/12/2022				
on all trucks of 8 cubic yard capacity or less (except dump trucks of 8 cubic yard capacity or over, tandem axle trucks, transit mix and semis, euclid type equipment, double bottoms and low boys)		\$52.34	\$67.88	\$83.42	H H H H H H D Y

TM-RB1A	1/12/2022				
of all trucks of 8 cubic yard capacity or over semi, tractor trailer		\$52.49	\$68.11	\$83.72	H H H H H H D Y

Official Request #: 331  
 Requestor: Hobbs+Black Associates, Inc.  
 Project Description: MSP Northville Forensic Lab Elevator Replacement  
 Project Number: 551/21167.TYC  
 County: Wayne

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Official Commercial Prevailing Wage Rates for State Funded Projects

Issue Date: 8/18/2023

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<u>Classification</u>		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
TM-RB1B		1/12/2022				
on euclid type equipment, Pole drier, lowboy, doubles, fuel, bus, water			\$52.59	\$67.28	\$81.97	H H H H H H D Y
<i>make up day allowed</i>						

Official Request #: 331

Requestor: Hobbs+Black Associates, Inc.

Project Description: MSP Northville Forensic Lab Elevator Replacement

Project Number: 551/21167.TYC

County: Wayne

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## SECTION 012500 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.01 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.

#### 1.02 SUMMARY:

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements are Included in the Following Sections:
  - 1. Section 012513 Substitution Request Form to fill in and submit attesting to compliance of substitution with specified requirements.
  - 2. Section 016000 Product Requirements for submitting comparable product submittals for products by listed manufacturers.

#### 1.03 DEFINITIONS:

- A. Substitutions: Changes in products, materials, equipment and methods of construction from those required by the Contract Documents and proposed by Contractor.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 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.

#### 1.04 ACTION SUBMITTALS:

- A. Substitution Requests: Submit electronic files in PDF format of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use only Section 012513 Substitution Request Form as a template to complete.
  - 2. Submit a separate request for each product. Each request shall be on a separate "Substitution Request Form".
  - 3. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution. Contractor will

coordinate installation as an accepted substitution into the Work, and make such other changes as may be required to make the work complete in all respects with no additional cost to the Owner or other contractors.

- c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may 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 Work specified.
- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
- e. Samples, where applicable or requested.
- f. Certificates and qualification data, where applicable or requested.
- g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
- h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
- i. Research reports evidencing compliance with building code in effect for Project.
- j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
- k. Cost information, including a proposal of change, if any, in the Contract Sum.
- l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
- m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- n. Provide availability of maintenance and repair services, and sources of repair or replacement items.

4. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
- b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### 1.05 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.

#### 1.06 PROCEDURES:

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved



substitutions.

- B. Substitutions WILL NOT be considered when they are indicated or implied on shop drawings or product data submittals, without separate written request

## PART 2 - PRODUCTS

### 2.01 SUBSTITUTIONS:

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 30 days prior to time required for preparation and review of related submittals.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Substitution request is fully documented and properly submitted.
    - c. Requested substitution will not adversely affect Contractor's construction schedule.
    - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - e. Requested substitution is compatible with other portions of the Work.
    - f. Requested substitution has been coordinated with other portions of the Work.
    - g. Requested substitution provides specified warranty.
    - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received before Award of Subcontract. Requests received after that time may be considered or rejected at discretion of Architect.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    - b. Requested substitution does not require extensive revisions to the Contract Documents.
    - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - d. Substitution request is fully documented and properly submitted.
    - e. Requested substitution will not adversely affect Contractor's construction schedule.
    - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - g. Requested substitution is compatible with other portions of the Work.
    - h. Requested substitution has been coordinated with other portions of the Work.
    - i. Requested substitution provides specified warranty.

- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION

(NOT APPLICABLE)

END OF SECTION 012500

SECTION 012513 - SUBSTITUTION REQUEST FORM

PART 1 - GENERAL

1.01 IDENTIFICATION:

A. Request Number: \_\_\_\_\_

B. Contractor: \_\_\_\_\_

C. Subcontractor: \_\_\_\_\_

1.02 REQUEST:

A. We hereby submit for consideration the following product in place of the specified product for this project:

Specified Product	Specification Section/Reference	Drawing(s)
_____	_____	_____

Proposed Substitution: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Location: \_\_\_\_\_

Product Website URL: \_\_\_\_\_ Phone: \_\_\_\_\_

Product Name: \_\_\_\_\_ Model ID: \_\_\_\_\_

Time Used:  New;  1-2 yrs.;  3-5 yrs.;  5-10 yrs.;  > 10 yrs.

Difference Between Proposed Substitution and Specified Product: \_\_\_\_\_

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

1.03 INFORMATION:

A. Attach complete information for changes to Drawings and/or Specifications which the proposed substitution will require for its proper installation.

1.04 SUBMISSION:

A. Submit with request all necessary samples and substantiating data to establish equivalent quality and performance to the specified product. Clearly mark manufacturer's literature to indicate equivalent performance.

1.05 AFFIRMATION:

A. Does the substitution affect dimension shown on the Drawings? Yes \_\_\_ No \_\_\_ If yes, clearly indicate how: \_\_\_\_\_

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B. Does the substitution result in a (credit \_\_) (add \_\_) (no change \_\_) to base contract amount?

If Credit/Add, How Much: (-/+)\_\_\_\_\_

C. Will the Undersigned pay for all additional costs resulting from the proposed substitution including Architect's and Consultants' additional services? Yes \_\_\_ No \_\_\_ If no, fully explain:

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D. What effect does the substitution have on other subcontracts or trades?

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E. What effect does the substitution have on the construction schedule?

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F. Are manufacturer's warranties for the proposed and specified products the same? Yes \_\_\_ No \_\_\_ If no, explain or provide attachment \_\_\_\_\_

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G. Reason for substitution request: \_\_\_\_\_

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H. Itemized comparison of specified product(s) and proposed substitution:

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I. Accurate cost data comparing proposed substitution with specified product:

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J. Differences of maintenance services and sources: \_\_\_\_\_

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1.06 AFFIRMATION DOCUMENTATION:

- A. Submit executed affidavit from Product Manufacturer as required in article 4.4.3.1 of the General Conditions.
- B. Additionally submit Testing Laboratory Certificate as required in article 4.4.3.2 of the General Conditions.
- C. Contractor is specifically bound by the requirements of article 4.4.4 of the General Conditions in addition to those of this Section.

1.07 ARCHITECT'S ACTION:

- A. Refer to Applied Stamp with Annotations.

PARTS 2 AND 3 - PRODUCTS AND EXECUTION

(Not Applicable)

END OF SECTION 012513

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## SECTION 012900 - PAYMENT PROCEDURES

### PART 1 - GENERAL

#### 1.01 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.

#### 1.02 SUMMARY:

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements are Included in the Following Sections:
  - 1. Section 013200 Construction Progress Documentation for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
  - 2. Section 013233 Photographic Documentation for submitting final completion construction photographic documentation.
  - 3. Section 017700 Closeout Procedures for conducting Substantial Completion procedures, Final Completion procedures, preparing lists of incomplete work, and final cleaning.
  - 4. Section 017823 Operation and Maintenance Data for operation and maintenance manual requirements.
  - 5. Section 017836 Warranties for warranty requirements.
  - 6. Section 017839 Project Record Documents for submitting Record Drawings, Record Specifications, and Record Product Data.

#### 1.03 DEFINITIONS:

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment. Comply with Owner's Standard General Conditions of the Contract for Construction including requirements for Cost Code Breakdown and use of Scheduled Forms.

#### 1.04 SCHEDULE OF VALUES:

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
  - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

- a. Application for Payment forms with continuation sheets.
  - b. Submittal schedule.
  - c. Items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Owner/Architect at earliest possible date, but no later than 30 days before the date scheduled for submittal of initial Applications for Payment.
  3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
  4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
    - a. Project name and location.
    - b. Name of Architect.
    - c. Architect's project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
    - a. Related specification section or division.
    - b. Description of Work.
    - c. Name of subcontractor.
    - d. Name of manufacturer or fabricator.
    - e. Name of supplier.
    - f. Change Orders (numbers) that affect value.
    - g. Dollar value of the following, as a percentage of Contract Sum to the nearest one-hundredth percent adjusted to total 100 percent.
      - (1) Labor.
      - (2) Materials.
      - (3) Equipment.
  3. Provide a breakdown of Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
    - a. Include separate line items under Contractor and principal subcontracts for Project



closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

4. Round amounts off to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance.
6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
9. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work in-place may be shown as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
10. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.05 APPLICATIONS FOR PAYMENT:

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
  1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and Final Application for Payment involve additional requirements.
- B. Progress payments will be made monthly on date determined by Owner for construction work performed in the preceding thirty days.
  1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703.
- D. Retainage: Ten (10) percent of the estimated amounts will be retained until Substantial Completion.
  - 1. The balance of the retained percentage will be paid thirty (30) days after Owner's acceptance of Work, providing that all requirements of the Contract are met.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
  - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
  - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
  - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
  - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  - 3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- G. Transmittal: Submit not less than four signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments as required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  2. When an application shows completion of an item, submit conditional final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  5. Waiver Forms: Use forms in Schedule 3 of the General Conditions.
  6. Sworn Statement Forms: Use forms in Schedule 3 of the General Conditions.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first application for payment include the following as applicable:
1. List of subcontractors.
  2. List of principal suppliers and fabricators.
  3. Schedule of values.
  4. LEED submittal for project materials cost data.
  5. Contractors construction schedule (preliminary if not final).
  6. Products list (preliminary if not final).
  7. LEED action plans.
  8. Schedule of unit prices.
  9. Submittal schedule (preliminary if not final).
  10. List of Contractor's staff assignments.
  11. List of Contractor's principal consultants.
  12. Copies of building permits.

13. Copies of authorizations and licenses from governing authorities for performance of the Work.
  14. Initial progress report.
  15. Report of preconstruction meeting.
  16. Certificates of insurance and insurance policies.
  17. Performance and payment bonds.
  18. Initial settlement survey and damage report.
  19. Data needed to acquire Owner's insurance.
- J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete. Reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work. Administrative actions and submittals that must precede or coincide with this application include:
1. Occupancy permits and similar approvals.
  2. Warranties and maintenance agreements.
  3. Test/adjust/balance records.
  4. Maintenance instructions.
  5. Meter readings.
  6. Start-up performance reports.
  7. Change-over information related to Owner's occupancy, use, operation and maintenance.
  8. Final cleaning.
  9. Application for reduction of retainage and consent of surety.
  10. Advice on transferring insurance coverages.
  11. Final progress photographs.
  12. List of incomplete work recognized as exceptions to Architect's Certificate of Substantial Completion.
- K. Final Payment Application: Administrative actions and submittals which must precede or

coincide with submittal of the final application for payment include the following:

1. Completion of project closeout requirements including those specified in Section 017700.
2. Completion of items specified for completion after Substantial Completion.
3. Assurance that unsettled claims will be settled as acceptable to Owner and Architect.
4. Assurance that work not complete and accepted will be completed without undue delay as acceptable to Owner and Architect.
5. Transmittal of required project construction records to Owner.
6. Certified property survey.
7. Insurance certificates for products and completed operations where required.
8. Updated final statement, accounting for final changes to the Contract Sum.
9. AIA Document G706, Contractor's Affidavit of Payment of Debts and Claims.
10. AIA Document G706A, Contractor's Affidavit of Release of Liens.
11. AIA Document G707, Consent of Surety to Final Payment.
12. Proof that taxes, fees and similar obligations have been paid.
13. Removal of temporary facilities and controls.
14. Removal of surplus materials, rubbish and similar elements.
15. Change of lock cylinders to Owner's access.
16. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
17. Final liquidated damages settlement statement (if any).

## PART 2 - PRODUCTS

(NOT APPLICABLE)

## PART 3 - EXECUTION

(NOT APPLICABLE)

## PAYMENT PROCEDURES

012900 - 7

SOM – DTMB  
MSP Northville Forensic Laboratory Elevator Replacement  
ISSUED FOR BID

H+B Project No. 22300  
08/18/23

END OF SECTION 012900

## SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

#### 1.01 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.

#### 1.02 SUMMARY:

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project Web site.
5. Project meetings.

- B. Related Requirements are Included in the Following Sections:

1. Section 013200 Construction Progress Documentation for preparing and submitting Contractor's construction schedule.
2. Section 017300 Execution for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 Closeout Procedures for coordinating closeout of the Contract.

#### 1.03 DEFINITIONS:

- A. RFI: Request from Owner or Contractor seeking information required by or clarifications of the Contract Documents.

#### 1.04 INFORMATIONAL SUBMITTALS:

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key

personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, on Project Web site, and by each temporary telephone. Keep list current at all times.

1.05 GENERAL COORDINATION PROCEDURES:

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service and repair.
  3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
  2. Preparation of the schedule of values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Preinstallation conferences.
  7. Project closeout activities.
  8. Startup and adjustment of systems.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.



1.06 COORDINATION DRAWINGS:

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations and details as needed to describe relationship of various systems and components.
    - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical and electrical systems.
    - c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    - d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    - e. Indicate required installation sequences.
    - f. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. 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.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
  2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical 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.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
  6. Mechanical and Plumbing Work: Show the following:
    - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.

- c. Fire-rated enclosures around ductwork.
    7. Electrical Work: Show the following:
      - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
      - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
      - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
      - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
    8. Fire-Protection System: Show the following:
      - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
    9. 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.
    10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 Submittal Procedures.
  - C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
    1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
    2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
    3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
      - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
      - b. Digital Data Software Program: Drawings are available in AutoCAD 2016, Version M.107.0.0, dwg format using only AutoDesk software.
      - c. Contractor shall execute a data licensing agreement in the form of Section 013318.
- 1.07 REQUESTS FOR INFORMATION (RFIs):
- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
    1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
    2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
  - B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
  2. Project number.
  3. Date.
  4. Name of Contractor.
  5. Name of Architect.
  6. RFI number, numbered sequentially.
  7. RFI subject.
  8. Specification Section number and title and related paragraphs, as appropriate.
  9. Drawing number and detail references, as appropriate.
  10. Field dimensions and conditions, as appropriate.
  11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  12. Contractor's signature.
  13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software generated form with substantially the same content as indicated above, acceptable to Architect and Owner.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or inaccurately prepared RFIs.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract

Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 Contract Modification Procedures.

- a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Owner in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain and submit a tabular log of RFIs organized by the RFI number. Maintain and update log daily. Use software log that is part of Project Web site, which includes not less than the following:
1. Project name.
  2. Name and address of Contractor.
  3. Name and address of Architect.
  4. RFI number including RFIs that were returned without action or withdrawn.
  5. RFI description.
  6. Date the RFI was submitted.
  7. Date Architect's response was received.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.08 PROJECT WEB SITE:

- A. Provide, administer and use Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:
1. Project directory.
  2. Project correspondence.
  3. Meeting minutes.
  4. Contract modifications forms and logs.
  5. RFI forms and logs.
  6. Task and issue management.

7. Photo documentation.
  8. Schedule and calendar management.
  9. Submittals forms and logs.
  10. Payment application forms.
  11. Drawing and specification document hosting, viewing, and updating.
  12. Online document collaboration.
  13. Reminder and tracking functions.
  14. Archiving functions.
- B. Provide up to 25 Project Web site user licenses for use of the Owner, Owner's Commissioning Authority, Architect, and Architect's consultants. Provide up to eight hours of software training at Architect's office for Project Web site users.
- C. On completion of Project, provide one complete archive copy of Project Web site files to Owner and to Architect in a digital storage format acceptable to Architect.
- D. Provide Project Web site software package designated by Owner under current published licensing agreement.
- E. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement in the form of an Agreement acceptable to Owner and Architect.
- 1.09 PROJECT MEETINGS:
- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
  2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the

conference shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect progress, including the following:

- a. Tentative construction schedule.
- b. Phasing.
- c. Critical work sequencing and long-lead items.
- d. Designation of key personnel and their duties.
- e. Lines of communications.
- f. Procedures for processing field decisions and Change Orders.
- g. Procedures for RFIs.
- h. Procedures for testing and inspecting.
- i. Procedures for processing Applications for Payment.
- j. Distribution of the Contract Documents.
- k. Submittal procedures.
- l. Sustainable design requirements.
- m. Preparation of record documents.
- n. Use of the premises.
- o. Work restrictions.
- p. Working hours.
- q. Owner's occupancy requirements.
- r. Responsibility for temporary facilities and controls.
- s. Procedures for moisture and mold control.
- t. Procedures for disruptions and shutdowns.
- u. Construction waste management and recycling.
- v. Parking availability.
- w. Office, work, and storage areas.
- x. Equipment deliveries and priorities.
- y. First aid.
- z. Security.
- aa. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Owner, and Owner's Commissioning Authority of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
  - a. Contract Documents.
  - b. Options.
  - c. Related RFIs.
  - d. Related Change Orders.
  - e. Purchases.
  - f. Deliveries.
  - g. Submittals.
  - h. Sustainable design requirements.

- i. Review of mockups.
  - j. Possible conflicts.
  - k. Compatibility requirements.
  - l. Time schedules.
  - m. Weather limitations.
  - n. Manufacturer's written instructions.
  - o. Warranty requirements.
  - p. Compatibility of materials.
  - q. Acceptability of substrates.
  - r. Temporary facilities and controls.
  - s. Space and access limitations.
  - t. Regulations of authorities having jurisdiction.
  - u. Testing and inspecting requirements.
  - v. Installation procedures.
  - w. Coordination with other work.
  - x. Required performance results.
  - y. Protection of adjacent work.
  - z. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of record documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Submittal of written warranties.
    - d. Requirements for completing sustainable design documentation.
    - e. Requirements for preparing operations and maintenance data.
    - f. Requirements for delivery of material samples, attic stock, and spare parts.
    - g. Requirements for demonstration and training.
    - h. Preparation of Contractor's punch list.
    - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.

- j. Submittal procedures.
  - k. Coordination of separate contracts.
  - l. Owner's partial occupancy requirements.
  - m. Installation of Owner's furniture, fixtures, and equipment.
  - n. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at weekly intervals.
- 1. Coordinate dates of meetings with preparation of payment requests.
  - 2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Resolution of BIM component conflicts.
      - 4) Status of submittals.
      - 5) Status of sustainable design documentation.
      - 6) Deliveries.
      - 7) Off-site fabrication.
      - 8) Access.
      - 9) Site utilization.
      - 10) Temporary facilities and controls.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Status of correction of deficient items.
      - 14) Field observations.
      - 15) Status of RFIs.
      - 16) Status of proposal requests.



- 17) Pending changes.
  - 18) Status of Change Orders.
  - 19) Pending claims and disputes.
  - 20) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
    - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    - c. Review present and future needs of each contractor present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Resolution of BIM component conflicts.
      - 4) Status of submittals.
      - 5) Deliveries.
      - 6) Off-site fabrication.
      - 7) Access.
      - 8) Site utilization.
      - 9) Temporary facilities and controls.
      - 10) Work hours.
      - 11) Hazards and risks.
      - 12) Progress cleaning.
      - 13) Quality and work standards.
      - 14) Change Orders.
  3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

SOM – DTMB  
MSP Northville Forensic Laboratory Elevator Replacement  
ISSUED FOR BID

H+B Project No. 22300  
08/18/23

PART 2 - PRODUCTS

(NOT APPLICABLE)

PART 3 - EXECUTION

(NOT APPLICABLE)

END OF SECTION 013100

## SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

### PART 1 - GENERAL

#### 1.01 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.

#### 1.02 SUMMARY:

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work.

- B. Required schedules include the following:

1. Startup construction schedule.
2. Contractor's construction schedule.

- C. Required reports include the following:

1. Construction schedule updating reports.
2. Daily construction reports.
3. Material location reports.
4. Site condition reports.
5. Special reports.

- D. Related Requirements are Included in the Following Sections:

1. Section 012900 Payment Procedures for requirements for Applications for Payment for Substantial and Final Completion.
2. Section 013300 Submittal Procedures for submitting schedules and reports.
3. Section 014000 Quality Requirements for submitting a schedule of tests and inspections.

#### 1.03 DEFINITIONS:

- A. 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 Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
  - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
  - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
  - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.04 INFORMATIONAL SUBMITTALS:

- A. Format for Submittals: Submit required submittals in the following format:
  - 1. Working electronic copy of schedule file, where indicated.
  - 2. PDF electronic file.
- B. Startup Construction Schedule: Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
  - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
  - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

3. Total Float Report: List of all activities sorted in ascending order of total float.
  4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.
- G. Daily Construction Reports: Submit at weekly intervals.
- H. Material Location Reports: Submit at weekly intervals.
- I. Field Correction Reports: Submit at time when corrective action is required.
- J. Special Reports: Submit at time of unusual event.
- 1.05 QUALITY ASSURANCE:
- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 Project Management and Coordination. Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
  2. Verify availability of qualified personnel needed to develop and update schedule.
  3. Discuss constraints, including phasing, work stages, interim milestones, and partial Owner occupancy.
  4. Review delivery dates for Owner-furnished products.
  5. Review schedule for work of Owner's separate contracts.
  6. Review submittal requirements and procedures.
  7. Review time required for review of submittals and resubmittals.
  8. Review requirements for tests and inspections by independent testing and inspecting agencies.
  9. Review time required for Project closeout and Owner startup procedures including commissioning activities.
  10. Review and finalize list of construction activities to be included in schedule.
  11. Review procedures for updating schedule.
- 1.06 COORDINATION:
- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from entities

involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

## PART 2 - PRODUCTS

### 2.01 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL:

- A. Time Frame: Extend schedule from date established for Commencement of the Work to date of Substantial Completion.
  1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
  1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
  2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication and delivery.
  3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 Submittal Procedures in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
  4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
  5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
  6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
  1. Phasing: Arrange list of activities on schedule by phase.
  2. Work under More Than One Contract: Include a separate activity for each contract.
  3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
  4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 Summary. Delivery dates indicated stipulate the earliest possible delivery date.
  5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 Summary. Delivery dates indicated stipulate the earliest

possible delivery date.

6. Work Restrictions: Show the effect of the following items on the schedule:
  - a. Coordination with existing construction.
  - b. Limitations of continued occupancies.
  - c. Uninterruptible services.
  - d. Partial occupancy before Substantial Completion.
  - e. Use of premises restrictions.
  - f. Provisions for future construction.
  - g. Seasonal variations.
  - h. Environmental control.
  
7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
  - a. Subcontract awards.
  - b. Submittals.
  - c. Purchases.
  - d. Mockups.
  - e. Fabrication.
  - f. Sample testing.
  - g. Deliveries.
  - h. Installation.
  - i. Tests and inspections.
  - j. Adjusting.
  - k. Curing.
  - l. Building flush-out.
  - m. Startup and placement into final use and operation.
  
8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
  - a. Structural completion.
  - b. Temporary enclosure and space conditioning.
  - c. Permanent space enclosure.
  - d. Completion of mechanical installation.
  - e. Completion of electrical installation.
  - f. Substantial Completion.
  
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, final completion, and the following interim milestones:
  1. Temporary enclosure and space conditioning.
  
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
  1. See Section 012900 Payment Procedures for cost reporting and payment procedures.
  
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
  2. Unanswered Requests for Information.
  3. Rejected or unreturned submittals.
  4. Notations on returned submittals.
  5. Pending modifications affecting the Work and Contract Time.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules. Use software compatible with Project Web site software specified in Section 013100 Project Management and Coordination.

#### 2.02 STARTUP CONSTRUCTION SCHEDULE:

- A Startup Network Diagram: Prepare preliminary network diagram outlining activities for the first 90 days of construction. Include a skeleton diagram for remainder of the Work with preliminary diagram.
1. Include each significant construction activity. Coordinate each activity in network with other activities. Schedule each construction activity in proper sequence.
  2. Indicate completion of the Work in advance of date established for Substantial Completion.
  3. Submit diagram within 14 days of date established for the Notice to Proceed.
- B. Cash Requirement Prediction: Submit with preliminary network diagram, include a preliminary cash requirement prediction based on all indicated activities.
- C. Tabulation of Submittals: Submit with preliminary network diagram, include a tabulation by date of submittals required during first 90 days of construction. List those required to maintain orderly progress of the Work, and those required early because of long lead time for manufacture or fabrication.
- D. Distribution: Distribute preliminary network diagram to all parties that need to know about construction activities that are scheduled early including Architect and Owner.

#### 2.03 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE):

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. CPM Schedule: Prepare Contractor's construction schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice of Award.



- a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's acceptance of the schedule.
  2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
  3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
  4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
    - a. Preparation and processing of submittals.
    - b. Mobilization and demobilization.
    - c. Purchase of materials.
    - d. Delivery.
    - e. Fabrication.
    - f. Utility interruptions.
    - g. Installation.
    - h. Work by Owner that may affect or be affected by Contractor's activities.
    - i. Testing and commissioning.
    - j. Punch list and final completion.
    - k. Activities occurring following final completion.
  2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
  3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
  4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
  5. Cost and Resource Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's acceptance prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training, in the amount of 5 percent of the Contract Sum.
    - a. Each activity cost shall reflect an appropriate value subject to approval by Architect.

- b. Total cost assigned to activities shall equal the total Contract Sum.
  
- D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
  
- E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
  - 1. Contractor or subcontractor and the Work or activity.
  - 2. Description of activity.
  - 3. Main events of activity.
  - 4. Immediate preceding and succeeding activities.
  - 5. Early and late start dates.
  - 6. Early and late finish dates.
  - 7. Activity duration in workdays.
  - 8. Total float or slack time.
  - 9. Average size of workforce.
  - 10. Dollar value of activity (coordinated with the schedule of values).
  
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
  - 1. Identification of activities that have changed.
  - 2. Changes in early and late start dates.
  - 3. Changes in early and late finish dates.
  - 4. Changes in activity durations in workdays.
  - 5. Changes in the critical path.
  - 6. Changes in total float or slack time.
  - 7. Changes in the Contract Time.
  
- G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
  - 1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
  - 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.

3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
  - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
  - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.04 REPORTS:

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
  1. List of subcontractors at Project site.
  2. List of separate contractors at Project site.
  3. Approximate count of personnel at Project site.
  4. Equipment at Project site.
  5. Material deliveries.
  6. High and low temperatures and general weather conditions, including presence of rain or snow.
  7. Accidents.
  8. Meetings and significant decisions.
  9. Unusual events (see special reports).
  10. Stoppages, delays, shortages, and losses.
  11. Meter readings and similar recordings.
  12. Emergency procedures.
  13. Orders and requests of authorities having jurisdiction.
  14. Change Orders received and implemented.
  15. Construction Change Directives received and implemented.
  16. Services connected and disconnected.
  17. Equipment or system tests and startups.
  18. Partial completions and occupancies.
  19. Substantial Completions authorized.

- B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
  - 1. Material stored prior to previous report and remaining in storage.
  - 2. Material stored prior to previous report and since removed from storage and installed.
  - 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.05 SPECIAL REPORTS:

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE:

- A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
  - 1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
  - 2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate final completion percentage for each activity.

- C. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
  2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

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## SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

### PART 1 - GENERAL

#### 1.01 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.

#### 1.02 SUMMARY:

- A. Section includes administrative and procedural requirements for the following:
  - 1. Preconstruction photographs.
  - 2. Periodic construction photographs.
  - 3. Final completion construction photographs.
  - 4. Preconstruction video recordings.
  - 5. Periodic construction video recordings.
  - 6. Web-based construction photographic documentation.
- B. Related Requirements are Included in the Following Sections:
  - 1. Section 012200 Unit Prices for procedures for unit prices for extra photographs.
  - 2. Section 013300 Submittal Procedures for submitting photographic documentation.
  - 3. Section 017700 Closeout Procedures for submitting photographic documentation as project record documents at Project closeout.

#### 1.03 UNIT PRICES:

- A. Basis for Bids: Base number of construction photographs on average of 30 photographs per week over the duration of Project.

#### 1.04 INFORMATIONAL SUBMITTALS:

- A. Qualification Data: Submit qualification data for photographer.
- B. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- C. Digital Photographs: Submit image files within three days of taking photographs.

1. Digital Camera: Minimum sensor resolution of 8 megapixels.
  2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
  3. Identification: Provide the following information with each image description in file metadata tag:
    - a. Name of Project.
    - b. Name and contact information for photographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date photograph was taken.
    - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
    - g. Unique sequential identifier keyed to accompanying key plan.
- D. Video Recordings: Submit video recordings within seven days of recording.
1. Submit video recordings in digital video disc format acceptable to Architect.
  2. Identification: With each submittal, provide the following information:
    - a. Name of Project.
    - b. Name and address of photographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date video recording was recorded.
    - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
    - g. Weather conditions at time of recording.
  3. Transcript: Prepared on 8-1/2 by 11-inch paper, punched and bound in heavy duty, three ring, vinyl covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as corresponding video recording. Include name of Project and date of video recording on each page.
- 1.05 QUALITY ASSURANCE:
- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.
- 1.06 USAGE RIGHTS:
- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.



## PART 2 - PRODUCTS

### 2.01 PHOTOGRAPHIC MEDIA:

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.
- B. Digital Video Recordings: Provide high resolution, digital video file in format acceptable to Architect.

## PART 3 - EXECUTION

### 3.01 CONSTRUCTION PHOTOGRAPHS:

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
  - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
  - 1. Date and Time: Include date and time in file name for each image.
  - 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.
- D. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
  - 1. Flag construction limits before taking construction photographs.
  - 2. Take 20 or more photographs as acceptable to Architect to show existing conditions adjacent to property before starting the Work.
  - 3. Take 20 or more photographs as acceptable to Architect of existing buildings adjoining property to accurately record physical conditions at start of construction.
  - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements and improvements.
- E. Periodic Construction Photographs: Take 20 or more photographs as acceptable to Architect

monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

- F. Architect Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.
- G. Final Completion Construction Photographs: Take 20 or more color photographs as acceptable to Architect after date of Substantial Completion for submission as project record documents. Architect will inform photographer of desired vantage points.
- H. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.
  - 1. Three days' notice will be given, where feasible.
  - 2. In emergency situations, take additional photographs within 24 hours of request.
  - 3. Circumstances that could require additional photographs include, but are not limited to, the following:
    - a. Special events planned at Project site.
    - b. Immediate follow-up when on-site events result in construction damage or losses.
    - c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
    - d. Substantial Completion of a major phase or component of the Work.
    - e. Extra record photographs at time of final acceptance.
    - f. Owner's request for special publicity photographs.

### 3.02 CONSTRUCTION VIDEO RECORDINGS:

- A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.
- B. Recording: Mount camera on tripod before starting recording unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each video recording, record weather conditions from local newspaper or television and the actual temperature reading at Project site.
- C. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
  - 1. Confirm date and time at beginning and end of recording.
  - 2. Begin each video recording with name of Project, Contractor's name, videographer's

name, and Project location.

- D. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video recording opposite the corresponding narration segment.
- E. Architect Directed Construction Video Recordings: Record video recording from time to time as directed by Architect. Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time shall be 60 minutes(s).

END OF SECTION 013233

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## SECTION 013300 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.01 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.

#### 1.02 SUMMARY:

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements are Included in the Following Sections:
  - 1. Section 012900 Payment Procedures for submitting Applications for Payment and the schedule of values.
  - 2. Section 013200 Construction Progress Documentation for submitting schedules and reports, including Contractor's construction schedule.
  - 3. Section 017823 Operation and Maintenance Data for submitting operation and maintenance manuals.
  - 4. Section 017839 Project Record Documents for submitting record Drawings, record Specifications, and record Product Data.

#### 1.03 DEFINITIONS:

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device independent and display resolution independent fixed layout document format.

#### 1.04 ACTION SUBMITTALS:

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making

corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 90 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
  - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
  - a. Scheduled date for first submittal.
  - b. Specification Section number and title.
  - c. Submittal category: Action; informational.
  - d. Name of subcontractor.
  - e. Description of the Work covered.
  - f. Scheduled date for Architect's final release or approval.
  - g. Scheduled date of fabrication.
  - h. Scheduled dates for purchasing.
  - i. Scheduled dates for installation.
  - j. Activity or event number.

1.05 SUBMITTAL ADMINISTRATIVE REQUIREMENTS:

- A. Architect's Digital Data Files: Electronic digital data files comprising portions of the Contract Drawings will be made available by Architect for Contractor's use in preparing submittals subject to limitations, conditions, and restrictions specified herein.
  1. Architect will make certain electronic digital data drawing files comprising portions of the Contract Drawings available to the Contractor and his subcontractors for use in preparing Shop Drawings For this project only for the fee stated in the data licensing agreement.
    - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. Digital Data Software Program: Drawings are available in AutoCAD 2016, Version M.107.0.0, dwg format using only AutoDesk software.
    - c. Contractor shall execute a data licensing agreement in the form of Section 013318.
    - d. There will be a licensing fee as provided in Section 013318.
    - e. The following types of digital data files will by made available for each discipline which has prepared drawings:
      - 1) Floor plans.
      - 2) Reflected ceiling plans.
      - 3) Elevations.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
  5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
    - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., UTC-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., UTC-061000.01.A).
  3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.

4. Transmittal Form for Electronic Submittals: Use software generated form from electronic project management software acceptable to Owner, containing the following information:
  - a. Project name.
  - b. Date.
  - c. Name and address of Architect.
  - d. Name of Construction Manager.
  - e. Name of Contractor.
  - f. Name of firm or entity that prepared submittal.
  - g. Names of subcontractor, manufacturer, and supplier.
  - h. Category and type of submittal.
  - i. Submittal purpose and description.
  - j. Specification Section number and title.
  - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
  - l. Drawing number and detail references, as appropriate.
  - m. Location(s) where product is to be installed, as appropriate.
  - n. Related physical samples submitted directly.
  - o. Indication of full or partial submittal.
  - p. Transmittal number, numbered consecutively.
  - q. Submittal and transmittal distribution record.
  - r. Other necessary identification.
  - s. Remarks.
  
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
  - a. Project name.
  - b. Number and title of appropriate Specification Section.
  - c. Manufacturer name.
  - d. Product name.
  
- E. Options: Identify options requiring selection by Architect.
  
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
  
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked with approval notation from Architect's action



stamp.

- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

## PART 2 - PRODUCTS

### 2.01 SUBMITTAL PROCEDURES:

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
  - 1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.
    - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  - 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  - 4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
  6. Submit Product Data as PDF electronic files.
- C. Shop Drawings: Prepare Project specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  2. Sheet Size: Except for templates, patterns, and similar full size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
  3. Submit Shop Drawings as PDF electronic files.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of applicable Specification Section.
    - e. Specification paragraph number and generic name of each item.
  3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
  4. Disposition: Maintain sets of approved Samples at Project site, available for quality control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

- a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
6. Samples for Verification: Submit full size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
  - a. Number of Samples: Submit three sets of Samples unless more specified. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
    - 1). Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
    - 2). If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
  5. Submit product schedule as a PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 Project Management and Coordination.
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 Construction Progress Documentation.
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 Payment Procedures.
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 Quality Requirements.
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 Closeout Procedures.

- K. Maintenance Data: Comply with requirements specified in Section 017823 Operation and Maintenance Data.
- L. LEED Submittals: Comply with requirements specified in Section 018113 Sustainable Design Requirements.
- M. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- N. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- O. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- P. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- Q. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- R. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- S. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- T. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- U. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.

7. Limitations of use.

- V. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- W. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- X. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- Y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.02 DELEGATED DESIGN SERVICES:

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.01 CONTRACTOR'S REVIEW:

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 Closeout Procedures.
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.02 ARCHITECT'S ACTION:

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

## AGREEMENT RELATING TO USE OF HOBBS+BLACK DIGITAL DATA

**PROVIDER:** Hobbs + Black Associates, Inc.  
100 N. State Street  
Ann Arbor, MI 48104

**RECIPIENT:** \_\_\_\_\_  
Contractor Company Name

**PROJECT:** MSP – Northville Lab Elevator Replacement \_\_\_\_\_  
Street Address

**PROJECT #:** 22-300 \_\_\_\_\_  
City, State, Zip

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### **ARTICLE 1 GENERAL PROVISIONS**

- 1.1** Hobbs + Black Associates, Inc. (“Hobbs+Black”) has been asked to provide the (“Recipient”) electronic/digital format versions of construction documents and other project related information for MSP – Northville Lab Elevator Replacement project. (The “Project”)
- 1.2** The use of digital information, i.e., Digital Data, the Recipient is limited to the Project and the Recipient agrees that the Digital Data shall not be used for any other purpose. The Recipient further agrees that it will obligate any other recipients of the Digital Data to agree in writing to be bound to all of the terms set forth herein. Each recipient will agree to pass on the same contractual obligation to any other recipients permitted under this Agreement.
- 1.3** The purpose of this Agreement is to grant a license from the Transmitting Party, Hobbs+Black, to the Receiving Party, for the Receiving Party’s use of Digital Data on the Project, and to set forth the license terms.
- 1.4** This Agreement is the entire and integrated agreement between the parties. Except as specifically set forth herein, this agreement does not create any other contractual relationship between the parties.
- 1.5** Digital Data is defined as information, communications, drawings, or designs created or stored for the Project in digital form.
- 1.6** Confidential Information is defined as Digital Data that the Transmitting Party has designated as confidential and marked with an indication such as “Confidential” or “Business Proprietary.” This can be accomplished by an

indication in the subject line of an email transferring Digital Data.

### **ARTICLE 2 TRANSMISSION OF DIGITAL DATA**

- 2.1** The Transmitting Party grants the Receiving Party a nonexclusive limited license to use the Digital Data solely and exclusively to perform services or construction for the Project in accordance with the conditions set forth herein.
- 2.2** The Transmitting Party retains its rights in the Digital Data. By transmitting the Digital Data, the Transmitting Party does not grant to the Receiving Party an assignment of those rights; nor does the Transmitting Party convey to the Receiving Party any right in the software used to generate the Digital Data.
- 2.3** To the fullest extent permitted by law, the Receiving Party shall indemnify and defend the Transmitting Party from and against all claims arising from or related to the Receiving Party’s modification to, or use of, the Digital Data.
- 2.4** The Receiving Party agrees to keep Confidential Information strictly confidential and not to disclose it to any other person except to (1) its employees, (2) those who need to know the content of the Confidential Information in order to perform services or construction solely and exclusively for the Project, or (3) its consultants and contractors whose contracts include similar restrictions on the use of Confidential Information.

**ARTICLE 3 LICENSE CONDITIONS**

**3.1** The parties agree to the following conditions on the limited license granted in Section 2.1.

**3.2** The documents, including all Digital Data, whether in hard copy or machine readable form, represents instruments of professional service and shall remain Hobbs + Black’s property. As the author of the documents, Hobbs + Black retains all proprietary rights, including copyrights embodied therein.

**3.3** Hobbs + Black does not represent or warrant that all information contained in the Digital Data is complete or accurate, noting that there could be subsequent changes to the documents. Furthermore, items shown in the documents may not be dimensioned or to scale.

**3.4** The Recipient acknowledges that anomalies and errors can be introduced into documents when they are transferred or used in an incompatible computer environment. Further, the Recipient acknowledges and solely accepts the risks associated with and/or the responsibility for any damages to hardware, software or computer systems or networks related to any use of the Digital Information. The Digital Information is being furnished “as is.”

**ARTICLE 4 LICENSE DURATION**

This Agreement is entered into as of the day and year first written above and will terminate upon Substantial Completion of the Project unless otherwise agreed by the parties.

Signing this Agreement indicates your agreement to the terms stated above.

Sincerely,  
**Hobbs + Black Associates, Inc.**

Accepted and Agreed By:

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Signature)

Name: \_\_\_\_\_

Name: \_\_\_\_\_

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

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

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

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

END OF SECTION 013300.1



## SECTION 014000 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.01 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.

#### 1.02 SUMMARY:

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections and related actions do not limit Contractor's other quality assurance and control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality assurance and control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
  - 4. Specific test and inspection requirements are not specified in this Section.
- C. Related Requirements:
  - 1. Section 012100 Allowances for testing and inspection allowances.

#### 1.03 DEFINITIONS:

- A. Quality Assurance Services: Activities, actions and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality Control Services: Tests, inspections, procedures and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or General Contractor.
- C. Mockups: Full size physical assemblies that are constructed on site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full size physical assemblies constructed at testing facility to verify performance characteristics.
  2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies and subassemblies.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory or shop.
- G. Field Quality Control Testing: Tests and inspections that are performed on site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub subcontractor, to perform a particular construction operation, including installation, erection, application and similar operations.
1. Use of trade specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### 1.04 CONFLICTING REQUIREMENTS:

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

#### 1.05 ACTION SUBMITTALS:

- A. Shop Drawings: For integrated exterior and laboratory mockups, provide plans, sections and elevations, indicating materials and size of mockup construction.
1. Indicate manufacturer and model number of individual components.

2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions

1.06 INFORMATIONAL SUBMITTALS:

- A. Contractor's Quality Control Plan: For quality assurance and quality control activities and responsibilities.
- B. Qualification Data: For Contractor's quality control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
  1. Seismic force-resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by Architect.
  2. Main wind force resisting system or a wind resisting component listed in the wind force resisting system quality assurance plan prepared by Architect.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  1. Specification Section number and title.
  2. Entity responsible for performing tests and inspections.
  3. Description of test and inspection.
  4. Identification of applicable standards.
  5. Identification of test and inspection methods.
  6. Number of tests and inspections required.
  7. Time schedule or time span for tests and inspections.
  8. Requirements for obtaining samples.
  9. Unique characteristics of each quality-control service.

1.07 CONTRACTOR'S QUALITY CONTROL PLAN:

- A. Quality Control Plan, General: Submit quality control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records and forms to be used to carry out Contractor's quality assurance and quality control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality Control Personnel Qualifications: Engage qualified full time personnel trained and experienced in managing and executing quality-assurance and quality control procedures similar in nature and extent to those required for Project.

1. Project quality control manager shall not have other Project responsibilities.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
  1. Contractor performed tests and inspections including subcontractor performed tests and inspections. Include required tests and inspections and Contractor elected tests and inspections.
  2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
  3. Owner performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.08 REPORTS AND DOCUMENTS:

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
  1. Date of issue.
  2. Project title and number.
  3. Name, address and telephone number of testing agency.
  4. Dates and locations of samples and tests or inspections.
  5. Names of individuals making tests and inspections.
  6. Description of the Work and test and inspection method.
  7. Identification of product and Specification Section.
  8. Complete test or inspection data.
  9. Test and inspection results and an interpretation of test results.
  10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  12. Name and signature of laboratory inspector.
  13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- C. Factory Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address and telephone number of factory authorized service representative making report.
  2. Statement that equipment complies with requirements.
  3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  4. Statement whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- 1.09 QUALITY ASSURANCE:
- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
  - B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to

those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly or product that are similar in material, design and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
  - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
  - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
  - 1. Contractor responsibilities include the following:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.

- d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
  - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
  - f. When testing is complete, remove test specimens, assemblies, mockups and laboratory mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection and similar quality assurance service to Architect through General Contractor, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Owner.
  2. Notify Architect and Owner not less than seven days in advance of dates and times when mockups will be constructed.
  3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
  4. Demonstrate the proposed range of aesthetic effects and workmanship.
  5. Obtain Architect's and Owner's approval of mockups before starting work, fabrication or construction.
    - a. Allow not less than seven days for initial review and each re-review of each mockup.
  6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  7. Demolish and remove mockups when directed unless otherwise indicated.
- L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.
- M. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.
- 1.10 QUALITY CONTROL:
- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  2. Payment for these services will be made from testing and inspecting allowances, as

authorized by Change Orders.

3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Contractor by authorities having jurisdiction, whether specified or not.
  2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies not less than 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  4. Where quality control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality control service.
  5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory authorized service representative to inspect field assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 Submittal Procedures.
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Architect, Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Owner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections and state in each report whether tested and



inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents as a component of Contractor's quality control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, General Contractor, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 1.11 SPECIAL TESTS AND INSPECTIONS:

- A. Special Tests and Inspections: Conducted by a qualified testing agency and special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections and in

Statement of Special Inspections attached to this Section], and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Owner, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality control service to Architect and Owner through Contractor with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

## PART 2 - PRODUCTS

(NOT APPLICABLE)

## PART 3 - EXECUTION

### 3.01 TEST AND INSPECTION LOG:

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
  1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Architect.
  4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Owners and Contractor=s reference during normal working hours.

### 3.02 REPAIR AND PROTECTION:

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 Execution.

END OF SECTION 014000

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## SECTION 014200 - REFERENCES

### PART 1 - GENERAL

#### 1.01 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.

#### 1.02 DEFINITIONS:

- A. General: Basic Contract definitions are included in the Conditions of the Contract.

#### 1.03 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.

#### 1.04 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. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

- 001. AABC - Associated Air Balance Council; [www.aabc.com](http://www.aabc.com).
- 002. AAMA - American Architectural Manufacturers Association; [www.aamanet.org](http://www.aamanet.org).
- 003. AAPFCO - Association of American Plant Food Control Officials; [www.aapfco.org](http://www.aapfco.org).
- 004. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
- 005. AATCC - American Association of Textile Chemists and Colorists; [www.aatcc.org](http://www.aatcc.org).
- 006. ABMA - American Bearing Manufacturers Association; [www.americanbearings.org](http://www.americanbearings.org).
- 007. ACI - American Concrete Institute; (Formerly: ACI International); [www.concrete.org](http://www.concrete.org).
- 008. ACPA - American Concrete Pipe Association; [www.concrete-pipe.org](http://www.concrete-pipe.org).
- 009. AEIC - Association of Edison Illuminating Companies, Inc. (The); [www.aeic.org](http://www.aeic.org).
- 010. AF&PA - American Forest & Paper Association; [www.afandpa.org](http://www.afandpa.org).
- 011. AGA - American Gas Association; [www.aga.org](http://www.aga.org).
- 012. AHAM - Association of Home Appliance Manufacturers; [www.aham.org](http://www.aham.org).
- 013. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); [www.ahrinet.org](http://www.ahrinet.org).
- 014. AI - Asphalt Institute; [www.asphaltinstitute.org](http://www.asphaltinstitute.org).
- 015. AIA - American Institute of Architects (The); [www.aia.org](http://www.aia.org).
- 016. AISC - American Institute of Steel Construction; [www.aisc.org](http://www.aisc.org).

017. AISI - American Iron and Steel Institute; [www.steel.org](http://www.steel.org).
018. AITC - American Institute of Timber Construction; [www.aitc-glulam.org](http://www.aitc-glulam.org).
019. AMCA - Air Movement and Control Association International, Inc.; [www.amca.org](http://www.amca.org).
020. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
021. AOSA - Association of Official Seed Analysts, Inc.; [www.aosaseed.com](http://www.aosaseed.com).
022. APA - APA - The Engineered Wood Association; [www.apawood.org](http://www.apawood.org).
023. APA - Architectural Precast Association; [www.archprecast.org](http://www.archprecast.org).
024. API - American Petroleum Institute; [www.api.org](http://www.api.org).
025. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
026. ARI - American Refrigeration Institute; (See AHRI).
027. ARMA - Asphalt Roofing Manufacturers Association; [www.asphaltroofing.org](http://www.asphaltroofing.org).
028. ASCE - American Society of Civil Engineers; [www.asce.org](http://www.asce.org).
029. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
030. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; [www.ashrae.org](http://www.ashrae.org).
031. ASME - ASME International; (American Society of Mechanical Engineers); [www.asme.org](http://www.asme.org).
032. ASSE - American Society of Safety Engineers (The); [www.asse.org](http://www.asse.org).
033. ASSE - American Society of Sanitary Engineering; [www.asse-plumbing.org](http://www.asse-plumbing.org).
034. ASTM - ASTM International; (American Society for Testing and Materials International); [www.astm.org](http://www.astm.org).
035. ATIS - Alliance for Telecommunications Industry Solutions; [www.atis.org](http://www.atis.org).
036. AWEA - American Wind Energy Association; [www.awea.org](http://www.awea.org).
037. AWI - Architectural Woodwork Institute; [www.awinet.org](http://www.awinet.org).
038. AWMAC - Architectural Woodwork Manufacturers Association of Canada; [www.awmac.com](http://www.awmac.com).
039. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); [www.awpa.com](http://www.awpa.com).
040. AWS - American Welding Society; [www.aws.org](http://www.aws.org).
041. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
042. BHMA - Builders Hardware Manufacturers Association; [www.buildershardware.com](http://www.buildershardware.com).
043. BIA - Brick Industry Association (The); [www.gobrick.com](http://www.gobrick.com).
044. BICSI - BICSI, Inc.; [www.bicsi.org](http://www.bicsi.org).
045. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); [www.bifma.com](http://www.bifma.com).
046. BISSC - Baking Industry Sanitation Standards Committee; [www.bissc.org](http://www.bissc.org).
047. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
048. DA - Copper Development Association; [www.copper.org](http://www.copper.org).
049. CEA - Canadian Electricity Association; [www.electricity.ca](http://www.electricity.ca).
050. CEA - Consumer Electronics Association; [www.ce.org](http://www.ce.org).
051. CFFA - Chemical Fabrics & Film Association, Inc.; [www.chemicalfabricsandfilm.com](http://www.chemicalfabricsandfilm.com).
052. CFSEI - Cold-Formed Steel Engineers Institute; [www.cfsei.org](http://www.cfsei.org).
053. CGA - Compressed Gas Association; [www.cganet.com](http://www.cganet.com).
054. CIMA - Cellulose Insulation Manufacturers Association; [www.cellulose.org](http://www.cellulose.org).
055. CISCA - Ceilings & Interior Systems Construction Association; [www.cisca.org](http://www.cisca.org).
056. CISPI - Cast Iron Soil Pipe Institute; [www.cispi.org](http://www.cispi.org).
057. CLFMI - Chain Link Fence Manufacturers Institute; [www.chainlinkinfo.org](http://www.chainlinkinfo.org).
058. CPA - Composite Panel Association; [www.pbmdf.com](http://www.pbmdf.com).
059. CRI - Carpet and Rug Institute (The); [www.carpet-rug.org](http://www.carpet-rug.org).
060. CRRC - Cool Roof Rating Council; [www.coolroofs.org](http://www.coolroofs.org).
061. CRSI - Concrete Reinforcing Steel Institute; [www.crsi.org](http://www.crsi.org).
062. CSA - Canadian Standards Association; [www.csa.ca](http://www.csa.ca).
063. CSA - CSA International; (Formerly: IAS - International Approval Services); [www.csa-international.org](http://www.csa-international.org).
064. CSI - Construction Specifications Institute (The); [www.csinet.org](http://www.csinet.org).

065. CSSB - Cedar Shake & Shingle Bureau; [www.cedarbureau.org](http://www.cedarbureau.org).
066. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); [www.cti.org](http://www.cti.org).
067. CWC - Composite Wood Council; (See CPA).
068. DASMA - Door and Access Systems Manufacturers Association; [www.dasma.com](http://www.dasma.com).
069. DHI - Door and Hardware Institute; [www.dhi.org](http://www.dhi.org).
070. ECA - Electronic Components Association; [www.ec-central.org](http://www.ec-central.org).
071. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
073. EIA - Electronic Industries Alliance; (See TIA).
074. EIMA - EIFS Industry Members Association; [www.eima.com](http://www.eima.com).
075. EJMA - Expansion Joint Manufacturers Association, Inc.; [www.ejma.org](http://www.ejma.org).
076. ESD - ESD Association; (Electrostatic Discharge Association); [www.esda.org](http://www.esda.org).
077. ESTA - Entertainment Services and Technology Association; (See PLASA).
078. EVO - Efficiency Valuation Organization; [www.evo-world.org](http://www.evo-world.org).
079. FM Approvals - FM Approvals LLC; [www.fmglobal.com](http://www.fmglobal.com).
080. FM Global - FM Global; (Formerly: FMG - FM Global); [www.fmglobal.com](http://www.fmglobal.com).
081. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.;  
[www.floridarroof.com](http://www.floridarroof.com).
082. FSA - Fluid Sealing Association; [www.fluidsealing.com](http://www.fluidsealing.com).
083. FSC - Forest Stewardship Council U.S.; [www.fscus.org](http://www.fscus.org).
084. GA - Gypsum Association; [www.gypsum.org](http://www.gypsum.org).
085. GANA - Glass Association of North America; [www.glasswebsite.com](http://www.glasswebsite.com).
086. GS - Green Seal; [www.greenseal.org](http://www.greenseal.org).
087. HI - Hydraulic Institute; [www.pumps.org](http://www.pumps.org).
088. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
089. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
090. HPVA - Hardwood Plywood & Veneer Association; [www.hpva.org](http://www.hpva.org).
091. HPW - H. P. White Laboratory, Inc.; [www.hpwhite.com](http://www.hpwhite.com).
092. IAPSC - International Association of Professional Security Consultants; [www.iapsc.org](http://www.iapsc.org).
093. IAS - International Approval Services; (See CSA).
094. ICBO - International Conference of Building Officials; (See ICC).
095. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
096. ICEA - Insulated Cable Engineers Association, Inc.; [www.icea.net](http://www.icea.net).
097. ICPA - International Cast Polymer Alliance; [www.icpa-hq.org](http://www.icpa-hq.org).
098. ICRI - International Concrete Repair Institute, Inc.; [www.icri.org](http://www.icri.org).
099. IEC - International Electrotechnical Commission; [www.iec.ch](http://www.iec.ch).
100. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); [www.ieee.org](http://www.ieee.org).
101. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); [www.ies.org](http://www.ies.org).
102. IESNA - Illuminating Engineering Society of North America; (See IES).
103. IEST - Institute of Environmental Sciences and Technology; [www.iest.org](http://www.iest.org).
104. IGMA - Insulating Glass Manufacturers Alliance; [www.igmaonline.org](http://www.igmaonline.org).
105. IGSHPA - International Ground Source Heat Pump Association; [www.igshpa.okstate.edu](http://www.igshpa.okstate.edu).
106. ILI - Indiana Limestone Institute of America, Inc.; [www.iliai.com](http://www.iliai.com).
107. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA);  
[www.intertek.com](http://www.intertek.com).
108. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); [www.isa.org](http://www.isa.org).
109. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
110. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface

- Fabricators Association); [www.isfanow.org](http://www.isfanow.org).
111. ISO - International Organization for Standardization; [www.iso.org](http://www.iso.org).
  112. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
  113. ITU - International Telecommunication Union; [www.itu.int/home](http://www.itu.int/home).
  114. KCMA - Kitchen Cabinet Manufacturers Association; [www.kcma.org](http://www.kcma.org).
  115. LMA - Laminating Materials Association; (See CPA).
  116. LPI - Lightning Protection Institute; [www.lightning.org](http://www.lightning.org).
  117. MBMA - Metal Building Manufacturers Association; [www.mbma.com](http://www.mbma.com).
  118. MCA - Metal Construction Association; [www.metalconstruction.org](http://www.metalconstruction.org).
  119. MFMA - Maple Flooring Manufacturers Association, Inc.; [www.maplefloor.org](http://www.maplefloor.org).
  120. MFMA - Metal Framing Manufacturers Association, Inc.; [www.metalframingmfg.org](http://www.metalframingmfg.org).
  121. MHIA - Material Handling Industry of America; [www.mhia.org](http://www.mhia.org).
  122. MIA - Marble Institute of America; [www.marble-institute.com](http://www.marble-institute.com).
  123. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); [www.wmmpa.com](http://www.wmmpa.com).
  124. MPI - Master Painters Institute; [www.paintinfo.com](http://www.paintinfo.com).
  125. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; [www.mss-hq.org](http://www.mss-hq.org).
  126. NAAMM - National Association of Architectural Metal Manufacturers; [www.naamm.org](http://www.naamm.org).
  127. NACE - NACE International; (National Association of Corrosion Engineers International); [www.nace.org](http://www.nace.org).
  128. NADCA - National Air Duct Cleaners Association; [www.nadca.com](http://www.nadca.com).
  129. NAIMA - North American Insulation Manufacturers Association; [www.naima.org](http://www.naima.org).
  130. NBGQA - National Building Granite Quarries Association, Inc.; [www.nbgqa.com](http://www.nbgqa.com).
  131. NCMA - National Concrete Masonry Association; [www.ncma.org](http://www.ncma.org).
  132. NEBB - National Environmental Balancing Bureau; [www.nebb.org](http://www.nebb.org).
  133. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).
  134. NeLMA - Northeastern Lumber Manufacturers Association; [www.nelma.org](http://www.nelma.org).
  135. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
  136. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
  137. NFHS - National Federation of State High School Associations; [www.nfhs.org](http://www.nfhs.org).
  138. NFPA - NFPA; (National Fire Protection Association); [www.nfpa.org](http://www.nfpa.org).
  139. NFPA - NFPA International; (See NFPA).
  140. NFRC - National Fenestration Rating Council; [www.nfrc.org](http://www.nfrc.org).
  141. NHLA - National Hardwood Lumber Association; [www.nhla.com](http://www.nhla.com).
  142. NLGA - National Lumber Grades Authority; [www.nlga.org](http://www.nlga.org).
  143. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
  144. NOMMA - National Ornamental & Miscellaneous Metals Association; [www.nomma.org](http://www.nomma.org).
  145. NRCA - National Roofing Contractors Association; [www.nrca.net](http://www.nrca.net).
  146. NRMCA - National Ready Mixed Concrete Association; [www.nrmca.org](http://www.nrmca.org).
  147. NSF - NSF International; (National Sanitation Foundation International); [www.nsf.org](http://www.nsf.org).
  148. NSPE - National Society of Professional Engineers; [www.nspe.org](http://www.nspe.org).
  149. NSSGA - National Stone, Sand & Gravel Association; [www.nssga.org](http://www.nssga.org).
  150. NTMA - National Terrazzo & Mosaic Association, Inc. (The); [www.ntma.com](http://www.ntma.com).
  151. NWFA - National Wood Flooring Association; [www.nwfa.org](http://www.nwfa.org).
  152. PCI - Precast/Prestressed Concrete Institute; [www.pci.org](http://www.pci.org).
  153. PDI - Plumbing & Drainage Institute; [www.pdionline.org](http://www.pdionline.org).
  154. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); [www.plasa.org](http://www.plasa.org).
  155. RCSC - Research Council on Structural Connections; [www.boltcouncil.org](http://www.boltcouncil.org).
  156. RFCI - Resilient Floor Covering Institute; [www.rfci.com](http://www.rfci.com).
  157. IS - Redwood Inspection Service; [www.redwoodinspection.com](http://www.redwoodinspection.com).
  158. SAE - SAE International; (Society of Automotive Engineers); [www.sae.org](http://www.sae.org).
  159. SCTE - Society of Cable Telecommunications Engineers; [www.scte.org](http://www.scte.org).
  160. SDI - Steel Deck Institute; [www.sdi.org](http://www.sdi.org).



161. SDI - Steel Door Institute; [www.steeldoor.org](http://www.steeldoor.org).
162. SEFA - Scientific Equipment and Furniture Association; [www.sefalabs.com](http://www.sefalabs.com).
163. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
164. SIA - Security Industry Association; [www.siaonline.org](http://www.siaonline.org).
165. SJI - Steel Joist Institute; [www.steeljoist.org](http://www.steeljoist.org).
166. SMA - Screen Manufacturers Association; [www.smainfo.org](http://www.smainfo.org).
167. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; [www.smacna.org](http://www.smacna.org).
168. SMPTE - Society of Motion Picture and Television Engineers; [www.smpte.org](http://www.smpte.org).
169. SPFA - Spray Polyurethane Foam Alliance; [www.sprayfoam.org](http://www.sprayfoam.org).
170. SPIB - Southern Pine Inspection Bureau; [www.spib.org](http://www.spib.org).
171. SPRI - Single Ply Roofing Industry; [www.spri.org](http://www.spri.org).
172. SRCC - Solar Rating and Certification Corporation; [www.solar-rating.org](http://www.solar-rating.org).
173. SSINA - Specialty Steel Industry of North America; [www.ssina.com](http://www.ssina.com).
174. SSPC - SSPC: The Society for Protective Coatings; [www.sspc.org](http://www.sspc.org).
175. STI - Steel Tank Institute; [www.steeltank.com](http://www.steeltank.com).
176. SWI - Steel Window Institute; [www.steelwindows.com](http://www.steelwindows.com).
177. SWPA - Submersible Wastewater Pump Association; [www.swpa.org](http://www.swpa.org).
178. TCA - Tilt-Up Concrete Association; [www.tilt-up.org](http://www.tilt-up.org).
179. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); [www.tileusa.com](http://www.tileusa.com).
180. TEMA - Tubular Exchanger Manufacturers Association, Inc.; [www.tema.org](http://www.tema.org).
181. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); [www.tiaonline.org](http://www.tiaonline.org).
182. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
183. TMS - The Masonry Society; [www.masonrysociety.org](http://www.masonrysociety.org).
184. TPI - Truss Plate Institute; [www.tpinst.org](http://www.tpinst.org).
185. TPI - Turfgrass Producers International; [www.turfgrassod.org](http://www.turfgrassod.org).
186. TRI - Tile Roofing Institute; [www.tilerroofing.org](http://www.tilerroofing.org).
187. UBC - Uniform Building Code; (See ICC).
188. UL - Underwriters Laboratories Inc.; [www.ul.com](http://www.ul.com).
189. UNI - Uni-Bell PVC Pipe Association; [www.uni-bell.org](http://www.uni-bell.org).
190. USGBC - U.S. Green Building Council; [www.usgbc.org](http://www.usgbc.org).
191. USITT - United States Institute for Theatre Technology, Inc.; [www.usitt.org](http://www.usitt.org).
192. WASTEC - Waste Equipment Technology Association; [www.wastec.org](http://www.wastec.org).
193. WCLIB - West Coast Lumber Inspection Bureau; [www.wclib.org](http://www.wclib.org).
194. WCMA - Window Covering Manufacturers Association; [www.wcmanet.org](http://www.wcmanet.org).
195. WDMA - Window & Door Manufacturers Association; [www.wdma.com](http://www.wdma.com).
196. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); [www.wicnet.org](http://www.wicnet.org).
197. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
198. WSRCA - Western States Roofing Contractors Association; [www.wsrca.com](http://www.wsrca.com).
199. WPA - Western Wood Products Association; [www.wwpa.org](http://www.wwpa.org).

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

001. DIN - Deutsches Institut für Normung e.V.; [www.din.de](http://www.din.de).
002. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
003. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
004. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).

- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
- 001. COE - Army Corps of Engineers; [www.usace.army.mil](http://www.usace.army.mil).
  - 002. CPSC - Consumer Product Safety Commission; [www.cpsc.gov](http://www.cpsc.gov).
  - 003. DOC - Department of Commerce; National Institute of Standards and Technology; [www.nist.gov](http://www.nist.gov).
  - 004. DOD - Department of Defense; <http://dodssp.daps.dla.mil>.
  - 005. DOE - Department of Energy; [www.energy.gov](http://www.energy.gov).
  - 006. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
  - 007. FAA - Federal Aviation Administration; [www.faa.gov](http://www.faa.gov).
  - 008. FG - Federal Government Publications; [www.gpo.gov](http://www.gpo.gov).
  - 009. GSA - General Services Administration; [www.gsa.gov](http://www.gsa.gov).
  - 010. HUD - Department of Housing and Urban Development; [www.hud.gov](http://www.hud.gov).
  - 011. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; <http://eetd.lbl.gov>.
  - 012. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).
  - 013. SD - Department of State; [www.state.gov](http://www.state.gov).
  - 014. TRB - Transportation Research Board; National Cooperative Highway Research Program; [www.trb.org](http://www.trb.org).
  - 015. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; [www.ars.usda.gov](http://www.ars.usda.gov).
  - 016. USDA - Department of Agriculture; Rural Utilities Service; [www.usda.gov](http://www.usda.gov).
  - 017. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; [www.ojp.usdoj.gov](http://www.ojp.usdoj.gov).
  - 018. USP - U.S. Pharmacopeia; [www.usp.org](http://www.usp.org).
  - 019. USPS - United States Postal Service; [www.usps.com](http://www.usps.com).
- D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
- 001. CFR - Code of Federal Regulations; Available from Government Printing Office; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
  - 002. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
  - 003. DSCC - Defense Supply Center Columbus; (See FS).
  - 004. FED-STD - Federal Standard; (See FS).
  - 005. FS - Federal Specification; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
    - a. Available from Defense Standardization Program; [www.dsp.dla.mil](http://www.dsp.dla.mil).
    - b. Available from General Services Administration; [www.gsa.gov](http://www.gsa.gov).
    - c. Available from National Institute of Building Sciences/Whole Building Design Guide; [www.wbdg.org/cbb](http://www.wbdg.org/cbb).
  - 006. MILSPEC - Military Specification and Standards; (See DOD).
  - 007. USAB - United States Access Board; [www.access-board.gov](http://www.access-board.gov).
  - 008. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following

list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

001. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; [www.bearhfti.ca.gov](http://www.bearhfti.ca.gov).
002. CCR - California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; [www.calregs.com](http://www.calregs.com).
003. CDHS - California Department of Health Services; (See CDPH).
004. CDPH - California Department of Public Health; Indoor Air Quality Program; [www.cal-iaq.org](http://www.cal-iaq.org).
005. CPUC - California Public Utilities Commission; [www.cpuc.ca.gov](http://www.cpuc.ca.gov).
006. SCAQMD - South Coast Air Quality Management District; [www.aqmd.gov](http://www.aqmd.gov).
007. TFS - Texas Forest Service; Forest Resource Development and Sustainable Forestry; <http://txforests-service.tamu.edu>.

## PART 2 - PRODUCTS

(NOT APPLICABLE)

## PART 3 - EXECUTION

(NOT APPLICABLE)

END OF SECTION 014200

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## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.01 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.

#### 1.02 SUMMARY:

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements are Included in the Following Sections:
  - 1. Section 011000 Summary for work restrictions and limitations on utility interruptions.
  - 2. Section 017419 Construction Waste Management and Disposal for salvaging, recycling and disposing of non-hazardous demolition and construction waste.

#### 1.03 USE CHARGES:

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

#### 1.04 INFORMATIONAL SUBMITTALS:

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion and Sedimentation Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Fire Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- D. Moisture Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
  - 1. Describe delivery, handling and storage provisions for materials subject to water absorption or water damage.

2. Indicate procedures for discarding water damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.
  3. Indicate sequencing of work that requires water, such as sprayed fire resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- E. Dust and HVAC Control Plan: Submit coordination drawing and narrative that indicates the dust and HVAC control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of work.
  2. HVAC system isolation schematic drawing.
  3. Location of proposed air-filtration system discharge.
  4. Waste handling procedures.
  5. Other dust-control measures.

1.05 QUALITY ASSURANCE:

- A. Electric Service: Comply with NECA, NEMA and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.06 PROJECT CONDITIONS:

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Chain Link Fencing: Minimum 2 inch, 0.148 inch thick, galvanized steel, chain link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8 inch OD line posts and 2-7/8 inch OD corner and pull posts
- B. Polyethylene Sheet: Reinforced, fire resistive sheet, 10 mil minimum thickness, with flame spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- C. Dust Control Adhesive Surface Walk off Mats: Provide mats minimum 36 by 60 inches.

2.02 TEMPORARY FACILITIES:

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
  - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120 V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4 foot square tack and marker boards.
  - 3. Drinking water and private toilet.
  - 4. Coffee machine and supplies.
  - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
  - 6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished and equipped to accommodate materials and equipment for construction operations.
  - 1. Store combustible materials apart from building.

#### 2.03 EQUIPMENT:

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self contained, liquid propane-gas or fuel oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open flame heaters, or salamander type heating units is prohibited.
  - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
  - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 Closeout Procedures.
- C. Air Filtration Units: Primary and secondary HEPA filter equipped portable units with four stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

#### PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL:

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION:

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation and maintenance of fixtures and facilities.
- E. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
  - 1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity and power characteristics required for construction operations.
  - 1. Install electric power service overhead unless otherwise indicated.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections and traffic conditions.
  - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
  - 2. Install lighting for Project identification sign.



- I. Telephone Service: Provide temporary telephone service in common use facilities for use by all construction personnel. Install not less one telephone line for each field office.
  1. Provide additional telephone lines for the following:
    - a. Provide a dedicated telephone line for each facsimile machine in each field office.
  2. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Contractor's emergency after hours telephone number.
    - e. Architect's office.
    - f. Engineers' offices.
    - g. Owner's office.
    - h. Principal subcontractors' field and home offices.
  3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- J. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:
  1. Processor: Intel CoreDuo, 3.0 GHz processing speed.
  2. RAM Memory: 16 gigabytes.
  3. Disk Storage: 750 gigabyte hard-disk drive and combination DVD-RW/CD-RW drive.
  4. Display: 24 inch LCD monitor with 1 Gb dedicated video RAM.
  5. Full size keyboard and mouse.
  6. Network Connectivity: 10/100BaseT or faster Ethernet.
  7. Operating System: Microsoft Windows 7 Ultimate or Enterprise. Specifically do not provide Windows 8.
  8. Productivity Software:
    - a. Microsoft Office Professional 2010 including Word, Excel and Outlook.
    - b. Adobe Reader X or higher.
    - c. WinZip 16.0 or higher.
  9. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning and faxing.
  10. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 1.24 Mbps upload and 12 Mbps download speeds at each computer.
  11. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing and spam protection in a combined application.

12. Backup: External hard drive, minimum 750 gigabyte, with automated backup software providing daily backups.

3.03 SUPPORT FACILITIES INSTALLATION:

A. General: Comply with the following:

1. Provide construction for temporary offices, shops and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 Earth Moving.
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting and testing.

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Provide temporary parking areas for construction personnel.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.

2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
    - a. Provide temporary, directional signs for construction personnel and visitors.
  3. Maintain and touchup signs so they are legible at all times.
- H. Waste Disposal Facilities: Comply with requirements specified in Section 017419 Construction Waste Management and Disposal.
- I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
- J. Temporary Elevator Use: Use of elevators is not permitted.
- K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.
- 3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION:
- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway and subsoil contamination or pollution or other undesirable effects.
  1. Comply with work restrictions specified in Section 011000 Summary.
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and] requirements specified in Section 311000 Site Clearing.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Comply with requirements specified in Section 015639 Temporary Tree and Plant Protection.
- F. Pest Control: Engage pest control service to recommend practices to minimize attraction and harboring of rodents, roaches and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

- G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
    - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
  - H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security. Lock entrances at end of each work day.
  - I. Barricades, Warning Signs and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
  - J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
    - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
  - K. Temporary Partitions: Provide floor to ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner=s tenants from fumes and noise.
    - 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
  - L. Temporary Fire Protection: Install and maintain temporary fire protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
    - 1. Prohibit smoking in construction areas.
    - 2. Supervise welding operations, combustion type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
    - 3. Develop 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.
- 3.05 MOISTURE AND MOLD CONTROL:
- A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
  - B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
    - 1. Protect porous materials from water damage.
    - 2. Protect stored and installed material from flowing or standing water.
    - 3. Keep porous and organic materials from coming into prolonged contact with concrete.

4. Remove standing water from decks.
  5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
  2. Keep interior spaces reasonably clean and protected from water damage.
  3. Periodically collect and remove waste containing cellulose or other organic matter.
  4. Discard or replace water-damaged material.
  5. Do not install material that is wet.
  6. Discard, replace or clean stored or installed material that begins to grow mold.
  7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  2. Use permanent HVAC system to control humidity.
  3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 to 72 hours, depending upon ambient temperature, are considered defective.
    - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 to 72 hours, depending upon ambient temperature. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 to 72 hours.

3.06 OPERATION, TERMINATION AND REMOVAL:

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24 hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Operate Project identification sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
  3. At Substantial Completion, repair, renovate and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 Closeout Procedures.

END OF SECTION 015000

## SECTION 017300 - EXECUTION

### PART 1 - GENERAL

#### 1.01 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.

#### 1.02 SUMMARY:

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Coordination of Owner installed products.
  - 6. Progress cleaning.
  - 7. Starting and adjusting.
  - 8. Protection of installed construction.
- B. Related Requirements are Included in the Following Sections:
  - 1. Section 011000 Summary for limits on use of Project site.
  - 2. Section 013300 Submittal Procedures for submitting surveys.
  - 3. Section 017700 Closeout Procedures for submitting final property survey with Project Record Documents, recording of Owner accepted deviations from indicated lines and levels, and final cleaning.

#### 1.03 DEFINITIONS:

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

#### 1.04 INFORMATIONAL SUBMITTALS:

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land certifying that location and elevation of improvements comply with requirements.

- C. Cutting and Patching Plan: Submit plan describing procedures not less than 10 days prior to the time cutting and patching will be performed. Include the following information:
    - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
    - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
    - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
    - 4. Dates: Indicate when cutting and patching will be performed.
    - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
      - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
  - D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
  - E. Certified Surveys: Submit two copies signed by land surveyor.
  - F. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.
- 1.05 QUALITY ASSURANCE:
- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
  - B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
    - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load carrying capacity or increase deflection.
    - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
      - a. Primary operational systems and equipment.
      - b. Fire separation assemblies.
      - c. Air or smoke barriers.
      - d. Fire-suppression systems.
      - e. Mechanical systems piping and ducts.



- f. Control systems.
  - g. Communication systems.
  - h. Fire-detection and -alarm systems.
  - i. Conveying systems.
  - j. Electrical wiring systems.
  - k. Operating systems of special construction.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
- a. Water, moisture, or vapor barriers.
  - b. Membranes and flashings.
  - c. Exterior curtain-wall construction.
  - d. Sprayed fire-resistive material.
  - e. Equipment supports.
  - f. Piping, ductwork, vessels, and equipment.
  - g. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

- A. General: Comply with requirements specified in other Sections.
1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements in Section 018113 Sustainable Design Requirements.
- B. In Place Materials: Use materials for patching identical to in place materials. For exposed surfaces, use materials that visually match in place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in place materials.

## PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer and water service piping; underground electrical services, and other utilities.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Examine roughing in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 2. Examine walls floors, and roofs for suitable conditions where products and systems are to be installed.
  - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  - 1. Description of the Work.
  - 2. List of detrimental conditions, including substrates.
  - 3. List of unacceptable installation tolerances.
  - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION:

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move or relocate existing utility structures, utility poles, lines, services or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown

diagrammatically on Drawings.

- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 Project Management and Coordination.

### 3.03 CONSTRUCTION LAYOUT:

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and General Contractor promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish limits on use of Project site.
  - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 4. Inform installers of lines and levels to which they must comply.
  - 5. Check the location, level and plumb, of every major element as the Work progresses.
  - 6. Notify Architect and General Contractor when deviations from required lines and levels exceed allowable tolerances.
  - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and General Contractor.

### 3.04 FIELD ENGINEERING:

- A. Identification: Owner will identify existing benchmarks, control points and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written

approval of Architect and General Contractor. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and General Contractor before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field engineering services, prepare a certified survey showing dimensions, locations, angles and elevations of construction and sitework.
- E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
  2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.05 INSTALLATION:

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
  2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  3. Conceal pipes, ducts and wiring in finished areas unless otherwise indicated.
  4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results.

Maintain conditions required for product performance until Substantial Completion.

- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.06 CUTTING AND PATCHING:

- A. Cutting and Patching, 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 in place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to

requirements in Section 011000 Summary.

- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  - 3. Floors and Walls: Where walls or partitions that are removed 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 in place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty and similar materials from adjacent finished surfaces.

3.07 OWNER INSTALLED PRODUCTS:

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
  2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.08 PROGRESS CLEANING:

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
  3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
  4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
  2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 Construction Waste Management and Disposal.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.09 STARTING AND ADJUSTING:

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 General Commissioning Requirements.
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 Quality Requirements.

3.10 PROTECTION OF INSTALLED CONSTRUCTION:

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.



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08/18/23

END OF SECTION 017300

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## SECTION 017329 - CUTTING AND PATCHING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. See Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
- C. See Division 07 Section "Penetration Firestopping" for patching fire-rated construction.

#### 1.2 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least **10** days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
  - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
  - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
  - 3. Products: List products to be used and firms or entities that will perform the Work.
  - 4. Dates: Indicate when cutting and patching will be performed.
  - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
  - 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
  - 7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

#### 1.3 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity

to perform as intended, or that results in increased maintenance or decreased operational life or safety.

- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

#### 1.4 WARRANTY

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

### **PART 2 - PRODUCTS**

#### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
  - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to **prevent** interruption to occupied areas.

### 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 in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and 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. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. **Masonry**: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  - 2. Exposed Finishes: 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.
  - 3. Floors and Walls: Where walls or partitions that are removed 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 in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

## SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

### PART 1 - GENERAL

#### 1.01 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.

#### 1.02 SUMMARY:

- A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

- B. Related Requirements are Included in the Following Sections:

1. Section 015000 Temporary Facilities and Controls for other support facilities.

#### 1.03 DEFINITIONS:

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

#### 1.04 PERFORMANCE REQUIREMENTS:

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total non hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

#### 1.05 ACTION SUBMITTALS:

- A. Waste Management Plan: Submit plan within 30 days of date established for the Notice to

Proceed.

1.06 INFORMATIONAL SUBMITTALS:

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:
  - 1. Material category.
  - 2. Generation point of waste.
  - 3. Total quantity of waste in tons.
  - 4. Quantity of waste salvaged, both estimated and actual in tons.
  - 5. Quantity of waste recycled, both estimated and actual in tons.
  - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
  - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts and invoices.
- G. Qualification Data: Submit qualification data for waste management coordinator.

1.07 QUALITY ASSURANCE:

- A. Waste Management Coordinator Qualifications: Employ an experienced firm, with a record of successful waste management coordination of projects with similar requirements, that is certified by the USGBC, as waste management coordinator.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 Project Management and Coordination. Review methods and procedures related to waste management including, but not limited to, the following:



1. Review and discuss waste management plan including responsibilities of waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.08 WASTE MANAGEMENT PLAN:

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, siteclearing and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
  2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
  3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
  4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
  6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste]. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

## PART 2 - PRODUCTS

(NOT APPLICABLE)

## PART 3 - EXECUTION

### 3.01 PLAN IMPLEMENTATION:

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
  1. Comply with operation, termination, and removal requirements in Section 015000 Temporary Facilities and Controls.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors and suppliers on proper waste management procedures, as appropriate for the Work.
  1. Distribute waste management plan to everyone concerned within three days of submittal return.
  2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure

minimum interference with roads, streets, walks, walkways and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated and sold.
2. Comply with Section 015000 Temporary Facilities and Controls for controlling dust and dirt, environmental protection and noise control.

### 3.02 SALVAGING DEMOLITION WASTE:

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

E. Equipment: Drain tanks, piping and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

F. Plumbing Fixtures: Separate by type and size.

G. Lighting Fixtures: Separate lamps by type and protect from breakage.

H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers and other devices by type.

### 3.03 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL:

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits and other incentives received for recycling waste materials shall be shared equally by Owner and Contractor.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  - 4. Store components off the ground and protect from the weather.
  - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.04 RECYCLING DEMOLITION WASTE:

- A. Asphalt Paving: Break up and transport paving to asphalt recycling facility.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  - 1. Clean and stack undamaged, whole masonry units on wood pallets.
- D. Wood Materials: Sort and stack members according to size, type and length. Separate lumber, engineered wood products, panel products and treated wood materials.
- E. Metals: Separate metals by type.
  - 1. Structural Steel: Stack members according to size, type of member and length.
  - 2. Remove and dispose of bolts, nuts, washers and other rough hardware.
- F. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

- G. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- H. Metal Suspension System: Separate metal members including trim and other metals from acoustical panels and tile and sort with other metals.
- I. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive and tack strips.
  - 1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- J. Carpet Tile: Remove debris, trash and adhesive.
  - 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- K. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers and other components by type and size.
- L. Conduit: Reduce conduit to straight lengths and store by type and size.

### 3.05 RECYCLING CONSTRUCTION WASTE:

- A. Packaging:
  - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
  - 2. Polystyrene Packaging: Separate and bag materials.
  - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
  - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
  - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
  - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

### 3.06 DISPOSAL OF WASTE:

- A. General: Except for items or materials to be salvaged, recycled or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator

acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

3.07 ATTACHMENTS:

- A. Form CWM-1 for construction waste identification.
- B. Form CWM-2 for demolition waste identification.
- C. Form CWM-3 for construction waste reduction work plan.
- D. Form CWM-4 for demolition waste reduction work plan.
- E. Form CWM-5 cost/revenue analysis of construction waste reduction work plan.
- F. Form CWM-6 cost/revenue analysis of demolition waste reduction work plan.
- G. Form CWM-7 for construction waste
- H. Form CWM-8 for demolition waste.

END OF SECTION 017419

## SECTION 017700 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.01 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.

#### 1.02 SUMMARY:

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. List of incomplete work (punch list).
4. Final cleaning.

- B. Related Sections Include the Following:

1. Section 012900 Payment Procedures for requirements for Applications for Payment for Substantial and Final Completion.
2. Section 013233 Photographic Documentation for submitting final completion construction photographic documentation.
3. Section 017300 Execution for progress cleaning of the project site.
4. Section 017700E Punch List.
5. Section 017823 Operation and Maintenance Data for operation and maintenance manual requirements.
6. Section 017839 Project Record Documents for submitting Record Drawings, Record Specifications, and Record Product Data.
7. Divisions 02 through 35 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

#### 1.03 ACTION SUBMITTALS:

- A. Product Data: Submit product data for cleaning agents.
- B. Contractor's List of Incomplete Items: Submit Contractor's Initial List of Incomplete Items (Initial Punch List) at Substantial Completion.
- C. Certified List of Incomplete Items: Submit Contractor's Certified Final List of Incomplete Items (Final Punch List) at Final Completion.

#### 1.04 CLOSEOUT SUBMITTALS:

- A. Certificates of Release: Submit Certificates of Release from authorities having jurisdiction.
- B. Certificate of Insurance: Submit Certificate of Insurance for continuing coverage.
- C. Field Report: Submit Field Report for pest control inspection.

1.05 MAINTENANCE MATERIAL SUBMITTALS:

- A. Schedule of Maintenance Material Items: Submit schedule for maintenance material submittal items specified in other Sections.

1.06 SUBSTANTIAL COMPLETION PROCEDURES:

- A. Contractor's List of Incomplete Items: 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.
- B. Submittals Prior to Substantial Completion: Complete the following not less than 14 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates and similar releases.
  - 2. Submit closeout submittals specified in other Division 01 Sections including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
  - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number where applicable.
    - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Contractor's signature for receipt of submittals.
  - 5. Submit test/adjust/balance records.
  - 6. Submit sustainable design submittals required in Section 018113 Sustainable Design Requirements and in individual Sections.
  - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following not less than 14 days days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.



1. Advise Owner of pending insurance changeover requirements.
  2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  3. Complete startup and testing of systems and equipment.
  4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 Demonstration and Training.
  6. Advise Owner of changeover in heat and other utilities.
  7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements, including touchup painting.
  10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion not less than 14 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect, Owner, and Contractor will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for final completion.
- 1.07 FINAL COMPLETION PROCEDURES:
- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 Payment Procedures.
  2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Submit pest control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.08 LIST OF INCOMPLETE ITEMS (PUNCH LIST):

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment and building systems.

3. Include the following information at the top of each page:

- a. Project name.
- b. Date.
- c. Name of Architect.
- d. Name of Contractor.
- e. Page number.

4. Submit list of incomplete items in the following format:

- a. PDF electronic file.
- b. Submit not less than three paper copies of punch list unless otherwise directed.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## PART 3 - EXECUTION

### 3.01 FINAL CLEANING:

A. General: Perform final cleaning. Conduct cleaning and waste removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following before requesting inspection to determine date of Substantial Completion for the entire project or a portion thereof:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard surfaced finishes to a dirt free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - k. Remove labels that are not permanent.
    - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    - m. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
    - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grilles.
    - p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
    - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
    - r. Leave Project clean and ready for occupancy.
  - C. Pest Control: Comply with pest control requirements in Section 015000 Temporary Facilities and Controls. Prepare written report.
  - D. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 Construction Waste Management and Disposal.
- 3.02 REPAIR OF THE WORK:
- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
  - B. Repair or remove and replace defective construction. Repairing includes replacing defective

parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
  - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700



# PUNCH LIST

Project: DSP Northville Forensic Lab Elevator Replacement  
42145 W. Seven Mile Rd. Northville, Mi. 48167

From (A/E): Hobbs+Black Associates, Inc., 100 N. State St. Ann Arbor, Mi. 48104

Site Visit Date: \_\_\_\_\_

To (Contractor): \_\_\_\_\_  
\_\_\_\_\_

A/E Project Number: 22300.00

Contract For: \_\_\_\_\_

The following items require the attention of the Contractor for completion or correction. This list may not be all-inclusive, and the failure to include any items on this list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Item Number	Room Number	Location (Area)	Description	Correction/Completion Date	Verification A/E Check
-------------	-------------	-----------------	-------------	----------------------------	------------------------

Attachments

Signed by: \_\_\_\_\_ Date: \_\_\_\_\_

Copies:  Owner  Consultants  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  File

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY:

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems and equipment.
  - 4. Product maintenance manuals.
  - 5. Systems and equipment maintenance manuals.
- B. Related Sections Include the Following:
  - 1. Section 013300 Submittal Procedures for submitting copies of submittals for operation and maintenance manuals.
  - 2. Section 017700 Closeout Procedures for conducting Substantial Completion procedures, Final Completion procedures, preparing lists of incomplete work, and final cleaning.
  - 3. Section 017836 Warranties for warranty requirements.
  - 4. Section 017839 Project Record Documents for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 5. Section 017900 Demonstration and Training for requirements for instructing Owner's personnel.
  - 6. Section 019113 General Commissioning Requirements for verification and compilation of data into operation and maintenance manuals.
  - 7. Divisions 02 through 35 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.03 DEFINITIONS:

- A. System: An organized collection of parts, equipment or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.04 CLOSEOUT SUBMITTALS:

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
  - 1. Electronic File: Assemble each manual into a composite electronically indexed searchable file in PDF format. Provide not less than three external portable HDD's as required so that each one contains all maintenance and record files also containing Project Record Documents and Training Videos.
    - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    - b. Enable inserted reviewer comments on draft submittals.
  - 2. Submit three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
  - 1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

## PART 2 - PRODUCTS

### 2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY:

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.



- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

## 2.02 REQUIREMENTS FOR EMERGENCY, OPERATION AND MAINTENANCE MANUALS:

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- B. Title Page: Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name and contact information for Contractor.
  - 6. Name and contact information for General Contractor.
  - 7. Name and contact information for Architect.
  - 8. Name and contact information for Commissioning Authority.
  - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  - 10. Cross reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross referenced to Specification Section number in Project Manual.
  - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each

volume of the set.

- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
  - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
  - 1. Binders: Heavy duty, three ring, vinyl covered, loose leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2 by 11 inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple volume sets.
  - 2. Dividers: Heavy paper dividers with plastic covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross referenced to Specification Section number and title of Project Manual.
  - 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
  - 4. Supplementary Text: Prepared on 8-1/2 by 11 inch white bond paper.
  - 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.03 EMERGENCY MANUALS:

- A. Content: Organize manual into a separate section for each of the following:
  - 1. Type of emergency.
  - 2. Emergency instructions.
  - 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  - 1. Fire.
  - 2. Flood.
  - 3. Gas leak.
  - 4. Water leak.
  - 5. Power failure.
  - 6. Water outage.
  - 7. System, subsystem, or equipment failure.
  - 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
  - 1. Instructions on stopping.
  - 2. Shutdown instructions for each type of emergency.
  - 3. Operating instructions for conditions outside normal operating limits.
  - 4. Required sequences for electric or electronic systems.
  - 5. Special operating instructions and procedures.

2.04 OPERATION MANUALS:

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  - 2. Performance and design criteria if Contractor has delegated design responsibility.

3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
  2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.
  9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
  2. Equipment or system break-in procedures.
  3. Routine and normal operating instructions.
  4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.
  7. Seasonal and weekend operating instructions.
  8. Required sequences for electric or electronic systems.

9. Special operating instructions and procedures.

- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

2.05 PRODUCT MAINTENANCE MANUALS:

- A. Content: Organize manual into a separate section for each product, material and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

2.06 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS:

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include

source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting and checking instructions.
  - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual and annual frequencies.
  - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross referenced to manufacturers' maintenance documentation and local

sources of maintenance materials and related services.

- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

### PART 3 - EXECUTION

#### 3.01 MANUAL PREPARATION:

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  - 1. Engage a factory authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original project record documents as part of operation and maintenance manuals.
  - 2. Comply with requirements of newly prepared record Drawings in Section 017839 Project Record Documents.

- G. Comply with Section 017700 Closeout Procedures for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823



SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Attention is directed to Division 00, Bidding and Contract Requirements, and to Division 01, General Requirements, which are hereby made a part of this Section.

1.02 SUMMARY:

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
  - 4. Miscellaneous Record Submittals.
- B. Related Sections Include the Following:
  - 1. Section 017300 Execution for final property survey.
  - 2. Section 017700 Closeout Procedures for general closeout procedures.
  - 3. Section 017823 Operation and Maintenance Data for operation and maintenance manual requirements.
  - 4. Section 017836 Warranties for warranty requirements.
  - 5. Section 017900 Demonstration and Training for requirements for instructing Owner's personnel.
  - 6. Section 019100 Commissioning for commissioning requirements.
  - 7. Divisions 02 through 35 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.03 DEFINITIONS:

- A. Record Drawings: Contractor performed record of the Work recorded on the Contract Drawings as it is/was performed, including modifications and other information as part of the graphic and pictorial portion of the Contract Documents.
- B. Record Specifications: Contractor performed record of the Work recorded on the Contract Specifications as it is/was performed, including modifications and other information as part of the written requirements of the Contract Documents for materials, equipment, systems, standards, performance, workmanship, and other provisions.
- C. Record Product Data: Contractor submitted Product Data documentation which includes illustrations, schedules, performance charts, instructions, brochures, diagrams, and other

information which has been reviewed and acknowledged as demonstrating compliance with the design intent of the Contract Documents as described by review stamps and annotations associated with them.

- D. Digital Data Files: Data processed on a computer using only software directed by Owner which organizes processed output electronically in PDF format to represent text, images, or other visually discernable patterns into digital data files which can be stored, transferred, modified on computer media or viewed on prepared screen.

1.04 SUBMITTALS:

- A. Record Drawings: Refer to PART 2.
- B. Record Specifications: Refer to PART 2.
- C. Record Product Data: Refer to PART 2.
- D. Miscellaneous Record Submittals: Refer to PART 2.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS:

- A. Preparation: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  - 1. Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
    - e. Cross reference record prints to corresponding archive photographic documentation.
  - 2. Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.

- o. Any work performed on existing utilities specifically:
  - 1) Indicating all utility lines and Work performed or not performed on them.
  - 2) Recording whether or not each item of equipment or utility line was or was not capped, removed, abandoned in place, relocated, or left untouched.
  - 3) Recording what Work was performed by this Contract or by contractor performing Work of any adjacent swing space.
- 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  - a. Ensure any marks on Shop Drawings which are not on Contract Drawings are cross referenced on the Contract Drawings.
- 4. Mark record sets as required to fully describe changes. Use colors to distinguish between changes for different categories of the Work at same location.
- 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
- 6. Note Instruction Bulletin numbers, Addenda numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: When directed by Architect and Owner, review marked-up record prints with Architect and Contractor. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
  - 1. Format: Annotated PDF electronic file with comment function enabled using only software designated by Owner.
    - a. Incorporate hyper-links to Requests For Information (RFI's).
    - b. Do not use or employ "Flatten" function on any file until the Final Set is being completed.
  - 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  - 3. Refer instances of uncertainty to Architect through Contractor for resolution.
  - 4. Architect will furnish Contractor one set of digital data files in PDF format of the Contract Drawings for use in recording information. Architect will provide Contractor updated digital data files in PDF format for Instruction Bulletins that are issued for use in updating background of Record Files.
- C. Record Digital CAD Background Files: To be provided directly to Owner by Architect.
- D. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
  - 1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, Instruction Bulletin, or other modification.
  - 2. Consult Architect and Contractor for proper scale and scope of detailing and notations

required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

3. Format: Original New Drawing, AutoCAD 2016, Version M49.0.0, dwg format using only AutoDesk software.
  - a. Converted Record Format: Annotated PDF electronic file with comment function enabled using only software designated by Owner.
  - b. Incorporate hyper-links to Requests For Information (RFI's).
- E. BIM Model: As part of the preparation of Record Digital Data Files, update the entire project BIM Model. Provide updated BIM Model on not less than two external (or groups of) portable HDD's as required so that each HDD (or more if required) contains all Model files.
  1. Format: Use only <Navisworks v11> software by Autodesk or other software found acceptable to Owner.
  2. Incorporate changes and additional information previously marked on record prints.
  3. Refer instances of uncertainty to Architect through Contractor for resolution.
  4. Refer to the BIM Model matrix included at the end of this section for information and links to be contained within the BIM Model including:
    - a. Links to Operation and Maintenance Manuals.
    - b. Links to Record Drawings.
    - c. Links to Building Management System.
- F. IDENTIFICATION, ORGANIZATION, AND DUPLICATION: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
  1. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file. Use file names (including extensions) not more than 200 characters in length.
    - a. Provide not less than three external (or groups of) portable HDD's as required so that each HDD (or more if required) contains all record files.
    - b. Provide three complete full size printouts of Record Drawings including Newly Prepared Record Drawings bound into sets with unique covers for each separate bound set as originally issued, updated as specified.
  2. BIM Modeling: Provide not less than two external portable HDD's (as required so that each HDD (or more if required) contains all Model files.
  3. Identification: Provide identification on each record print/drawing consisting of the information below. Utilize the "Stamp" function for this purpose on digital drawing files, placing the designation "PROJECT RECORD DRAWING" in a prominent and consistent location.
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWING".
    - d. Name of Architect and Contractor.

- e. Name of Contractor.

2.02 RECORD SPECIFICATIONS:

- A. Preparation: Maintain one set of marked-up paper copies of the Contract Specifications, incorporating new and revised specifications as modifications are issued.
  - 1. Mark Record Specification sections to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
    - a. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
    - b. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
    - c. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
    - d. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
    - e. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
  - 2. Mark the Contract Specifications completely and accurately. Use personnel proficient at recording information in production of marked-up record specifications.
    - a. Ensure any marks on Product Data which are not on Contract Specifications are cross referenced on the Contract Specifications.
  - 3. Mark record sections as required to fully describe changes. Use colors to distinguish between changes for different categories of the Work at same location.
  - 4. Mark important additional information that was omitted from original Specifications.
  - 5. Note Instruction Bulletin numbers, Addenda numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: When directed by Architect and Owner, review marked-up Record Specifications with Architect and Contractor. When authorized, prepare a full set of corrected digital data files of the Contract Specifications, as follows:
  - 1. Format: Annotated PDF electronic file with comment function enabled using only software directed by Owner.
    - a. Incorporate hyper-links to Requests For Information (RFI's).
    - b. Do not use or employ "Flatten" function on any file until the Final Set is being completed.
  - 2. Incorporate changes and additional information previously marked on record Specifications. Delete, modify, and add text and notations where applicable.
  - 3. Refer instances of uncertainty to Architect through Contractor for resolution.
  - 4. Architect will furnish Contractor one set of digital data files in PDF format of the Contract Specifications for use in recording information. Architect will provide Contractor updated digital data files in PDF format for Instruction Bulletins that are issued for use in updating

Record Files.

- C. IDENTIFICATION, ORGANIZATION, AND DUPLICATION: Identify and date each record Specification Section Page; include the designation "PROJECT RECORD SPECIFICATION" in a prominent location.
1. Record Paper Specifications: Organize record Specifications into manageable volumes using same "Volume" system as Architect unless otherwise directed by Owner.
    - a. Binders: Heavy duty, three ring, vinyl covered, loose leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2 by 11 inch paper; with clear plastic sleeve on spine, front, and back to hold labels and covers describing contents and with pockets inside covers to hold folded oversize sheets.
    - b. Dividers: Heavy paper dividers with plastic covered tabs for each Division of the manual. Mark each tab to indicate Division number.
    - c. Supplementary Text: Prepared on 8-1/2 by 11 inch white bond paper.
    - d. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
      - 1) If oversize documents are necessary, fold documents to same size as text pages and use as foldouts.
      - 2) If documents are too large to be used as foldouts, fold and place documents in labeled envelopes and bind envelopes in rear of Volume. At appropriate locations in manual, insert typewritten pages indicating document titles, descriptions of contents, and document locations.
  2. Include identification to insert on front and back of each volume.
    - a. Provide three complete sets of Volumes.
  3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each section of the Contract Specifications. Name each file with the section identification. Include identification in each digital data file. Use file names (including extensions) not more than 200 characters in length.
    - a. Provide not less than three external (or groups of) portable HDD's as required so that each HDD (or more if required) contains all Record files.
  4. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD SPECIFICATIONS".
    - d. Name of Architect and Contractor.
    - e. Name of Contractor.

2.03 RECORD PRODUCT DATA:

- A. Preparation: Maintain one set of marked-up paper copies of the accepted Product Data, incorporating new and revised information as modifications are issued.
1. Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
    - a. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
    - b. Include significant changes in the product delivered to Project site and changes in

- manufacturer's written instructions for installation.
    - c. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
  - 2. Record Digital Data Files: When directed by Architect and Owner, review marked-up record Product Data with Architect and Contractor. When authorized, prepare a full set of corrected digital data files of the Product Data, as follows:
  - 3. Format: Annotated PDF electronic file with comment function enabled using only software designated by Owner.
    - a. Incorporate hyper-links to Requests For Information (RFI's).
    - b. Do not use or employ "Flatten" function on any file until the Final Set is being completed.
  - 4. Incorporate changes and additional information previously marked on record Product Data. Delete, modify, and add text and notations where applicable.
  - 5. Refer instances of uncertainty to Architect through Contractor for resolution.
  - 6. Owner will furnish Contractor one set of digital data files in PDF format of the Product Data for use in recording information. Owner will provide Contractor updated digital data files in PDF format for Instruction Bulletins that are issued for use in updating Record Files.
- B. IDENTIFICATION, ORGANIZATION, AND DUPLICATION: Identify and date each record Product Data; include the designation "PROJECT RECORD PRODUCT DATA" in a prominent location.
  - 1. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each section number of the Contract Specifications. Name each file with the section identification. Include identification in each digital data file. Use file names (including extensions) not more than 200 characters in length.
    - a. Provide not less than three external (or groups of) portable HDD's as required so that each HDD (or more if required) contains all Record files.
  - 2. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD PRODUCT DATA".
    - d. Name of Architect and Contractor.
    - e. Name of Contractor.

#### 2.04 MISCELLANEOUS RECORD SUBMITTALS:

- A. Preparation: Maintain one set of marked-up hard copies of the Miscellaneous Record Submittals, incorporating new and revised information as modifications are issued.
  - 1. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
  - 2. Types of items requiring marking include, but are not limited to, the following:

- a. Project Submittals and Shop Drawings.
  - b. Meeting Minutes.
  - c. QC/QA documentation including QC checklists.
  - d. Inspection test reports.
  - e. Progress Photos.
  - f. Safety incident reports.
  - g. Daily reports.
- B. Record Digital Data Files: When directed by Architect and Owner, review marked-up record Miscellaneous Record Submittals with Architect and Contractor. When authorized, prepare a full set of corrected digital data files of Miscellaneous Record Submittals, as follows:
1. Format: Annotated PDF electronic file with comment function enabled using only software designated by Owner.
    - a. Incorporate hyper-links to Requests For Information (RFI's).
    - b. Do not use or employ "Flatten" function on any file until the Final Set is being completed.
  2. Incorporate changes and additional information previously marked on record Product Data. Delete, modify, and add text and notations where applicable.
  3. Refer instances of uncertainty to Architect through Contractor for resolution.
  4. Contractor will furnish Owner one set of digital data files of the Miscellaneous Record Submittals for use in recording information.
- C. IDENTIFICATION, ORGANIZATION, AND DUPLICATION: Identify and date each miscellaneous record submittal; include the designation "PROJECT MISCELLANEOUS RECORD SUBMITTALS" in a prominent location.
1. Record Digital Data Files: Organize digital data information into separate electronic files as directed by Owner. Name each file with the identification as directed. Include identification in each digital data file. Use file names (including extensions) not more than 200 characters in length.
    - a. Provide not less than three external (or groups of) portable HDD's as required so that each HDD (or more if required) contains all Record files.
  2. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT MISCELLANEOUS RECORD SUBMITTALS".
    - d. Name of Architect and Contractor.
    - e. Name of Contractor.

2.05 ELECTRONIC RECORD SUBITTAL MEDIA AND DEVICES:



- A. HDD's: Portable external hard disk drives, USB 3.0 or IEEE 13394b as acceptable to Owner, 2-1/2 inch form factor, 7,200 RPM spin rate, capacity as required but greater than 500 Gb and less than 1.0 Tb, extremely durable hard plastic or metal case with ventilation, minimum three year warranty on entire drive.
  - 1. Designated Design: Seagate GoFlex or similar Buffalo or Iomega products.

### PART 3 - EXECUTION

#### 3.01 RECORDING AND MAINTENANCE:

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's, Owner's, and Contractor's reference during normal working hours.

END OF SECTION 017839

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## SECTION 024119 - SELECTIVE DEMOLITION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of 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 elevator hoistway elements/portions of wall. Coordinate with elevator contractor prior to start of demolition work.

- B. Related Requirements:

- 1. Section 017300 "Execution" for cutting and patching procedures.
- 2. Section 142400 "Hydraulic Elevator" for elevator equipment demolition performed by the elevator contractor.

#### 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 Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- C. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

#### 1.4 MATERIALS OWNERSHIP

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

#### 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 and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. 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 control and for 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. Ensure Owner's and other tenants' on-site operations are uninterrupted.
  2. Interruption of utility services. Indicate how long utility services will be interrupted.
  3. Coordination for shutoff, capping, and continuation of utility services.
  4. Use of elevator and stairs.
  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. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.
- 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 QUALITY ASSURANCE

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

#### 1.8 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.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

#### 1.9 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.
- 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.

#### 1.10 COORDINATION

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

### 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. 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.
- B. 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.

C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."

### 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. 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.

2. 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. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.

c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

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. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

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 two 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. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

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. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and 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 sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- E. Ceramic Floor Tile: Remove ceramic tile and setting bed materials. Do not use methods that will result in damage to structural concrete slab substrate or to existing tile indicated to remain. Leave concrete slab surface smooth and clean, ready to receive cementitious patching/leveling compound.

### 3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."
  - 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 specified in Section 017419 "Construction Waste Management and 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 033053 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
  - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
  - 2. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements. For each design mixture submitted, include an equivalent concrete mixture that does not contain portland cement replacements, to determine amount of portland cement replaced.
- C. Other Action Submittal:
  - 1. Design Mixtures: For each concrete mixture.

#### 1.3 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Comply with ACI 301.
- C. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

### PART 2 - PRODUCTS

#### 2.1 FORMWORK

- A. Furnish formwork and formwork accessories according to ACI 301.

#### 2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- C. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.
- E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

### 2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I.
    - a. Fly Ash: ASTM C 618, Class C or F.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
  - 2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag cement.
- B. Normal-Weight Aggregate: ASTM C 33, graded, 1-1/2-inch nominal maximum aggregate size.
- C. Water: ASTM C 94/C 94M.

### 2.4 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/C 494M, Type A.
  - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

### 2.5 RELATED MATERIALS

- A. Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick; or plastic sheet, ASTM E 1745, Class C.
- B. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

### 2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.

- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

## 2.7 CONCRETE MIXTURES

- A. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:
  - 1. Minimum Compressive Strength: 4500 psi at 28 days.
  - 2. Maximum Water-Cementitious Materials Ratio: 0.50.
  - 3. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
  - 4. Slump Limit: 4 inches, plus or minus 1 inch.
  - 5. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

## 2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116, and furnish batch ticket information.
  - 1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 FORMWORK

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

### 3.2 EMBEDDED ITEMS

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

### 3.3 VAPOR RETARDERS

- A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.
  - 1. Lap joints 6 inches and seal with manufacturer's recommended adhesive or joint tape.

### 3.4 STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

### 3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

- B. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
  - 1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

### 3.6 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Consolidate concrete with mechanical vibrating equipment.

### 3.7 FINISHING FORMED SURFACES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.
  - 1. Apply to concrete surfaces exposed to public view, or to be covered with a coating or covering material applied directly to concrete.
- B. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301, to smooth-formed finished as-cast concrete where indicated:
  - 1. Smooth-rubbed finish.
  - 2. Grout-cleaned finish.
  - 3. Cork-floated finish.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.8 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
  - 1. Do not further disturb surfaces before starting finishing operations.
- C. Scratch Finish: Apply scratch finish to surfaces indicated and surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes, unless otherwise indicated.
- D. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.

- E. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
- F. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- G. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

### 3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days 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.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301.

1. Testing Frequency: One composite sample shall be obtained for each day's pour of each concrete mix exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: One composite sample shall be obtained for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

3.11 REPAIRS

- A. Remove and replace concrete that does not comply with requirements in this Section.

END OF SECTION 033053

## SECTION 042000 - UNIT MASONRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Concrete masonry units.
  - 2. Mortar and grout.
  - 3. Steel reinforcing bars.
  - 4. Masonry-joint reinforcement.
  - 5. Ties and anchors.
  - 6. Miscellaneous masonry accessories.

#### 1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
  - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
  - 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of the following:
  - 1. Masonry units.
    - a. Include material test reports substantiating compliance with requirements.
  - 2. Cementitious materials. Include name of manufacturer, brand name, and type.
  - 3. Mortar admixtures.
  - 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.

5. Grout mixes. Include description of type and proportions of ingredients.
6. Reinforcing bars.
7. Joint reinforcement.
8. Anchors, ties, and metal accessories.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units 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. If units become wet, do not install until they are dry.
- 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. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.7 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls, and hold cover securely in place.
  2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe, and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.



1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

### 2.2 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

### 2.3 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
  1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  2. Provide square-edged units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C 90.
  1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa).
  2. Density Classification: Medium weight or Normal weight.
  3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less-than-nominal dimensions.
  4. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

## 2.4 CONCRETE AND MASONRY LINTELS

- A. General: Provide one of the following:
- B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.
- C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 033000 "Cast-in-Place Concrete," and with reinforcing bars indicated.
- D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

## 2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, 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.
  - 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Aggregate for Mortar: ASTM C 144.
  - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  - 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
  - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
  - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- E. Aggregate for Grout: ASTM C 404.
- F. Water: Potable.

## 2.6 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

- C. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.
  - 1. Interior Walls: Hot-dip galvanized carbon steel.
  - 2. Exterior Walls: Hot-dip galvanized carbon steel.
  - 3. Wire Size for Side Rods: 0.187-inch (4.76-mm) diameter.
  - 4. Wire Size for Cross Rods: 0.187-inch (4.76-mm) diameter.
  - 5. Wire Size for Veneer Ties: 0.187-inch (4.76-mm) diameter.
  - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
  - 7. Provide in lengths of not less than 10 feet (3 m).
- D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

## 2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

## 2.8 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

## 2.9 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Use portland cement-lime mortar unless otherwise indicated.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
  - 1. For masonry below grade or in contact with earth, use Type M.
  - 2. For reinforced masonry, use Type S.
  - 3. For mortar parge coats, use Type S or Type N.

4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
  5. For interior nonload-bearing partitions, Type O may be used instead of Type N.
- C. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
  2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
  3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
  2. Verify that foundations are within tolerances specified.
  3. Verify that reinforcing dowels are properly placed.
  4. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

### 3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

### 3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches (100 mm). Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
  - 1. Install compressible filler in joint between top of partition and underside of structure above.
  - 2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay CMUs as follows:
  - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
  - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
  - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
  - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
  - 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
  - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.

2. Allow cleaned surfaces to dry before setting.
  3. Wet joint surfaces thoroughly before applying mortar.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

### 3.6 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
1. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
  2. Embed tie sections in masonry joints.
  3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  4. Space anchors as indicated, but not more than 18 inches (458 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally, with not less than one anchor for each 2 sq. ft. (0.2 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 8 inches (203 mm), around perimeter.
- B. Provide not less than 2 inches (50 mm) of airspace between back of masonry veneer and face of insulation.
1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

### 3.7 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
1. Space reinforcement not more than 16 inches (406 mm) o.c.
  2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
  3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

### 3.8 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
  - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
  - 2. Install preformed control-joint gaskets designed to fit standard sash block.
- C. Form expansion joints in brick as follows:
  - 1. Form open joint full depth of brick wythe and of width indicated, but not less than 1/2 inch (13 mm) for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."
- D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch (10 mm).
  - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

### 3.9 LINTELS

- A. Provide concrete or masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

### 3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage Special Inspectors to perform QA tests and inspections and prepare reports. Allow Special Inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Quality Assurance Testing: The Contractor shall engage the Independent Testing Agency (ITA) to perform additional quality control inspections in accordance with their quality plan as necessary to certify compliance with the construction documents.
- C. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
  - 1. Perform pre-construction testing in accordance with Section 014500 E.3.
  - 2. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
  - 3. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
  - 4. Place grout only after inspectors have verified proportions of site-prepared grout.



- D. Testing Prior to Construction: One set of tests performed by the Special Inspector
- E. QC Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof. QC testing shall be performed by the ITA inspector employed by the Contractor. Perform at least one test where total area of wall on project is less than 5000 sq. ft.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Prism Test: For each type of construction provided, according to ASTM C 1314 at 28 days.

### 3.11 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  - 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
  - 6. Clean stone trim to comply with stone supplier's written instructions.
  - 7. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

### 3.12 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

## SECTION 055000 - METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### 1.2 SUMMARY

- A. Section Includes:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Shelf angles.
4. Steel shapes for supporting elevator door sills.
5. Elevator hoist beams.
6. Metal ladders.
7. Elevator pit sump covers.

- B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

- C. Related Requirements:

1. Section 033053 "Miscellaneous Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

#### 1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Paint products.
  - 2. Grout.
  
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
  - 1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  - 2. Elevator hoist beams.
  - 3. Steel shapes for supporting elevator door sills.
  - 4. Shelf angles.
  - 5. Metal ladders.
  - 6. Elevator pit sump covers.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

#### 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

#### 1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

### 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.
- D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
- G. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- H. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- I. Zinc-Coated Steel Wire Rope: ASTM A 741.
  - 1. Wire-Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
- J. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
  - 1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm), or as indicated.
  - 2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B, or structural steel, Grade 33 (Grade 230), with G90 (Z275) coating; minimum 0.079-inch (2-mm) nominal thickness.
- K. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- L. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- M. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- N. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

- O. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- P. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).
- Q. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).
- R. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.
- S. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

### 2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless-steel fasteners for fastening aluminum.
  - 2. Provide stainless-steel fasteners for fastening stainless steel.
  - 3. Provide stainless-steel fasteners for fastening nickel silver.
  - 4. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593 (ASTM F 738M); with hex nuts, ASTM F 594 (ASTM F 836M); and, where indicated, flat washers; Alloy Group 1 (A1).
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- F. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

#### 2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting and Section 099123 Interior Painting".
- B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- H. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

#### 2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

## 2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  1. Fabricate units from slotted channel framing where indicated.
  2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

## 2.7 METAL LADDERS

- A. General:
  1. Comply with ANSI A14.3, except for elevator pit ladders.
  2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Steel Ladders:
  1. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
  2. Siderails: Continuous, 1/2-by-2-1/2-inch (12.7-by-64-mm) steel flat bars, with eased edges.
  3. Rungs: 3/4-inch- (19-mm-) diameter steel bars.
  4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.



5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
7. Galvanize and prime exterior ladders, including brackets.
8. Prime ladders, including brackets and fasteners, with zinc-rich primer.

#### 2.8 ELEVATOR PIT SUMP COVERS FOR EXISTING SUMP PIT

- A. Fabricate from welded or pressure-locked galvanized steel bar grating Limit openings in gratings to no more than 1 inch (25 mm) in least dimension.
- B. Provide steel angle supports as required.

#### 2.9 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.
- C. Prime plates with zinc-rich primer.

#### 2.10 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

#### 2.11 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

#### 2.12 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
  1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
  - 1. Shop prime with primers specified in Section 099113 "Exterior Painting" and in Section 099123 "Interior Painting" unless zinc-rich primer is indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
  - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
  1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

### 3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with non-shrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

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SECTION 075323 – EPDM ROOFING - Fully Adhered

PART 1 - 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 SECTION INCLUDES

- A. Insulation, membrane roofing, base flashings, and counter flashings for installation of items covered in section 077200 Roof Accessories.
  - 1. Membrane manufacturer shall coordinate and be singularly responsible for the insulation, flashing, and membrane installation, compatibility, and water tightness.
  - 2. Walk Pads

1.3 REFERENCES

- A. ASTM C177 - Test Method for Steady-State thermal Transmission Properties by Means of the Guarded Hot Plate.
- B. ASTM C578 - Preformed, Cellular Polystyrene Thermal Insulation.
- C. ANSI/ASTM D412 - Rubber Properties in Tension.
- D. ANSI/ASTM D746 - Brittleness Temperature of Plastics and Elastomeric by Impact.
- E. ASTM D624 - Rubber Property - Tear Resistance.
- F. ASTM D822 - Practice for Operating Light and Water-Exposure Apparatus (Carbon-Arc) Type for Testing Paint, Varnish, Lacquer, and Related Products.
- G. ASTM D1004 - Initial Tear Resistance of Plastic Film and Sheeting.
- H. ASTM D2240 - Rubber Property - Durometer Hardness.
- I. ASTM E96 - Water Vapor Transmission of Materials.
- J. Factory Mutual Engineering & Research Corporation (FM) - Roof Assembly Classifications.
- K. FS HH-I-551 - Insulation Block and Boards, Thermal (Cellular Glass).
- L. FS LLL-I-535 - Insulation Board, Thermal (Cellulosic Fiber).
- M. National Roofing Contractors Association (NRCA) - Roofing and Waterproofing Manual.
- N. Underwriters Laboratories (UL) - Fire Hazard Classifications.

1.4 SYSTEM DESCRIPTION

- A. Existing roof membrane is an Elastomeric Sheet Membrane Roofing System: Black – Versico by Carlisle, 20 year warranty (expiration date = 10/9/2033), non-reinforced membrane system adhesive applied over a minimum of 2 layers of insulation with staggered joints.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 3300.
- B. Shop Drawings: Indicate setting plan for new roof walk pads
- C. Product Data: Provide characteristics on walk pad materials & flashing materials.
- D. Manufacturer's Installation Instructions: Indicate special precautions required for setting the walk pads.

- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Manufacturer's Field Reports: Submit under provisions of Section 01 4000.
- G. Reports: Indicate procedures followed; ambient temperatures, humidity and wind velocity during application.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with three years documented experience.
- B. Applicator: Company specializing in performing the work of this section with three years documented experience and approved by system manufacturer.
- C. Work of this section to conform to NRCA Roofing and Waterproofing Manual and manufacturer's instructions, unless more stringent criteria is specified here-in.

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable code for roof assembly fire hazard requirements.
- B. Installed by a Manufacturer's Certified Contractor.
- C. Factory Mutual Engineering & Research Corporation (FM): Roof Assembly Classification, of Class 1 Construction, intent is to follow the wind uplift requirements of I.60, in accordance with FM Construction Bulletin 1-28.
- D. Manufacturer shall certify that before, during, and after membrane is complete that manufacturer's instructions were followed.
- E. This Contractor shall be responsible for testing mechanical anchors into existing deck for base layer of insulation; minimum pull out resistance shall be 300 lbs. per fastener.
- F. For top layer of insulation follow roofing manufacturer's adhesive applied insulation system to meet I.60 requirements.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, seals and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply walk pads during inclement weather and when ambient temperatures are below 40 degrees F.
- B. Do not apply walk pads to damp or frozen membrane surface.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.10 COORDINATION

- A. Coordinate the work with installation of associated metal flashings, as the work of these section proceeds.
- B. Membrane manufacturer shall have singular responsibility for water tightness of roof; including insulation, membrane, and flashing metals.

1.11 WARRANTY

- A. Existing membrane is covered by a 20 year total warranty.

- B. Warranty: Cover damage to building resulting from failure to prevent penetration of water; including labor and material of roofing system.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Carlisle Versico Systems. (This is existing roof system - still under warranty)

### 2.2 MEMBRANE AND ASSOCIATED MATERIALS

- A. Membrane: EPDM; .060 inches thick, (60 mil), 90 inches wide minimum roll width; black color; conforming to the following criteria:

<u>Properties:</u>	<u>Test:</u>	<u>Results:</u>
Tensile Strength	ANSI/ASTM D412	1305 psi
Elongation:	ANSI/ASTM D412	300%
Hardness - Shore A:	ASTM D2240	65 ± 10
Tear Strength:	ASTM D624	150 lbs/inch minimum
Moisture Vapor Perms:	ASTM E96	2.0
0 Zone resistance:	ASTM D1149	No cracks
Low Temp Brittleness:	ANSI/ASTM D746	-49° F

- B. Seaming Materials: As recommended by membrane manufacturer.

### 2.3 FLASHINGS

- A. Flexible Flashings: Same material as membrane, EPDM; White on black color; as manufactured by acceptable membrane manufacturer.  
B. Counter Flashing: Prefinished aluminum.  
C. Prefabricated Roof Specialties: Manufacturer's standard preformed boots and accessories.

### 2.4 ACCESSORIES

- A. Sealants: As recommended by membrane manufacturer.  
B. Traffic Walk Pads: molded rubber with slip resistant surface, factory rounded corners, approximately 30 inch x 30 inch x 3/16 inch. Color to match roof membrane.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.  
B. Verify deck is supported and secure.  
C. Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains.  
D. Verify deck surfaces are dry and free of snow or ice.  
E. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and wood nailing strips and reglets are in place.  
F. Verify compatibility of treated wood with roofing materials and attachment.

3.2 FLASHINGS AND ACCESSORIES

- A. Seal flashings and flanges of items penetrating membrane.
- B. Provide traffic walk pads where indicated on drawings, installed in accordance with manufacturer's instructions.

3.3 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01 4000. Manufacturer's representative shall certify roof material installation to be per recommendations and watertight.
- B. Correct identified defects or irregularities.
- C. Require site attendance of roofing and insulation materials' manufacturers during installation of the Work.

3.4 CLEANING

- A. In areas where finished surfaces are soiled by Work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- B. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.5 PROTECTION

- A. Protect building surfaces against damage from roofing work.
- B. Where traffic must continue over finished roof membrane, protect surfaces per manufacturer's recommendations.

END OF SECTION 075323



## SECTION 077200 - ROOF ACCESSORIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Equipment supports.
  - 2. Pipe and duct supports.
  - 3. Pipe portals.

#### 1.3 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranties: For manufacturer's special warranties.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

## 1.7 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

### 2.2 ROOF CURBS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Air Balance Inc.; a division of MESTEK, Inc.
    - b. Greenheck Fan Corporation.
    - c. Milcor; Commercial Products Group of Hart & Cooley, Inc.
    - d. Pate Company (The).
  - B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
  - C. Material: Zinc-coated (galvanized) steel sheet, 0.064 inch (1.63 mm) thick.
    1. Finish: Mill phosphatized.
  - D. Construction:
    1. Curb Profile: Manufacturer's standard compatible with roofing system.
    2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.

3. Fabricate curbs to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.
4. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange.
5. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
6. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
7. Liner: Same material as curb, of manufacturer's standard thickness and finish.
8. Nailer: Factory-installed wood nailer under top flange on side of curb, continuous around curb perimeter.
9. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

### 2.3 EQUIPMENT SUPPORTS

- A. Equipment Supports: Rail-type metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded corner joints and integrally formed structure-mounting flange at bottom.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Air Balance Inc.; a division of MESTEK, Inc.
    - b. Greenheck Fan Corporation.
    - c. Milcor; Commercial Products Group of Hart & Cooley, Inc.
    - d. Pate Company (The).
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Material: Zinc-coated (galvanized) steel sheet, 0.064 inch (1.63 mm) thick.
  1. Finish: Mill phosphatized.
- D. Construction:
  1. Curb Profile: Manufacturer's standard, compatible with roofing system.
  2. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to meet wind uplift requirements.
  3. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4-inch (19-mm) thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
  4. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
  5. Fabricate equipment supports to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.

## 2.4 PIPE AND DUCT SUPPORTS

- A. Curb-Mounted Pipe Supports: Galvanized steel support with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom; with adjustable-height roller-bearing pipe support accommodating up to 20-inch- (508-mm-)diameter pipe or conduit and with provision for pipe retainer; as required for quantity of pipe runs and sizes.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. MIRO Industries, Inc.
    - b. Pate Company (The).
    - c. PHP Systems/Design.

## 2.5 PIPE PORTALS

- A. Curb-Mounted Pipe Portal: Insulated roof-curb units with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom; with weathertight curb cover with single or multiple collared openings and pressure-sealed conically shaped EPDM protective rubber caps sized for piping indicated, with stainless-steel snaplock swivel clamps.

## 2.6 METAL MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.
1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.

## 2.7 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C), thickness as indicated.
- C. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.
- D. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- F. Underlayment:

1. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
3. Slip Sheet: Building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum, rosin sized.

G. Fasteners:

1. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
  - a. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.

H. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

I. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

J. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

K. Asphalt Roofing Cement: ASTM D 4586/D 4586M, asbestos free, of consistency required for application.

## 2.8 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
  - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
  - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
  - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
  - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
  - 1. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
  - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- D. Pipe Support Installation: Comply with MSS SP-58 and MSS SP-89. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.
  - 1. Pipes of Various Sizes: Space supports for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
- E. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

### 3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.
- B. Clean exposed surfaces according to manufacturer's written instructions.
- C. Clean off excess sealants.
- D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

## SECTION 078443 - JOINT FIRESTOPPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Joints in or between fire-resistance-rated constructions.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
  - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
  - 1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
      - 1) UL in its "Fire Resistance Directory."
      - 2) Intertek Group in its "Directory of Listed Building Products."

2.2 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.



1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. 3M Fire Protection Products.
    - b. A/D Fire Protection Systems Inc.
    - c. Hilti, Inc.
    - d. Passive Fire Protection Partners.
    - e. RectorSeal.
    - f. Specified Technologies, Inc.
  2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
  3. W-Rating: At floors, provide joint firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- C. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
  1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
  2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
  3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

### 3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:
  - 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
  - 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
  - 3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

### 3.5 CLEANING AND PROTECTION

- A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 078443

## SECTION 079200 - JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Butyl joint sealants.
  - 2. Latex joint sealants.
- B. Related Requirements:
  - 1. Section 042200 "Concrete Unit Masonry" for masonry control and expansion joint fillers and gaskets.
  - 2. Section 078443 "Joint Firestopping" for sealing joints in fire-resistance-rated construction.
  - 3. Section 092900 "Gypsum Board" for sealing perimeter joints.
  - 4. Section 099123 "Interior Painting".

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.
- B. Sample Warranties: For special warranties.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

#### 1.6 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: Two years from date of Substantial Completion.

- B. 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.

## 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. **Colors of Exposed Joint Sealants:** As selected by Architect from manufacturer's full range.

### 2.2 BUTYL JOINT SEALANTS

- A. **Butyl-Rubber-Based Joint Sealants:** ASTM C 1311.
  - 1. **Products:** Subject to compliance with requirements, provide one of the following:
    - a. Bostik, Inc.; Chem-Calk 300.
    - b. Pecora Corporation; BC-158.
    - c. Tremco Incorporated; Tremco Butyl Sealant.

### 2.3 LATEX JOINT SEALANTS

- A. **Acrylic Latex:** Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
  - 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
    - a. BASF Corporation; Construction Systems.
    - b. Pecora Corporation.
    - c. Tremco Incorporated.
    - d. DAP Products, Inc.

### 2.4 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.

## 2.5 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. 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.
- C. 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 the following:
    - a. Concrete.
    - b. Masonry.

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 the following:
    - a. Metal.
    - b. Glass.
    - c. Glazed surfaces of ceramic tile.
- 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 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 wet 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.
  - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

### 3.4 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.

### 3.5 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.

### 3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
  1. Joint Locations:
    - a. Control joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
    - c. Other joints as indicated on Drawings.
  2. Joint Sealant: Acrylic latex.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Concealed mastics.
  1. Joint Locations:
    - a. Aluminum thresholds.
    - b. Sill plates.
    - c. Other joints as indicated on Drawings.
  2. Joint Sealant: Butyl-rubber based.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

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## SECTION 092216 - NON-STRUCTURAL METAL FRAMING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Non-load-bearing steel framing systems for interior partitions.
  - 2. Suspension systems for interior ceilings and soffits.
- B. Related Requirements:
  - 1. Section 092900 "Gypsum Board".

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. Horizontal Deflection: For wall assemblies, limited to 1/360 of the wall height based on horizontal loading of 5 lbf/sq. ft. (239 Pa).

#### 2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners: ASTM C 645. Use either steel studs and runners or embossed steel studs and runners.
1. Steel Studs and Runners:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) CEMCO; California Expanded Metal Products Co.
      - 2) MBA Building Supplies.
      - 3) MRI Steel Framing, LLC.
      - 4) Phillips Manufacturing Co.
    - b. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection.
    - c. Depth: As indicated on Drawings.
  2. Embossed Steel Studs and Runners:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) CEMCO; California Expanded Metal Products Co.
      - 2) ClarkDietrich Building Systems.
      - 3) MarinoWARE.
      - 4) MBA Building Supplies.
      - 5) Phillips Manufacturing Co.
    - b. Minimum Base-Metal Thickness: As required by horizontal deflection performance requirements.
    - c. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to runners while allowing 1-inch (25-mm) minimum vertical movement.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) CEMCO; California Expanded Metal Products Co.
      - 2) ClarkDietrich Building Systems.
      - 3) Fire Trak Corp.
      - 4) Super Stud Building Products Inc.
    - b. Use with ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs.

2. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous 0.0179-inch galvanized steel strap bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
  3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Blazeframe Industries.
      - 2) CEMCO; California Expanded Metal Products Co.
      - 3) ClarkDietrich Building Systems.
      - 4) MBA Building Supplies.
      - 5) Metal-Lite.
- D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Blazeframe Industries.
    - b. CEMCO; California Expanded Metal Products Co.
    - c. ClarkDietrich Building Systems.
    - d. Fire Trak Corp.
    - e. Metal-Lite.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ClarkDietrich Building Systems.
    - b. MRI Steel Framing, LLC.
  2. Minimum Base-Metal Thickness: 0.0296 inch (0.752 mm).
- F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ClarkDietrich Building Systems.
    - b. MRI Steel Framing, LLC.
  2. Depth: 1-1/2 inches (38 mm).
  3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

- G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ClarkDietrich Building Systems.
    - b. MRI Steel Framing, LLC.
  2. Minimum Base-Metal Thickness: 0.0179 inch (0.455 mm).
  3. Depth: As indicated on Drawings.
- H. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 3/4 inch (19 mm).
  2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch (0.8 mm).
  3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.0179 inch (0.455 mm), and depth required to fit insulation thickness indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ClarkDietrich Building Systems.
    - b. MRI Steel Framing, LLC.

## 2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- B. Hanger Attachments to Concrete:
1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488/E 488M conducted by a qualified testing agency.
  2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.367 mm) and minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: 1-1/2 inches (38 mm).

E. Furring Channels (Furring Members):

1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
  - a. Minimum Base-Metal Thickness: 0.0179 inch (0.455 mm).

## 2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
  1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.3 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
  - 2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
  - 3. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
    - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
  - 5. Curved Partitions:
    - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (150 mm) o.c.
- E. Direct Furring:
  - 1. Attach to concrete or masonry with screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

F. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches (610 mm) o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (305 mm) from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches (1219 mm) o.c.
2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
  - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
  - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216



## SECTION 092900 - GYPSUM BOARD

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Interior gypsum board.
- B. Related Requirements:
  - 1. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
  - 1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.
- C. Samples for Initial Selection: For each type of trim accessory indicated.
- D. Samples for Verification: For the following products:
  - 1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

#### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

#### 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

- C. Do not install panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

### 2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

### 2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C 1396/C 1396M.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation.
    - b. Georgia-Pacific Building Products.
    - c. National Gypsum Company.
    - d. United States Gypsum Company.
  - 2. Thickness: 5/8 inch (12.7 mm).
  - 3. Long Edges: Tapered.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation.
    - b. Georgia-Pacific Building Products.
    - c. National Gypsum Company.
    - d. United States Gypsum Company.
  - 2. Thickness: 5/8 inch (15.9 mm).
  - 3. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. CertainTeed Corporation.
  - b. Georgia-Pacific Building Products.
  - c. National Gypsum Company.
  - d. United States Gypsum Company.
2. Thickness: 1/2 inch (12.7 mm).
3. Long Edges: Tapered.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:
  - a. Cornerbead.
  - b. Bullnose bead.
  - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
  - d. L-Bead: L-shaped; exposed long flange receives joint compound.
  - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
  - f. Expansion (control) joint.
  - g. Curved-Edge Cornerbead: With notched or flexible flanges.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound, or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

## 2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
  - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  1. Wallboard Type: Vertical surfaces unless otherwise indicated.
  2. Type X: Where required for fire-resistance-rated assembly, and other locations where indicated on Drawings.
  3. Flexible Type: Apply in double layer at curved assemblies.
  4. Ceiling Type: Ceiling surfaces.
  5. Impact-Resistant Type: As indicated on Drawings.
  6. Mold-Resistant Type: As indicated on Drawings.
  7. Type C: Where required for specific fire-resistance-rated assembly indicated.
- B. Single-Layer Application:
  1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
  2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
  3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

### 3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings, or if not indicated, according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. Bullnose Bead: Use where indicated.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use where indicated.
6. Curved-Edge Cornerbead: Use at curved openings.

### 3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  1. Level 2: Ceiling plenum areas, concealed areas, panels that are substrate for tile, and where indicated.
  2. Level 4: At panel surfaces that will be exposed to view.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

### 3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 096519 – RESILIENT TILE FLOORING

PART 1 - GENERAL

**1.1 RELATED DOCUMENTS**

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

**1.2 SECTION INCLUDES**

- A. Rubber floor tile. Install in elevator cab & use at existing floor areas damaged and requiring patching or complete area replacement in front of elevator doors.
- B. Rubber base. Match existing where required for patching at patched walls.
- C. Vinyl transition strips.

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- D. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 1. Show details of special patterns.
- E. Samples for Initial Selection: For each type of floor tile indicated.
- F. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- G. Qualification Data: For qualified Installer.
- H. Maintenance Data: For each type of floor tile to include in maintenance manuals.

**1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.
  - 1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

**1.6 PROJECT CONDITIONS**

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
  2. During installation.
  3. 48 hours after installation.
- B. Until Final Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

### **1.7 EXTRA MATERIALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
  2. Resilient Base: Furnish not less than 10 lineal feet for each 500 linear feet or fraction thereof of each different type and color of resilient wall base installed.

## **PART 2 - PRODUCTS**

### **2.1 RUBBER FLOOR TILE**

- A. Products: Norament Grano by NORA
- B. Tile Standard: ASTM F 1066 Class 2, through-pattern tile.
- C. Wearing Surface: Hammered/granular.
- D. Thickness: .14".
- E. Size: 39.53" x 39.53".
- F. Colors and Patterns: To be selected from manufacturers standard colors.

### **2.2 RESILIENT BASE AND ACCESSORIES**

- A. Rubber Wall Base: Match Existing
1. Height: 4 Inches.
  2. Thickness: 0.080 inch gage.
  3. Style: Standard topset cove at resilient tile; and straight at carpet.
  4. Acceptable Manufacturer's: Armstrong; Johnsonite.
  5. Color: Match existing
- B. Vinyl Edge and Reducer Strips: At all transitions between carpet or vinyl tile and dissimilar floor finishes, homogenous vinyl composition, profiles as scheduled, or if not indicated use profiles as recommended by the manufacturer.
1. Color: To be selected from manufacturer's full range.
  2. Acceptable Manufacturer's: Armstrong; Johnsonite.

### **2.3 INSTALLATION MATERIALS**

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.



1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - a. VCT and Asphalt Tile Adhesives: Not more than 50 g/L.
- C. Floor Polish: Provide protective liquid floor polish products only if recommended by tile manufacturer.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
  3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
  1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

#### **3.3 FLOOR TILE INSTALLATION**

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as

necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis unless otherwise indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  1. Lay tiles with grain running in one direction unless otherwise indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

### **3.4 INSTALLATION OF ACCESSORIES**

- A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable. Provide pre-molded inside and outside corners. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
  1. On masonry surfaces or other similar irregular vertical substrates, fill voids between top edge and vertical surface with manufacturer's recommended adhesive filler material, color to match base.
- B. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

### **3.5 CLEANING AND PROTECTION**

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  1. Remove adhesive and other blemishes from exposed surfaces.
  2. Sweep and vacuum surfaces thoroughly.
  3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply floor polish only if recommended by tile manufacturer.
  2. Apply two coats per tile manufacturer's recommendations (Again, only if floor polish is recommended by tile manufacturer)
- E. Protect floor tile until Final Completion.

END OF SECTION 096519

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## SECTION 099123 - INTERIOR PAINTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### 1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
  - 1. Steel and iron.
  - 2. Gypsum board.
  - 3. Concrete masonry units
- B. Related Requirements:
  - 1. Section 055000 "Metal Fabrications" for shop priming metal fabrications.

#### 1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
  - 2. Indicate VOC content.

- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

#### 1.5 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. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

#### 1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Benjamin Moore & Co.
  - 2. Dulux (formerly ICI Paints); a brand of AkzoNobel.
  - 3. Glidden Professional.
  - 4. PPG Architectural Finishes, Inc.
  - 5. Sherwin-Williams Company (The).

#### 2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: As indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  1. Wood: 15 percent.
  2. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
  1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 3.

- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

- a. Equipment, including panelboards.
- b. Uninsulated metal piping.
- c. Pipe hangers and supports.
- d. Metal conduit.
- e. Tanks that do not have factory-applied final finishes.
- f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:

- a. Equipment, including panelboards.
- b. Uninsulated metal piping.
- c. Pipe hangers and supports.
- d. Metal conduit.



- e. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
  - f. Other items as directed by Architect.
3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

### 3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
  1. Contractor shall touch up and restore painted surfaces damaged by testing.
  2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.6 INTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
  1. Alkyd System MPI INT 5.1EE:
    - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
    - b. Prime Coat: Shop primer specified in Section where substrate is specified.
    - c. Intermediate Coat: Alkyd, interior, matching topcoat.
    - d. Topcoat: Alkyd, interior (MPI Gloss Level 3), MPI #51.
- B. CMU Substrates:
  1. Latex System:
    - a. Prime Coat: Interior/exterior latex block filler.
    - b. Intermediate Coat: Interior latex matching topcoat.
    - c. Topcoat: Interior latex semigloss gloss.
- C. Gypsum Board and Plaster Substrates:
  1. High-Performance Architectural Latex System MPI INT 9.2B:

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
- c. Topcoat (ceilings): Latex, interior, high performance architectural (MPI Gloss Level 2), MPI #138.
- d. Topcoat (walls): Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.

END OF SECTION 099123

SECTION 142400  
HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Hydraulic elevator as follows:
  - 1. One (1) Holeless Passenger Elevator, Car #1.

1.2 EXISTING ELEVATOR

- A. Provide all equipment, labor, and permits for the removal and disposal of all elevator equipment related to the existing in-ground hydraulic passenger elevator.
  - 1. Hoistway equipment.
  - 2. Car frame, platform, cab shell and interiors.
  - 3. Pit equipment.
  - 4. Machine room equipment.
  - 5. All hoistway entrances and door panels.
  - 6. Remove existing in-ground hydraulic jack assembly.
    - A. Remove and dispose all oil and waste from the existing cylinder hole according to local and state rules and regulations.
    - b. Provide any necessary cutting and patching.

1.3 ACTION SUBMITTALS

- A. Product Data:
  - 1. Include capacities, sizes, performances, operation, control, signal systems operations, safety features, finishes, and similar information.
  - 2. Include product data for car enclosures and hoistway entrances.
  - 3. Include product data for signal fixtures, lights, graphics, Tactile marking plates, and details of mounting.
- B. Shop Drawings:
  - 1. Provide scaled shop drawings and construction drawings of the following:
    - a. Plan and section layouts of hoistways, pits, overheads, machinery spaces and openings at each landing, to include the following:
      - 1) Location of all equipment.
      - 2) Static and dynamic loads imposed on building structure.
      - 3) Details of equipment isolation.
      - 4) Required clearances around equipment.
      - 5) Machine room heat release.
      - 6) Power Requirements:
        - a) Motor horsepower, code letter, starting current, full load running current, and demand factor.
        - b) Provide engineered power consumption based on 80 starts per hour.
      - 7) Service connections.
      - 8) Running clearances.
      - 9) Location of fixtures.
    - b. Elevation section of hoistways:
      - 1) Overhead, pits, clearance, and runby.
      - 2) Entrance details.
      - 3) Sill support detail.

- c. Pit Equipment:
    - 1) Buffers.
    - 2) Pit reactions.
    - 3) Stop switches.
  - d. Elevator cabs:
    - 1) Car shell fabrication.
    - 2) Ventilation.
    - 3) Ceiling construction detail.
    - 4) Wall construction detail.
    - 5) Lighting detail.
    - 6) Handrail mounting detail.
    - 7) Transom, front returns.
  - e. Fixtures:
    - 1) Car operating panel.
    - 2) Hall stations.
    - 3) Car direction lantern.
    - 4) Position indicators.
    - 5) Access key switches.
    - 6) Two-way communication device (all master stations).
- 2. Provide details of cab air purifier for review and approval.
  - 3. All submittals shall be clearly marked and identified with project title and appropriate device identification.
  - 4. All submittals are subject to approval.
  - 5. Corrections requested shall be incorporated onto the submittals.
  - 6. All submittals delivered via Portable Document Format (.pdf).

C. Samples for Initial Selection:

- 1. For finishes involving surface treatment, paint, or color selection per Architectural list:
  - a. Sherwin Williams Indigo Batik 7602.

D. Samples for Verification:

- 1. For exposed car, hoistway door and frame, and signal equipment finishes.
- 2. Samples of sheet materials: 3" (75 mm) square.
- 3. Running trim members: 4" (100 mm) lengths.

#### 1.4 CLOSEOUT SUBMITTALS

A. Record Documents:

- 1. The following record documents shall be furnished upon completion and before final payment:
  - a. Shop Drawings:
    - 1) Complete sets of as installed plan and section layouts of hoistway, pit, overhead and equipment spaces, to include the following:
      - a) Loads imposed on building structure.
      - b) Details of equipment isolation.
      - c) Required clearances around equipment.
      - d) Machine room heat release/diversity factor.
      - e) Power requirements.
    - 2) Elevation Section of Hoistways:
      - a) Overhead, pits and entrance details.
    - 3) Elevator cabs.
    - 4) Fixtures:
      - a) Car fixtures.
      - b) Hall fixtures.
      - c) Remote fixtures.

- 5) Machine room heat release and power requirements.
  - b. Wiring Diagrams:
    - 1) Complete sets of as installed straight-line wiring diagrams, showing the electrical connections of all altered vertical transportation equipment, shall be furnished upon completion.
    - 2) A legend sheet shall be furnished with each set of drawings containing the following information:
      - a) Name and symbol of each relay, switch and other electrical or solid-state apparatus.
      - b) Location on drawings, drawing sheets, number and area of switches and relays, etc., and location of all contacts.
      - c) Location of apparatus whether on controller, hoistway or elevator cab.
  - c. Maintenance and Operating Manuals:
    - 1) Description and sequence of operation of all equipment installed, including operating use for Building Personnel and tenants, as well as system troubleshooting manuals for technicians.
    - 2) Maintenance instructions and procedures of all vertical transportation equipment installed, including parts lists, for each elevator system.
    - 3) Lubrication charts indicating all lubricating points and type of lubricant recommended for all equipment.
    - 4) Complete parts catalogs for all replaceable parts.
- B. Tools:
1. The following equipment shall be furnished upon completion and before final payment:
    - a. The Elevator Contractor shall provide all the necessary tools, including laptop, hand-held devices, required software and manuals, required to troubleshoot, adjust, synchronize, calibrate, repair, and maintain the vertical transportation systems, as well as perform all necessary procedures to perform all safety tests as required by code and local governing authority.
    - b. Owner's equipment and software shall be updated regularly to properly troubleshoot, adjust, synchronize, calibrate, repair, maintain and test the vertical transportation systems. All equipment and/or software shall be of the same version as issued to technicians maintaining the vertical transportation systems.
    - c. The Elevator Contractor shall provide a backup copy of any software that resides on the troubleshooting tool.
    - d. Upon cancellation of service agreement, the Elevator Contractor shall provide all updates indicated above.
- C. Keys:
1. Four sets of keys to operate all keyed switches and locks shall be furnished upon completion.
  2. Keys shall be properly tagged.
  3. All keying shall be arranged with the Contractor.

## 1.5 PERMITS, TESTS, AND CERTIFICATES

- A. Permits:
1. The Elevator Contractor shall secure the necessary permits required for work to be performed, including work performed by sub-contractors.
  2. The Elevator Contractor shall obtain and pay for all municipal and state permits necessary for execution of the elevator work, including fees for renewing permits.
  3. The Elevator Contractor shall be responsible for posting all permits as required by the AHJ.

4. The Elevator Contractor shall be responsible for obtaining final sign-off and approval for each permit filed by them.

B. Tests and Inspections:

1. The Elevator Contractor shall perform all necessary tests as required by ASME A17.1 and recommended by A17.2.
2. The Elevator Contractor shall be responsible for scheduling the necessary tests as required by the local authorities.
  - a. Any fees associated with a missed appointment, expediting of test or overtime test due to delays caused by the Elevator Contractor shall be the responsibility of the Elevator Contractor.

C. Certificates:

1. Elevator Contractor is responsible for obtaining and providing Contractor with all temporary and final inspection certificates of the proper governing authorities and shall provide the Contractor with such certificates.
2. The Elevator Contractor shall pay for all fees necessary for obtaining temporary and final inspection certificates.

## 1.6 QUALITY ASSURANCE

A. Compliance with Regulatory Agencies:

1. Comply with most stringent provisions of codes, laws, and/or authorities, including revisions and changes in effect:

- B. The Elevator Contractor is subject to reviews by the Consultant and/or Contractor at any time throughout the project.

## 1.7 DELIVERY, STORAGE, AND HOISTING

A. General:

1. The protection of all equipment and exposed finishes shall be the responsibility of the Elevator Contractor during delivery, handling, and installation until completion of project.
2. The Elevator Contractor shall replace damaged materials with new, at no additional cost for material and labor to Contractor.

B. Delivery and Storage:

1. It is expected that manufacturers' original packing shall adequately protect materials during delivery.
2. Deliver materials to the site ready for use in the accepted manufacturer's original and unopened containers and packaging, bearing labels as to type of material, brand name and manufacturer's name. Delivered materials shall be identical to accepted samples.
3. Store materials under cover in a dry and clean location, off the ground. Remove delivered materials that are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials.
4. It is the responsibility of the Elevator Contractor to properly store and protect all materials in space provided or designated by the Contractor against damage, stains, scratches, corrosion, weather, construction debris and environmental conditions.

C. Material Movement:

1. All required hoisting and movement of equipment shall be the responsibility of the Elevator Contractor.

## 1.8 COORDINATION

- A. General:
  - 1. Coordinate the following requirements with the other trades.
- B. Cast-in-Place Concrete:
  - 1. Elevator Contractor to provide guide rail bracket inserts and the locations for the General Contractor to install.
  - 2. Elevator Contractor to provide templates for machine room slab penetrations.
  - 3. Provide other hoistway and pit requirements, including location of sump pits.
- C. Masonry Penetrations:
  - 1. Provide locations in elevator machine room/hoistway walls where conduit, ropes, oil lines, etc. will penetrate walls and slabs.
  - 2. Coordinate installation of sleeves, block outs, inserts, and items that are embedded in concrete or masonry for elevator equipment.
  - 3. Furnish inserts, templates and installation instructions and deliver to Project site in time for installation.
- D. Structural Steel:
  - 1. Including, but not limited to, elevator machine rooms, hoistways and pits, sill supports, rail supports.
- E. Miscellaneous Steel:
  - 1. Pit ladders, working platforms, inspection platforms, guard rails, divider beams.
- F. Electric:
  - 1. Electrical service, mainline disconnects, 110 VAC disconnects, outlets, lights, switches in elevator machine rooms and pits.
- G. Sprinklers:
  - 1. Including installation of sprinkler systems in the elevator pits or shafts as per NFPA 13
- H. HVAC:
  - 1. Provide necessary information to General Contractor and coordinate installation of equipment for elevator machine rooms.
- I. Finishes:
  - 1. Cab interiors, hoistway entrances, fixtures.
- J. Elevator Cab Flooring:
  - 1. Material and finish to be specified in other applicable section.
  - 2. Flooring installation must be coordinated to ensure car saddle is installed level with finished floor.

## 1.9 WARRANTY

- A. Manufacturer's Warranty:
  - 1. Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
- B. Warranty Period: Twelve (12) months from date of Substantial Completion.

1. The Elevator Contractor shall guarantee that the materials and workmanship of the apparatus installed by them and any subcontractor, under this contract, shall be first class in every respect and that he will make good on any defects not due to ordinary wear and tear or improper use, which may develop within one year from the date of final acceptance of all equipment.
2. Manufacturer's warranty to repair or replace defective products or their components in the event of defects within a specified period.
3. Neither the final payment nor any provisions of the contract documents shall relieve the Elevator Contractor of the extent and period provided by law and upon written notice he shall remedy any defects due thereto and pay all expenses for any damage to other work resulting there from.
4. The warranty as outlined above, for all devices, shall start from the date of final acceptance of each device, by the Consultant and the Owner, of all work specified and intended under these contract documents.

#### 1.10 MAINTENANCE

##### A. General:

1. All maintenance shall be performed according to the guidelines stated in manufacturer's Maintenance and Operations manuals.
2. Maintenance records for each device, including lubrication logs, check charts, shall be provided in each machine room.
3. Replacement of components as required, using only components produced by the original manufacturer.
4. The machine room shall be equipped with a lockable storage cabinet to contain the necessary spare parts.

##### B. Warranty Maintenance:

1. Provide monthly preventive maintenance and regular time emergency callback service for one (1) year commencing on date of final acceptance of elevator by Purchaser. Systematically examine, adjust, clean, and lubricate all equipment. Repair or replace defective parts using parts produced by the Contractor of installed equipment. Maintain elevator machine room, hoistway, and pit in clean condition.
2. Use competent personnel, acceptable to the Purchaser, supervised and employed by Contractor.
3. Warranty Maintenance Hours: Contractor shall perform a minimum of one (1) hour per elevator of on-the-job preventive maintenance examinations for the elevator.
4. Unless otherwise stated, the facility's normal working hours are 7:00 a.m. to 4:30 p.m. Monday through Friday.
5. Emergency call back service between 7:00 am and 4:30 pm, Monday through Friday, shall be provided at no additional cost to Purchaser.
6. Response Time for Callback Service:
  - a. During regular time hours, Contractor shall arrive at the property within 60 minutes from time of notification of equipment problem or failure by Purchaser.
  - b. During the hours of 4:30 p.m. and 7:00 a.m. Monday through Friday, Contractor shall arrive at the property within 2 hours from time of notification of equipment problem or failure by Purchaser.
  - c. The Contractor on Saturdays, Sundays and holidays shall arrive at the property within 2 hours from time of notification of equipment problem or failure by Purchaser.
  - d. Contractor shall arrive at Property in response to passenger entrapment calls within 30 minutes from time of notification by Purchaser.
  - e. The contractor must have adequate personnel available to provide the emergency service 24 hours per day, 365 days per year.



- C. Purchaser retains the option to delete cost of warranty maintenance from modernization equipment contract and remit twelve (12) equal installments directly to Contractor during period in which maintenance is being performed.

## PART 2 - PRODUCTS

### 2.1 REFERENCES

- A. Definitions
  - 1. Terms used are defined in the latest edition of the Safety Code for Elevators and Escalators, ASME A17.1.
- B. American National Standard Institute (ANSI):
  - 1. A117.1 - Accessible and Usable Buildings and Facilities
- C. American Society of Mechanical Engineers:
  - 1. ASME A17.1 - Safety Code for Elevators and Escalators.
  - 2. ASME A17.2 – Guide for Inspection of Elevators, Escalators, and Moving Walks
  - 3. ASME A17.5 – Elevator and Escalator Electrical Equipment
  - 4. ASME A17.6 – Standard for Elevator Suspension, Compensation, and Governor Systems
- D. International Building Code (IBC)
- E. Michigan Elevator Rules – 2010 Edition
- F. National Fire Protection Association (NFPA):
  - 1. NFPA 70 – National Electric Code
  - 2. NFPA 80 – Fire Doors and Windows
  - 3. NFPA 101 – Life Safety Code
- G. Accessibility:
  - 1. Uniform Federal Accessibility Standards (UFAS)
  - 2. ADAAG – Americans with Disabilities Act Accessibility Guidelines

### 2.2 MANUFACTURERS

- A. Subject to compliance with project requirements, provide products by one of the following:
  - 1. Controllers:
    - a. GAL Galaxy.
    - b. MCE.
    - c. Smartrise.
  - 2. Hydraulic Elevator Components:
    - a. Canton Elevator.
    - b. CEMCO Lift Elevator Systems.
    - c. Minnesota Elevator Inc.
    - d. Otis Elevator Company.
    - e. Schindler Elevator Corporation.
    - f. TK Elevator.
  - 3. Hoistway Entrances:
    - a. KONE Incorporated.
    - b. Otis Elevator Company.
    - c. Schindler Elevator Corporation.
    - d. TK Elevator.
    - e. Wittur.

- f. Columbia.
- g. Approved Equal.
- 4. Passenger Elevator Door Equipment (Operators, Tracks, Hangers, and Closers):
  - a. GAL.
  - b. Wittur.
  - c. Approved Equal.
- 5. Elevator Car Enclosures:
  - a. EDI/ECI.
  - b. Globe Architectural & Metal.
  - c. National.
  - d. Manufacturer's Standard.
- 6. Fixtures Standard:
  - a. EPCO.
  - b. Monitor.
  - c. Innovation.
  - d. MAD Fixtures.
- 7. Two-Way Communication Device:
  - a. RingComm.
  - b. EMS.
  - c. RATH.

### 2.3 PERFORMANCE REQUIREMENTS

- A. Car Speed:
  - 1. +10%/-20% for standard hydraulic application.
- B. Car Capacity:
  - 1. Safely lower, stop and hold 125% of rated load.
- C. Car Stopping Zone:
  - 1.  $\pm 1/4$ " under any loading condition.
- D. Door Times:
  - 1. Seconds from start to fully open or fully closed:
    - a. Door Open 2.8 seconds, Door Close 3.4 seconds.
- E. Car Floor-to-Floor Performance Time:
  - 1. Seconds from start of doors closing until doors are 3/4 open (1/2 open for side opening doors) and car level and stopped at next successive floor under any loading condition or travel direction:
    - a. 15.5 seconds, floor height 12'-0", between floors U and R.
- F. Pressure:
  - 1. Fluid system components shall be designed for maximum operating pressure of 500 psi.
- G. Noise and Vibration Control:
  - 1. Airborne Noise:
    - a. Measured noise level of elevator equipment and its operation shall not exceed 60 dBA inside car under any condition including door operation and car ventilation exhaust blower on its highest speed.
    - b. Limit noise level in the machine room relating to elevator equipment and its operation to no more than 80 dBA.
    - c. All dBA readings to be taken 3'-0" off the floor and 3'-0" from the equipment using the "A" weighted scale.

2. Vibration Control:
  - a. All elevator equipment shall be mechanically isolated from the building structure and other components to minimize objectionable noise and vibrations being transmitted to occupied areas of the building.

## 2.4 ELEVATORS

- A. Elevator System, General:
  1. Manufacturer's standard elevator systems.
  2. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.
- B. Passenger Elevator Description:
  1. Elevator Identification: Car #1
  2. Capacity: 2100 lbs.
  3. Class of Loading: Class A.
  4. Contract Speed: 100 fpm.
  5. Machine: Hydraulic pump.
  6. Machine Location: Adjacent at bottom landing.
  7. Control System: Selective collective.
  8. Motor Control: Single speed AC with.
  9. Floors Served, Front: L, U, R.
  10. Openings: Front 3.
  11. Minimum Clear Height to Underside of Canopy: 8'-0" high.
  12. Entrance Size: 3'-0" wide x 7'-0" high.
  13. Entrance Type: Single-speed, side-opening.
  14. Hydraulic Type: Dual jack holeless.

## 2.5 MATERIALS

- A. General:
  1. All materials and finishes are subject to approval by Architect.
- B. Steel:
  1. Sheet Steel (Furniture Steel for Exposed Work): Stretcher-leveled, cold-rolled, commercial quality carbon steel, complying with ASTM A366, matte finish.
  2. Sheet Steel (for Unexposed Work): Hot-rolled, commercial quality carbon steel, pickled and oiled, complying with ASTM A568/A568M-03.
  3. Structural Steel Shapes and Plates: ASTM A36.
- C. Stainless-steel:
  1. Type 302 or 304 series complying with ASTM A240, with standard tempers and hardness required for fabrication, strength, and durability.
  2. Apply mechanical finish on fabricated work in the locations shown or specified, Federal Standard and NAAMM nomenclature, with texture and reflectivity required to match Architect's sample. Protect with adhesive paper covering.
    - a. No. 4 Satin:
      - 1) Directional polish finish.
      - 2) Graining directions as shown or, if not shown, in longest.
    - b. Textured:
      - 1) .050 inches mean pattern depth with bright directional polish (No. 4 satin finish).
      - 2) 5WL as manufactured by Rigidized Metals.
      - 3) Windsor pattern 5-SM as manufactured by Rimex Metals.

- D. Aluminum:
  - 1. Extrusions per ASTM B221; sheet and plate per ASTM B209.
  - 2. Die Cast Aluminum – ASTM B108, Alloy 356.0, T6.
  - 3. Extruded Aluminum – FS QQ-A 200/8, Alloy 6061, T6.
  
- E. Plastic Laminate:
  - 1. ASTM E84 Class A and NEMA LD3.1, Fire-Rated Grade (GP-50), Type 7, 0.050" ±.005" thick.
  - 2. Exposed Surfaces: Color and texture selected by Architect.
  - 3. Concealed Surfaces: Manufacturer's standard color and finish.
  
- F. Paint Finishes:
  - 1. General:
    - a. Clean exposed metal parts and assemblies of oil, grease, scale, and other foreign matter and factory paint one shop coat of standard rust-resistant primer.
    - b. Galvanized metal need not be painted.
  - 2. Prime Finish:
    - a. Apply one coat of rust-resistant primer followed by a filler coat over uneven surfaces.
    - b. Sand smooth and apply final coat of primer.
  - 3. All equipment and metal work installed under this contract, which does not have a baked enamel or special architectural finish, and which is exposed in the hoistway, shall be cleaned and painted one field coat of enamel.
  - 4. All machine room equipment shall be painted upon completion of the installation with the manufacturer's standard machinery enamel.
  - 5. Elevator designation (number and/or letter) shall be prominently indicated on all machine room and machinery space equipment, top of car crosshead and pit equipment.
  
- G. Baked Enamel Finish:
  - 1. Prime finish per above.
  - 2. Unless specified "prime finish" only, apply and bake three additional coats of enamel in the selected solid color.
  
- H. Linoleum Tile:
  - 1. 12" x 12" Linoleum tiles.

## 2.6 OPERATION

- A. General:
  - 1. Car automatically slows down and stops level at floors in response to car and landing calls with stops made in sequence in the established direction of travel, regardless of order in which buttons are pressed.
  - 2. Landing calls canceled when answered.
  - 3. Automatic Leveling:
    - a. An automatic two-way leveling device shall be provided, designed to govern the leveling of the car to within 1/8" above or below the landing sill. The leveling operation shall be effective to avoid overtravel, as well as undertravel of the car and maintain the leveling accuracy regardless of the load in the car, direction of travel, rope slippage or stretch.
  - 4. Door Control:
    - a. A car without registered car calls arriving at a floor where both up and down hall calls are registered, responds to the call in the direction of car travel. If no car call is registered for further travel in that direction, lantern immediately indicates changed direction without closing and reopening doors.
    - b. Direction lantern to remain illuminated until doors are fully closed.

5. Independent Service:
  - a. Provide controls for operation of each car from its pushbuttons only.
  - b. Close doors by constant pressure on desired destination floor button or door close button.
  - c. Open doors automatically upon arrival at selected floor.
  
- B. Microprocessor, Selective Collective Operation:
  1. General:
    - a. Elevator shall operate via car and landing buttons.
  2. Operation:
    - a. Momentary pressure of one or more car or landing buttons shall activate the elevator.
    - b. Momentary pressure of calls, other than calls for landing at which car is standing, will start car, and cause car to stop at first landing for which a call is registered corresponding to direction in which car is traveling.
    - c. Stops made in order in which landings are reached, irrespective of sequence in which calls are registered.
  
  3. Parked Car (No Demand):
    - a. Elevator may remain at landing of last assignment (if no further demand) with doors closed, for a predetermined amount of time (programmable for any amount of time) if feature is enabled.
    - b. If this feature is enabled, upon expiration of time, the elevator shall return to the main egress landing with the doors closed.
  4. If this feature is disabled, if no further demand exists, the elevator shall remain at landing of last assignment with the doors closed until a hall call is registered.
  
- A. Car / Hall Lantern Signals:
  1. The lantern shall generate signal upon each stop, regardless of responding to car or hall call.
  2. An option shall be provided to allow lanterns to be active in response to hall calls only.
  3. Lantern shall be provided with signal from controller compliant with ADA requirements.
  
- B. Firefighters' Service:
  1. Provide equipment and operation in accordance with code requirements.
  
- C. Motion Control:
  1. Microprocessor-based AC variable-voltage, variable frequency with digitally encoded closed-loop velocity feedback suitable for operation specified and capable of providing smooth, comfortable car acceleration, retardation, and dynamic braking.
  2. Limit the difference in car speed between full load and no load to not more than  $\pm 10\%$  of the contract speed in the up direction.
  
- D. Standby Lighting, Communication, and Alarm:
  1. Car mounted battery unit with solid-state charger to operate alarm bell, car emergency lighting, and voice communication system.
  2. Car lighting and communication shall be provided with a minimum of 4 hours of operation on back-up power during a loss of normal power, and a minimum of 1 hour of operation for car-mounted alarm.
  3. Battery to be rechargeable with minimum five-year life expectancy.
  4. Provide constant pressure test button in service compartment of car operating panel.
  
- E. Door Operation:

1. Automatically open doors when car arrives at a floor.
2. At expiration of normal dwell time, close doors.

F. Battery Lowering Operation:

1. Upon loss of normal power automatically lower car to the nearest landing depending on position at time of power outage.
2. Upon arrival at the landing, the elevator doors shall open automatically and remain open until regular door time has expired; the elevator shall then be removed from service.
3. The auxiliary power source shall be provided via 12-volt D.C. battery units installed in machine room.
4. Include solid-state charger and testing means mounted in a common metal container.
5. Battery to be rechargeable lead acid or nickel cadmium with a ten-year life expectancy.
6. Upon restoration of normal power, the elevator shall automatically resume normal operation.

2.7 MACHINE ROOM EQUIPMENT

A. Arrange equipment in spaces shown on drawings.

B. Tank:

1. The tank shall be designed and constructed so that when completely filled the factor of safety shall not be less than 4, based on the ultimate strength of material.
2. The tank shall be covered and vented.
3. The tank shall be provided with a means for checking liquid level.
  - a. Such means shall be accessible without the removal of any covers or other part.

C. Pump Unit:

1. Assembled unit consisting of positive displacement pump, induction motor, master-type control valves combining safety features, holding, direction, bypass, stopping, manual lowering functions, shut off valve, oil reservoir with protected vent opening, oil level gauge, outlet strainer, drip pan, muffler, all mounted on isolating pads.
2. Submersible pump motor shall be permitted up to 50 HP.

D. Landing System:

1. Solid-state, magnetic, or optical type.

E. Controller:

1. Compartment:
  - a. UL/CSA labeled.
  - b. Securely mount all assemblies, power supplies, chassis switches, relays, etc., on a substantial, self-supporting steel frame.
  - c. Completely enclose equipment with covers.
  - d. Provide means to prevent overheating.
2. Relay Design:
  - a. Magnet operated with contacts of design and material to insure maximum conductivity, long life, and reliable operation without overheating or excessive wear.
  - b. Provide wiping action and means to prevent sticking due to fusion.
  - c. Contacts carrying high inductive currents shall be provided with arc deflectors or suppressors.
3. Microprocessor Hardware:
  - a. Provide built-in noise suppression devices that provide a high level of noise immunity on all solid-state hardware and devices.
  - b. Provide power supplies with noise suppression devices.

- c. Isolate inputs from external devices (such as pushbuttons) with opto-isolation modules.
    - d. Design control circuits with one leg of power supply grounded.
    - e. Safety circuits shall not be affected by accidental grounding of any part of the system.
    - f. System shall automatically restart when power is restored.
    - g. System memory shall be retained in the event of power failure or disturbance.
    - h. Equipment shall be provided with Electro Magnetic Interference (EMI) shielding within FCC guidelines.
  4. Wiring:
    - a. CSA labeled copper for factory wiring.
    - b. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.
    - c. Provide labels for all extra or spare wires, neatly organized at base of controller cabinet.
  5. Permanently mark components (relays, fuses, PC boards, etc.) with symbols shown on wiring diagrams.
  6. Provide control panel compliant with UL 508A SB.SCCR of 5000A required.
- F. Electrical Wiring and Wiring Connections:
  1. Auxiliary Disconnect:
    - a. Provide controller or machine mounted auxiliary, lockable “open” disconnect.
  2. Conductors and Connections:
    - a. Copper throughout with individual wires coded and connections on identified studs or terminal blocks.
    - b. Use no splices or similar connections in wiring except at terminal blocks, control compartments, or junction boxes.
  3. Conduit:
    - a. Galvanized steel conduit, EMT, or duct.
    - b. Flexible conduit length not to exceed 3'-0”.
  4. Traveling Cables:
    - a. Tag spares in machine room.
    - b. Provide cables from controller to car top.
  5. Auxiliary Wiring:
    - a. Provide machine room demarcation junction boxes for the fire alarm initiating devices, emergency two-way communication system, security system and card reader interface terminals and relays.
    - b. Provide conduit, wiring and connections for the fire alarm initiating devices, emergency two-way communication system, security system and card reader interface terminals and relays, from machine room junction box to each car controller in machine room.
- G. Muffler:
  1. Provide in discharge oil line near pump unit.
    - a. Design shall dampen and absorb pulsation and noise in the flow of hydraulic fluid.
    - b. Muffler shall be an air charged or non-baffled design.
- H. Piping and Oil:
  1. Provide piping, connections, and oil for the system.
  2. Buried piping shall be secondarily contained with watertight Schedule 40 PVC sleeves between elevator machine room and pit.
  3. A minimum of two sound isolation couplings shall be provided between the pump unit and oil line and the oil line and jack unit.
  4. Provide isolated pipe stands or hangers.

- I. Shut-Off Valve:
  - 1. Provide oil line shut off valve in the machine room.
  - 2. Provide second shut off valve in pit adjacent to jack unit.
- J. Pressure Switch:
  - 1. Provide oil pressure sensitive switch to automatically close and prevent loss of oil in cylinder upon loss of pressure in oil supply line.

## 2.8 HOISTWAY EQUIPMENT

- A. Guide Rails:
  - 1. Planed steel T-sections for car of suitable size and weight for the application, including brackets for attachment to building structure.
  - 2. No additional structural points of attachment other than those shown on the Contract Documents will be provided.
- B. Terminal Stopping:
  - 1. Provide normal and final devices.
- C. Electrical Wiring and Wiring Connections:
  - 1. Conductors and Connections:
    - a. Copper throughout with individual wires coded and connections on identified studs or terminal blocks.
    - b. The use of splices or similar connections in wiring except at terminal blocks, control compartments, or junction boxes is prohibited.
    - c. Provide 20% spare conductors for each wire type.
    - d. Run spare wires from car connection points to individual elevator controllers in the machine room.
  - 2. Conduit:
    - a. Galvanized steel conduit, EMT, or duct.
    - b. Flexible conduit between isolated equipment, length not to exceed 3'-0".
    - c. Flexible heavy-duty service cord may be used between fixed car wiring and car door switches for door protective devices.
    - d. Provide conduit from the closest hoistway of each elevator group or single elevator to the firefighters' control room.
  - 3. Traveling Cables:
    - a. Flame and moisture-resistant outer cover.
    - b. Prevent traveling cable from rubbing or chafing against hoistway or equipment within hoistway.
    - c. Provide eight pair of spare shielded communication wires in addition to those required to connect specified items.
    - d. Tag spares in machine room. Provide cables from controller to car top.
    - e. Support traveling cable by suspending from supports by means that automatically tighten around the cable when tension is increased.
  - 4. Auxiliary Wiring:
    - a. Provide conduit, wiring and connections for systems.
- D. Entrance Equipment:
  - 1. Two-point hanger roller with non-metallic roller surface and suspension with eccentric upthrust roller adjustment.
  - 2. Bar or formed, cold-drawn removable steel door tracks with smooth roller contact surface.
  - 3. Door Interlocks:
    - a. Operable door locks without retiring cam.
  - 4. Door Closers:



- a. Spring, spirator, or jamb/strut mounted counterweight type.
- b. Design and adjust to ensure a smooth and quiet mechanical close of doors.

- E. Floor Numbers:
1. Stencil paint 4" high floor designations in contrasting color on inside face of hoistway doors or hoistway fascia. Must be visible from within car.

## 2.9 HOISTWAY ENTRANCES

- A. Entrance Assemblies:
1. Complete entrances bearing fire labels from a certified testing laboratory approved by authority having jurisdiction.
  2. Provide entrance assemblies bearing 1-1/2 hour UL label.
  3. Paint all exposed metal ferrous metal black.
- B. Frames:
1. 14-Gauge hollow metal at all floors.
  2. Bolted and lapped head to jamb assembly at all floors.
  3. Provide Arabic floor designation/Tactile marking plates:
    - a. Centered at 60" above finished floor.
    - b. Located on both side jambs of all entrances.
    - c. Minimum 4" in height.
    - d. Tactile marking indications shall be below Arabic floor designation.
  4. Provide car identification label:
    - a. Mounted directly below floor designation/Tactile marking plates.
    - b. Located on both side jambs at the following levels:
      - 1) Designated Level.
      - 2) Alternate Level.
      - 3) Level where means necessary for tests is provided.
    - c. Finish and design to match floor designation/Tactile marking plates.
  5. Provide plates at main egress landing with "Star" designation.
  6. For designated emergency car, provide "Star of Life" designation plates at height of 78"-84" above finished floor on both side jambs at all floors.
  7. Size clear opening of subframes at least 4" wider and 2" higher than clear finish opening.
- C. Door Panels:
1. 16-Gauge steel, sandwich construction without binder angles.
  2. Provide one leading edge of doors with rubber astragals.
  3. Provide a minimum of two gibs per panel, one at leading and one at trailing edge with gibs in the sill groove entire length of door travel.
  4. Provide one separate 4" steel reinforcement safety gib mounted between door gibs, where not integrated with door gibs.
  5. Construct door panels with interlocking, stiffening ribs.
- D. Sight Guards:
1. 14-gauge, same material, finish, and height as hoistway entrance door panels.
  2. Construct without sharp edges.
- E. Sills:
1. Extruded aluminum.
- F. Sill Supports:
1. Structural or formed steel designed to support door sill based upon car loading classification.

2. Design to eliminate need for grout under the sill.

G. Fascia, Platform Guards and Hanger Covers:

1. 14-Gauge furniture steel with Contractor's standard finish.
2. Provide hoistway width fascia, platform guards, and hanger covers.

H. Struts and Headers:

1. Provide all support of entrances and related material to building structure. No intermediate support provided.
2. Provide door open bumpers on entrances equipped with vertical struts.

I. Finish of Frames and Doors:

1. Door Frames: Painted. Color to be Sherwin Williams Indigo Batik 7602.
2. Door Panels: Stainless-steel satin finish.

J. Hoistway Access:

1. Hoistway Door Unlocking Device:
  - a. Provide unlocking device in door panel at all floors, with finish to match adjacent surface.
2. Hoistway Access Switches:
  - a. Mount in wall at top floor.

## 2.10 PIT EQUIPMENT

A. Buffers:

1. Provide spring type with blocking and support channels.

B. Hydraulic Jack Assembly:

1. Cylinders:
  - a. Seamless steel pipe.
  - b. Design head to receive unit-type packing and provide means to collect oil at cylinder head and return automatically to oil reservoir.
  - c. Provide cylinder stabilizer bracketing between guide rails as required.
2. Plungers:
  - a. Polished seamless steel tubing or pipe.
  - b. If plunger length exceeds 24'-0", provide two or more sections not exceeding 16'-0" in length, or coordinate installation of longer unit at the jobsite.
  - c. Join sections by internal threaded couplings.
  - d. Multiple section jack units shall be factory polished while assembled and marked.
  - e. Isolate plunger from car frames.
3. Provide dual jack holeless application.

C. Jack Support and Fluid Shut-Off Valves:

1. Provide steel pit channels to support jack assembly and transmit loads to building structure.
2. Provide intermediate stabilizers as required.
3. Provide manual on/off valves in oil lines adjacent to pump unit and jack units in pit.

D. Scavenger Pump:

1. Provide electrically operated scavenger pump to collect oil at cylinder head and return directly to oil reservoir in elevator machine room.

- E. Refuge Space:
  - 1. Identify and clearly mark refuge space in the pit.
- F. Pit Access:
  - 1. Hoistway Access Key Switch:
    - a. Provide key switch at lowest terminal landing.
    - b. Mount in wall.
  - 2. Provide pit stop switch(es).

## 2.11 CAR EQUIPMENT

- A. Frame:
  - 1. Welded or bolted steel channel construction to meet load classification specified.
- B. Platform:
  - 1. Design and construct to accommodate load classification requirements.
  - 2. The car platform shall consist of a steel frame with necessary steel stringers, all securely welded together.
  - 3. Cover the underside of the car platform with sheet steel.
  - 4. Isolate the passenger elevator platform.
    - a. The support frame shall include rubber pads on which the platform shall rest without any connection to the steel frame.
  - 5. Work Light Fixtures & AC Receptacles:
    - a. Provide permanent mounted work light fixtures below platform, complete with proper lamp guards.
- C. Platform Guard:
  - 1. Minimum 21" 14-gauge steel, reinforced and braced to car platform Manufacturer's standard finish.
- D. Cartop Guard Rail:
  - 1. Provide a railing system provided on the outside perimeter of the car top on all sides where the horizontal distance between the edges of the car top and the adjacent hoistway enclosure exceeds 12 inches.
- E. Passenger Guides:
  - 1. Roller type with three or more spring dampened sound-deadening rollers per shoe. Minimum 3" outside diameter.
- F. Cab Steadying Plates:
  - 1. Provide and install top of car steadying plates.
  - 2. Emphasis shall be placed on proper tension to car styles allowing minimal lateral movement of the cab.
  - 3. Steadying plates shall be isolated using rubber or non-metallic guides or rollers.
- G. Sills:
  - 1. One-piece extrusion with extension between car entrance columns to face of car front return.
  - 2. Extruded extension to match finish of sill.
  - 3. Extruded Aluminum.
- H. Door Panels:
  - 1. 16-Gauge steel, sandwich construction without binder angles.
  - 2. Provide satin finish stainless-steel.

3. Provide one leading edge of doors with rubber astragals.
  4. Provide a minimum of two gibs per panel, one at leading and one at trailing edge with gibs in the sill groove entire length of door travel.
  5. Construct door panels with interlocking, stiffening ribs.
- I. Door Hangers:
1. Two-point suspension.
  2. Hanger roller with non-metallic surface and eccentric roller adjustment.
- J. Door Track:
1. Bar or formed, cold-drawn removable steel track with smooth roller contact surface.
- K. Door Header:
1. Construct of minimum 12-gauge steel, shape to provide stiffening flanges.
- L. Door Electrical Contact:
1. Prohibit car operation unless car door is closed.
- M. Door Clutch:
1. Heavy-duty clutch, linkage arms, vane assembly and pickup rollers or cams to provide positive, smooth, quiet door operation.
- N. Restricted Opening Device:
1. Provide mechanical car-door restrictor to prevent opening of doors when outside unlocking zone.
- O. Door Operator:
1. Medium speed, heavy-duty door operator capable of opening doors at no less than 1.5 fps.
  2. Accomplish reversal within 2½" of door movement.
  3. Provide solid-state door control with closed loop circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current.
  4. Provide a minimum of four controller-based motion profiles, per floor, per door, to maintain consistent, smooth, and quiet door operation at all floors, regardless of door weight or varying air pressure.
- P. Door Reversing Device:
1. Infrared Reopening Device:
    - a. Black fully enclosed device with full screen infrared matrix or multiple beams extending vertically along leading edge of each door panel to minimum height of 7'-0" above finished floor.
    - b. Device shall prevent doors from closing and reverse doors at normal opening speed if beams are obstructed while doors are closing, except during nudging operation.
    - c. In event of device failure, provide for automatic shutdown of car at floor level with doors open.
  2. Nudging Operation:
    - a. After beams of door control device are obstructed for a predetermined time interval (minimum 20.0-25.0 seconds), warning signal shall sound, and doors shall attempt to close with a maximum of 2.5 foot-pounds kinetic energy.
    - b. Activation of the door open button shall override nudging operation and reopen doors.

3. Interrupted Beam Time:
    - a. When beams are interrupted during initial door opening, hold door open a minimum of 3.0 seconds.
    - b. When beams are interrupted after the initial 3.0 second hold open time, reduce time doors remain open to an adjustable time of approximately 1.0-1.5 seconds after beams are reestablished.
  4. Differential Door Time:
    - a. Provide separately adjustable timers to vary time that doors remain open after stopping in response to calls.
    - b. Car Call:
      - 1) Hold open time adjustable between 3.0 and 5.0 seconds.
    - c. Hall Call:
      - 1) Hold open time adjustable between 5.0 and 8.0 seconds.
      - 2) Use hall call time when car responds to coincidental calls.
- Q. Car Operating Panel:
1. Passenger:
    - a. One car operating panel with faceplate:
      - 1) Consisting of a metal box containing vandal resistant operating fixtures, mounted behind the car stationary front return panel.
      - 2) Faceplates shall be hinged and constructed of satin finish stainless-steel.
    - b. Suitably identify floor buttons, alarm button, door open button, door close button and emergency push-to-call button with cast stainless tactile symbols recessed flush mounted.
    - c. Provide "door open" button to stop and reopen doors or hold doors in open position.
    - d. Provide "door close" button to activate door close cycle.
      - 1) Cycle shall not begin until normal door dwell time for a car or hall call has expired, except firefighters' operation.
    - e. Pushbuttons:
      - 1) Provide minimum 3/4" diameter raised floor pushbuttons which illuminate to indicate call registration.
      - 2) Provide brushed stainless-steel buttons with illuminated LED halo.
    - f. Locate operating controls no higher than 48" above the car floor; no lower than 35" for emergency push-to-call button and alarm button.
    - g. Locked Firefighters Operation Panel:
      - 1) For fire officer use and independent service only.
      - 2) Openable by the same key which operates the Fire Operation switch.
      - 3) Including the following features:
        - a) Phase II fire access switch.
        - b) Firefighters' visual indication.
        - c) Call cancel button.
        - d) Stop switch, manually operated.
        - e) Door open button.
        - f) Door close button.
        - g) Floors served.
  2. Service Compartment:
    - a. Provide lockable service compartment with recessed flush door.
    - b. Door material and finish shall match car return panel or car operating panel faceplate.
    - c. Include the following controls in lockable service cabinet with function and operating positions identified by permanent signage or engraved legend:
      - 1) Access switch.
      - 2) Light switch.
      - 3) Exhaust blower switch.

- 4) Independent service switch.
  - 5) Constant pressure test button for battery pack emergency lighting.
  - 6) 120-volt, AC, GFCI protected electrical convenience duplex outlet.
  - 7) Switch to select either floor voice annunciation, floor passing tone, or chime.
  - 8) Keyed stop switch.
3. Provide black paint filled (except as noted), engraved, or approved etched signage as follows with approved size and font:
    - a. Phase II firefighters' operating instructions on inside face of firefighters' compartment door.
    - b. Engrave filled red firefighters' operation on outside face of compartment door.
    - c. Building identification car number on main car operating panel.
    - d. "No Smoking" on main car operating panel.
    - e. Car capacity in pounds on main car operating panel service compartment door.
- R. Car Top Control Station:
1. Mount to provide safe access and utilization while standing on car top.
  2. Operating device shall contain Up and Down direction buttons, a Run button, an Inspection/Automatic switch and Emergency Stop switch.
  3. Operating device shall contain an audible and visible indicator that fire recall has been initiated.
  4. This station shall be fixed to the car crosshead or may be portable provided the extension cord and housing is permanently attached to the car crosshead.
  5. The car will be operated by constant pressure on the appropriate directional button and the Run button simultaneously.
  6. Normal operating devices will be inoperative while this device is in use.
- S. Emergency Audible Signaling:
1. Provide on top of each elevator.
  2. Activation of Alarm Button or Emergency Stop switch will initiate Emergency Audible Signal.
  3. Provide auxiliary power supply to provide 1hr power in the event of normal power loss.
- T. Work Light and Duplex Plug Receptacle:
1. GFCI protected outlet at top and bottom of car.
  2. Include on/off switch and lamp guard.

## 2.12 CAR ENCLOSURE

- A. Passenger Elevator: Provide complete as specified herein and detailed on architectural drawings.
1. Shell:
    - a. Reinforced 14-gauge furniture steel formed panels with baked enamel interior finish as selected.
    - b. Apply sound-deadening mastic to exterior.
    - c. Provide concealed ventilation cutouts.
  2. Canopy:
    - a. Reinforced 12-gauge furniture steel formed panels with lockable, contacted, hinged emergency exit.
    - b. Interior finish white reflective baked enamel.
  3. Front Stationary Return Panels:
    - a. Reinforced 14-gauge furniture satin finish stainless-steel with cutouts for applied car operating panel and other equipment.
  4. Transom:
    - a. Reinforced 14-gauge furniture steel clad with minimum 16-gauge satin finish stainless-steel full width of enclosure.

5. Base:
  - a. Stainless-steel satin finish with concealed ventilation cutouts.
6. Finish Floor Covering:
  - a. Furnished under other sections.
7. Interior Wall Finish:
  - a. Removable panels faced and edged, with color core plastic laminate, color and finish as selected by Architect.
8. Ventilation:
  - a. Forced Ventilation
    - 1) 3-speed fan or blower mounted to car canopy.
    - 2) Exhaust blower shall meet noise and vibration criteria.
9. Lighting:
  - a. Provide LED fixtures with wiring and hookup.
10. Suspended Ceiling:
  - a. Exposed stainless-steel satin finish frame with 3 translucent panels.
11. Handrails:
  - a. ½" x 6" high flat grab bar with backing plates and captive nuts across rear and side walls.
  - b. Stainless-steel satin finish.
  - c. Bolt rails through car walls from back and mount on 1½" deep solid round stainless-steel standoff spacers no more than 18" O.C.
  - d. Provide at 32 in. above finished floor.
12. Pads and Buttons:
  - a. Three-piece removable pads.
  - b. Two pads covering side walls and adjacent front returns and one covering rear wall.
  - c. Provide cutouts to access main car operating panel.
13. Cab Air Purifier:
  - a. Provide cab air purifier on car top and fasten to new exhaust blower.
  - b. Isolate from car top to comply with noise and vibration requirements.

## 2.13 HALL CONTROL STATIONS

- A. Pushbuttons:
  1. Provide one pushbutton riser.
  2. Provide flush mounted faceplates.
  3. Include pushbuttons for each direction of travel that illuminate to indicate call registration.
  4. Include approved engraved message and pictorial representation prohibiting use of elevator during fire or other emergency as part of faceplate.
  5. Pushbutton design shall match car operating panel pushbuttons.
  6. Provide LED illumination.
  7. Provide Phase I Fire Service key switch, engraved operating instructions and illuminating jewel.
  8. Provide communication check failure indication and silence key switch.
  9. Incorporate all items required by Code at the primary egress level into a single hall fixture.
- B. Phase I Fire Service fixture:
  1. Provide separate fixture including key switch, engraved operating instructions, and illuminating jewel.

## 2.14 SIGNALS

- A. Car Direction Lantern:
  - 1. Provide flush-mounted car lantern in car entrance column.
  - 2. Illuminate up or down LED lights and sound tone once for up and twice for down direction.
  - 3. Illuminate light until the car doors start to close.
  - 4. Sound level shall be adjustable from 20-80 dBA measured at 5'-0" in front of hall control station and 3'-0" off floor.
  - 5. Car direction lenses shall be arrow shaped with faceplate.
  - 6. Lenses shall be minimum 2½" in their smallest dimension.
  
- B. Car Position Indicator:
  - 1. Alpha-numeric digital indicator containing floor designations and direction arrows a minimum of 2" high to indicate floor served and direction of car travel.
  - 2. Locate fixture in car operating panel.
  - 3. When a car leaves or passes a floor, illuminate indication representing position of car in hoistway.
  - 4. Illuminate proper direction arrow to indicate direction of travel.
  
- C. Fixture Faceplate Material and Finish:
  - 1. Satin finish Stainless-steel, all fixtures.
  - 2. Tamper resistant fasteners for all public facing fastenings.
  
- D. Floor Passing Tone:
  - 1. Provide an audible tone of no less than 20 decibels and frequency of no higher than 1500 Hz, to sound as the car passes or stops at a floor served.
  
- E. Voice Synthesizer:
  - 1. Provide electronic device with easily reprogrammable message and female voice to announce car direction, floor, emergency exiting instructions, etc.

## 2.15 COMMUNICATION

- A. Car Communication System:
  - 1. Hands-Free Phone System:
    - a. Two-way communication instrument in car with automatic dialing, tracking, and recall features, with shielded wiring to car controller in machine room.
    - b. Provide dialer with automatic rollover capability with minimum two numbers:
      - 1) Actuate two-way communication via "Help" button.
      - 2) Button or adjacent light jewel shall illuminate and flash when call is acknowledged.
      - 3) Button shall match car operating panel pushbutton design.
      - 4) Provide "Help" button tactile symbol, engraved signage, and Tactile marking adjacent to button mounted integral with car front return panel.

## 2.16 FIREFIGHTERS' CONTROL PANEL

- A. Firefighters' Control Panel:
  - 1. Connect to the building fire alarm system panel in the room located adjacent to the IT/Elevator Equipment Room.
  - 2. Provide wiring and conduit to control panel.
    - a. Coordinate size and location of conduit with Contractor.



- B. Firefighters' Key Box:
  - 1. Flush-mounted box with lockable hinged cover.
  - 2. Engrave instructions for use on cover per Local Fire Authority requirements.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Prior to beginning installation of equipment examine hoistway and machine room areas.
- B. Verify no irregularities exist which affect execution of work specified.
- C. Verify electrical power location and characteristics in coordination with equipment requirements.
- D. Do not proceed with installation until work in place conforms to project requirements.

#### 3.2 INSTALLATION

- A. Install all equipment in accordance with Contractor's instructions, referenced codes, specification, and approved submittals.
- B. Install machine room equipment with clearances in accordance with referenced codes and specification.
- C. Install all equipment so it may be easily removed for maintenance and repair.
- D. Install all equipment for ease of maintenance.
- E. Provide any required hoisting/safety beams.
- F. Install all equipment to afford maximum accessibility, safety, and continuity of operation.
- G. Remove oil, grease, scale, and other foreign matter from the following equipment and apply one coat of field-applied machinery enamel.
  - 1. All exposed equipment and metal work installed as part of this work which does not have architectural finish.
  - 2. Machine room equipment, hoistway equipment including guide rails, guide rail brackets, and pit equipment.
  - 3. Neatly touch up damaged factory-painted surfaces with original paint color. Protect machine-finish surfaces against corrosion.
- H. Fill hoistway door frames, back boxes for hallway stations and signal devices, and sills.
- I. Clean all architectural finishes and replace or restore any surfaces damaged during construction to like new condition.

#### 3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

- C. Independent Testing by Owner's Consultant.

### 3.4 CONSTRUCTION TOLERANCES

- A. Install rails plumb and align vertically with tolerance of 1/16" in 100'-0".
  - 1. Secure joints without gaps and file any irregularities to a smooth surface.

### 3.5 ADJUSTING

- A. Install hydraulic jack assembly and guide rails plumb and align vertically with tolerance of 1/16" in 100'-0". Secure piston joints without gaps and file any irregularities to a smooth surface.
- B. Static balance car to equalize pressure of guide shoes on guide rails.
- C. Lubricate all equipment in accordance with Contractor's instructions.
- D. Adjust motors, valves, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks, and safety devices to achieve required performance levels.

### 3.6 CLEANING

- A. Keep work areas orderly and free from debris during progress of project.
- B. Remove packaging materials on a daily basis.
- C. Remove all loose materials and filings resulting from work.
- D. Clean machine room equipment and floor.
- E. Clean hoistways, car, car enclosure, entrances, operating and signal fixtures.
- F. Clean pit equipment and floor.

### 3.7 DEMONSTRATION:

- A. Check operation of each elevator with Owner's personnel present before date of Substantial Completion.
  - 1. Determine that operation systems and devices are functioning properly.

END OF SECTION

## SECTION 220500 – COMMON WORK RESULTS FOR PLUMBING

### 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. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Supports and anchorages.
11. Pipe curbs and equipment supports

#### 1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

#### 1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

C. Operation and Maintenance Data: At the end of the project the contractor shall submit two paper copies of the Operation and Maintenance Data to the owner in three ring binders with the project title and contractor's contact information.

D. Project Record Documents: Throughout the project the contractor shall keep a running record of as-builts showing deviations from the plans. At the end of the project the contractor shall submit one clean hand sketch set of documents to the owner.

#### 1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

#### 1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."
- D. Drawings are diagrammatical and do not necessarily show all fittings required to meet field conditions and coordination requirements with other trades. The contractor is responsible for making adjustments in the routing and elevations to meet the job requirements and maintaining required slopes as required for each system.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

#### 2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

#### 2.3 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAgl, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining Plastic Piping:
  - 1. ABS Piping: ASTM D 2235.
  - 2. CPVC Piping: ASTM F 493.
  - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
  - 4. PVC to ABS Piping Transition: ASTM D 3138.

## 2.4 TRANSITION FITTINGS

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
  - 1. Manufacturers:
    - a. Cascade Waterworks Mfg. Co.
    - b. Dresser Industries, Inc.; DMD Div.
    - c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
    - d. JCM Industries.
    - e. Smith-Blair, Inc.
    - f. Viking Johnson.
  - 2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
  - 3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.

4. Aboveground Pressure Piping: Pipe fitting.
  - B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
    1. Manufacturers:
      - a. Eslon Thermoplastics.
  - C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
    1. Manufacturers:
      - a. Thompson Plastics, Inc.
  - D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
    1. Manufacturers:
      - a. NIBCO INC.
      - b. NIBCO, Inc.; Chemtrol Div.
  - E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve ends same size as piping to be joined, and corrosion-resistant metal band on each end.
    1. Manufacturers:
      - a. Cascade Waterworks Mfg. Co.
      - b. Fernco, Inc.
      - c. Mission Rubber Company.
      - d. Plastic Oddities, Inc.

## 2.5 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
  1. Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.

- c. Eclipse, Inc.
  - d. Epco Sales, Inc.
  - e. Hart Industries, International, Inc.
  - f. Watts Industries, Inc.; Water Products Div.
  - g. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300-psig minimum working pressure as required to suit system pressures.
- 1. Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. Epco Sales, Inc.
    - d. Watts Industries, Inc.; Water Products Div.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
- 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Central Plastics Company.
    - d. Pipeline Seal and Insulator, Inc.
  - 2. Separate companion flanges and steel bolts and nuts shall have 150 or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- 1. Manufacturers:
    - a. Calpico, Inc.
    - b. Lochinvar Corp.
- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
- 1. Manufacturers:
    - a. Perfection Corp.
    - b. Precision Plumbing Products, Inc.
    - c. Sioux Chief Manufacturing Co., Inc.
    - d. Victaulic Co. of America.



## 2.6 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
  2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  3. Pressure Plates: Plastic, Carbon steel or Stainless steel. Include two for each sealing element.
  4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## 2.7 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

## 2.8 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
  - 1. Finish: Polished chrome-plated and rough brass.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
  - 1. Finish: Polished chrome-plated and rough brass.
- E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With concealed or exposed-rivet hinge, set screw or spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## 2.9 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

## 2.10 PIPE CURBS AND EQUIPMENT CURBS

- A. Manufacturers:
  - 1. Pate.
  - 2. RPS Corporation.
  - 3. Thy Curb, Thybar Corporation.
- B. Equipment Support Rails:
  - 1. 18 Gauge galvanized steel with integral base plate, continuous welded corner seams, pressure treated wood nailer, counter flashing with leg screws, and internally reinforced for load bearing requirements.
  - 2. Height: Minimum 18 inches high or as specified.
  - 3. Length: As required for equipment and to span structural supports.
- C. Pipe Curb Assemblies:

1. Heavy Gauge galvanized steel with unitized construction and integral base plate, 3 lb density insulation and 2x2 nailer. Furnish acrylic clad thermo plastic cover, fastening screws, & graduated step boots with stainless steel clamps.
2. Height: 18 inches
3. Multiple Pipes: Size and configure cover to accommodate all pipes serving equipment including power conduit and control conduit.

D. Pipe Seals for Single Roof Penetrations:

1. One piece spun aluminum base with 5 inch flange, polyvinyl chloride boot with graduated widths and adjustable stainless steel clamps.
2. Reference Product: Pate-Pipe Seal.

### PART 3 - EXECUTION

#### 3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:
  - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
  - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
  - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
  - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
  - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
  - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
  - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.
  - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated or rough-brass finish.
  - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed or exposed-rivet hinge and set screw or spring clips.
  - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
  - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
  - l. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
  
2. Existing Piping: Use the following:
  - a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
  - b. Insulated Piping: Split-plate, stamped-steel type with concealed or exposed-rivet hinge and spring clips.
  - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
  - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and spring clips.
  - e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
  - f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and set screw.
  - g. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated or rough-brass finish.
  - h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge and set screw or spring clips.
  - i. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
  - j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with set screw or spring clips.
  - k. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.

M. Permanent sleeves are not required for holes formed by removable PE sleeves.

- N. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- O. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. PVC or Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
    - b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
      - 1) Seal space outside of sleeve fittings with grout.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
- P. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.
- R. Verify final equipment locations for roughing-in.
- S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
  - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
  - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
  - 1. Plain-End Pipe and Fittings: Use butt fusion.
  - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

### 3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.
- E. Install equipment per the manufacturer's recommendations. If the manufacturer's recommendations are different than shown on the construction documents or as otherwise specified contact the engineer.
- F. Contractor shall provide all equipment and associated controls required to provide a complete and operable system.
- G. The scope of work for all Division 22 sections includes all miscellaneous work needed (whether or not specified or shown on the documents) to produce a complete and fully operational system.

3.5 PAINTING

- A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.7 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 220500



## SECTION 220523 – GENERAL-DUTY VALVES FOR PLUMBING PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following general-duty valves:
  - 1. Copper-alloy ball valves.
  - 2. Bronze check valves.
  - 3. Gray-iron swing check valves.
  - 4. Spring-loaded, lift-disc check valves.
- B. See other Sections for general-duty and specialty valves for site construction piping.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; furnished specialties; and accessories.

#### 1.3 QUALITY ASSURANCE

- A. ASME Compliance: ASME B31.9 for building services piping valves.
- B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.
- C. NSF Compliance: NSF 61 and 372 for valve materials for potable-water service.
- D. ANSI Compliance: ANSI 372
- E. Senate Bills 3874: All valves 2 inches and smaller shall be lead free with lead content less than 0.25%.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

## 2.2 VALVES, GENERAL

- A. Refer to Part 3 "Valve Applications" Article for applications of valves.
- B. Bronze Valves: NPS 2 and Smaller: Threaded ends, unless otherwise indicated.
- C. Brass Valves: NPS 2 and Smaller: Victaulic VIP Press 304™ ends, unless otherwise indicated
- D. Ferrous Valves NPS 2-1/2 and Larger: Grooved or flanged ends, unless otherwise indicated.
- E. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- G. Valve Actuators:
  1. Handwheel: For valves other than quarter-turn types.
  2. Lever Handle: For quarter-turn valves NPS 6 and smaller, except plug valves.
- H. Extended Valve Stems: On insulated valves.
- I. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.
- J. Valve Grooved Ends: ASME/AWWA C606.
  1. Solder Joint: With sockets according to ASME B16.18.
    - a. Caution: Use solder with melting point below 840 deg F for check, gate, and globe valves; below 421 deg F for ball valves.
  2. Threaded: With threads according to ASME B1.20.1.
- K. Valve Bypass and Drain Connections: MSS SP-45.

## 2.3 COPPER-ALLOY BALL VALVES

- A. Manufacturers:
  1. One-Piece, Copper-Alloy Ball Valves:
    - a. Conbraco Industries, Inc.; Apollo Div.
    - b. Jenkins Valves.
    - c. Stockham Valves.
    - d. Grinnell Corporation.

- e. Jamesbury, Inc.
  - f. NIBCO INC.
  - g. Watts Industries, Inc.; Water Products Div.
2. Two-Piece, Copper-Alloy Ball Valves:
- a. Conbraco Industries, Inc.; Apollo Div.
  - b. Crane Valves.
  - c. Jenkins Valves.
  - d. Stockham Valves.
  - e. Grinnell Corporation.
  - f. Hammond Valve.
  - g. Jamesbury, Inc.
  - h. Milwaukee Valve Company.
  - i. NIBCO INC.
  - j. Victaulic Company of America
  - k. Watts Industries, Inc.; Water Products Div.

B. Plumbing

- 1. Ball Valves – 2” and Smaller (Alternate to standard port): Ball valves shall be 300 or 600# WOG, 150# SWP, 2 piece body style, full port, CP solid brass tunneled ball, reinforced Teflon seats, hex gland follower, bronze body of ASTM B584, blowout proof stem, lever handle.
- 2. Ball Valves – 3” and Smaller: Ball valves shall be 300 or 600# WOG, 150# SWP, 2 piece body style, STD port, CP solid brass tunneled ball, reinforced Teflon seats, hex gland follower, bronze body of ASTM B584, blowout proof stem, lever handle.

2.4 BRONZE CHECK VALVES

A. Manufacturers:

- 1. Type 1, Bronze, Horizontal Lift Check Valves with Metal Disc:
  - a. Cincinnati Valve Co.
  - b. Crane Co.; Crane Valve Group; Crane Valves.
  - c. Crane Co.; Crane Valve Group; Stockham Div.
- 2. Bronze, Swing Check Valves with Metal Disc:
  - a. Cincinnati Valve Co.
  - b. Crane Co.; Crane Valve Group; Crane Valves.
  - c. Crane Co.; Crane Valve Group; Jenkins Valves.
  - d. Crane Co.; Crane Valve Group; Stockham Div.
  - e. Grinnell Corporation.
  - f. Hammond Valve.
  - g. Milwaukee Valve Company.
  - h. NIBCO INC.
  - i. Powell, Wm. Co.

- j. Victaulic Company of America
- k. Watts Industries, Inc.; Water Products Div.

B. Plumbing

1. Check Valves – up to 2½” : Check valves shall be class 125# SWP, 200# WOG, horizontal swing check, body and cap shall be of ASTM B62 cast bronze, TFE disc, integral bronze seats, MSS SP-80
2. Check Valves – 3” and Larger: Check valves shall be class 125# SWP, 200# WOG, horizontal swing check, body and cap shall be of ASTM A 126 cast iron, bronze trim, bolted cap, flanged ends, MSS SP-71
3. Silent Check Valves – 2 1/2” and Larger: Silent Check valves shall be 200# WOG minimum, body shall be of ASTM A 126 class B cast iron, center guided, SS spring and screws, bronze disc, bronze seat.

2.5 SPRING-LOADED, LIFT-DISC CHECK VALVES

A. Manufacturers:

1. Lift-Disc Check Valves:
  - a. Flomatic Valves.
  - b. Grinnell Corporation.
  - c. Hammond Valve.
  - d. Metraflex Co.
  - e. Milwaukee Valve Company.
  - f. Mueller Steam Specialty.
  - g. NIBCO INC.
  - h. Victaulic Company of America

B. Plumbing

1. Spring Lift Check Valves – up to 2” : Check valves shall be 200# WOG minimum, bronze body, in-line spring lift check, TFE or Buna disc, integral seats.
2. Spring-assisted, Grooved end Check Valves: Ductile Iron body, aluminum bronze disc, stainless steel spring and shaft, synthetic rubber seal suitable for intended service, 300 psi maximum CWP.

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, or gate valves.
2. Throttling Service: Ball, butterfly, or globe valves.
3. Pump Discharge: Spring-loaded, lift-disc check valves.

- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

### 3.2 VALVE INSTALLATION

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Provide stem extensions for ball valves being installed on insulated lines.
- G. Provide memory stops for all valves to be used for balancing.
- H. Adjust all packing nuts after installation.
- I. Provide chain wheel operator when above 7 feet.

### 3.3 JOINT CONSTRUCTION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.
- B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

### 3.4 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 220523

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## SECTION 220700 – PLUMBING INSULATION

### 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 mechanical insulation for water heater breeching, equipment and pipe, including the following:
  - 1. Insulation Materials:
    - a. Flexible elastomeric.
    - b. Mineral fiber.
  - 2. Adhesives.
  - 3. Mastics.
  - 4. Lagging adhesives.
  - 5. Sealants.
  - 6. Factory-applied jackets.
  - 7. Tapes.
  - 8. Securements.

#### 1.3 DEFINITIONS

- A. ASJ: All-service jacket.
- B. FSK: Foil, scrim, kraft paper.
- C. FSP: Foil, scrim, polyethylene.
- D. PVDC: Polyvinylidene chloride.
- E. SSL: Self-sealing lap.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).
- B. Shop Drawings: Show details for the following:

1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Insulation application at pipe expansion joints for each type of insulation.
3. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Removable insulation at piping specialties, equipment connections, and access panels.
5. Application of field-applied jackets.
6. Field application for each equipment type.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
  1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- C. National Commercial and Industrial Insulation Standards: Comply with installation requirements and standards.
- D. ASHRAE Standard 90.1-2004: Comply with insulation values required by the standard.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

#### 1.7 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.



## 1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 INSULATION MATERIALS

- A. Refer to Part 3 schedule articles for requirements about where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
  - 1. Products:
    - a. Aeroflex USA Inc.; Aerocel.
    - b. Armacell LLC; AP Armaflex.
    - c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
- G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products:
  - a. Fibrex Insulations Inc.; Coreplus 1200.
  - b. Johns Manville; Micro-Lok.
  - c. Knauf Insulation; 1000 (Pipe Insulation).
  - d. Manson Insulation Inc.; Alley-K.
  - e. Owens Corning; Fiberglas Pipe Insulation.
2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

H. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 BTU x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Products:
  - a. CertainTeed Corp.; Crimp Wrap.
  - b. Johns Manville; MicroFlex.
  - c. Knauf Insulation; Pipe and Tank Insulation.
  - d. Manson Insulation Inc.; AK Flex.
  - e. Owens Corning; Fiberglas Pipe and Tank Insulation.

## 2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products:
  - a. Aeroflex USA Inc.; AeroSeal.
  - b. Armacell LCC; 520 Adhesive.
  - c. Foster Products Corporation, H. B. Fuller Company; 85-75.
  - d. RBX Corporation; Rubatex Contact Adhesive.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products:
  - a. Childers Products, Division of ITW; CP-82.
  - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
  - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
  - d. Marathon Industries, Inc.; 225.
  - e. Mon-Eco Industries, Inc.; 22-25.

- D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products:

- a. Childers Products, Division of ITW; CP-82.
- b. Foster Products Corporation, H. B. Fuller Company; 85-20.
- c. ITW TACC, Division of Illinois Tool Works; S-90/80.
- d. Marathon Industries, Inc.; 225.
- e. Mon-Eco Industries, Inc.; 22-25.

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products:

- a. Childers Products, Division of ITW; CP-35.
- b. Foster Products Corporation, H. B. Fuller Company; 30-90.
- c. ITW TACC, Division of Illinois Tool Works; CB-50.
- d. Marathon Industries, Inc.; 590.
- e. Mon-Eco Industries, Inc.; 55-40.
- f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products:

- a. Childers Products, Division of ITW; CP-30.
- b. Foster Products Corporation, H. B. Fuller Company; 30-35.
- c. ITW TACC, Division of Illinois Tool Works; CB-25.
- d. Marathon Industries, Inc.; 501.
- e. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Products:
  - a. Childers Products, Division of ITW; Encacel.
  - b. Foster Products Corporation, H. B. Fuller Company; 60-95/60-96.
  - c. Marathon Industries, Inc.; 570.
  - d. Mon-Eco Industries, Inc.; 55-70.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products:
  - a. Childers Products, Division of ITW; CP-10.
  - b. Foster Products Corporation, H. B. Fuller Company; 35-00.
  - c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
  - d. Marathon Industries, Inc.; 550.
  - e. Mon-Eco Industries, Inc.; 55-50.
  - f. Vimasco Corporation; WC-1/WC-5.
2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F.
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

## 2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Products:
  - a. Childers Products, Division of ITW; CP-52.
  - b. Foster Products Corporation, H. B. Fuller Company; 81-42.
  - c. Marathon Industries, Inc.; 130.
  - d. Mon-Eco Industries, Inc.; 11-30.
  - e. Vimasco Corporation; 136.
2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
3. Service Temperature Range: Minus 50 to plus 180 deg F.
4. Color: White.

## 2.6 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic-Foam, and Polyisocyanurate Products:
  - a. Childers Products, Division of ITW; CP-76.
  - b. Foster Products Corporation, H. B. Fuller Company; 30-45.
  - c. Marathon Industries, Inc.; 405.
  - d. Mon-Eco Industries, Inc.; 44-05.
  - e. Pittsburgh Corning Corporation; Pittseal 444.
  - f. Vimasco Corporation; 750.

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products:
  - a. Childers Products, Division of ITW; CP-76.
  - b. Materials shall be compatible with insulation materials, jackets, and substrates.
  - c. Fire- and water-resistant, flexible, elastomeric sealant.
  - d. Service Temperature Range: Minus 40 to plus 250 deg F.
  - e. Color: White.

2.7 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
  2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.
1. Products:
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
    - b. Compac Corp.; 104 and 105.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
    - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
  2. Width: 3 inches.
  3. Thickness: 11.5 mils.
  4. Adhesion: 90 ounces force/inch in width.
  5. Elongation: 2 percent.
  6. Tensile Strength: 40 lbf/ inch in width.
  7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

## 2.9 SECUREMENTS

### A. Bands:

#### 1. Products:

- a. Childers Products; Bands.
- b. PABCO Metals Corporation; Bands.
- c. RPR Products, Inc.; Bands.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing or closed seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing or closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

### B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch or 0.135-inch diameter shank, length to suit depth of insulation indicated.

#### a. Products:

- 1) AGM Industries, Inc.; CWP-1.
- 2) GEMCO; CD.
- 3) Midwest Fasteners, Inc.; CD.
- 4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- or 0.135-inch diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

#### a. Products:

- 1) AGM Industries, Inc.; CWP-1.
- 2) GEMCO; Cupped Head Weld Pin.
- 3) Midwest Fasteners, Inc.; Cupped Head.
- 4) Nelson Stud Welding; CHP.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

#### a. Products:

- 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
- 2) GEMCO; Perforated Base.

- 3) Midwest Fasteners, Inc.; Spindle.
  - b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - c. Spindle: Copper- or zinc-coated, low carbon steel, Aluminum, or Stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
  - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
  - a. Products:
    - 1) GEMCO; Nylon Hangers.
    - 2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.
  - b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1½-inches in diameter.
  - c. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2½-inches.
  - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
  - a. Products:
    - 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
    - 2) GEMCO; Press and Peel.
    - 3) Midwest Fasteners, Inc.; Self Stick.
    - 4) Baseplate: Galvanized carbon-steel sheet, 0.030-inch thick by 2-inches square.
  - b. Spindle: Copper- or zinc-coated, low carbon steel, Aluminum, or Stainless steel, fully annealed, 0.106-inch diameter shank, length to suit depth of insulation indicated.
  - c. Adhesive-backed base with a peel-off protective cover.
6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick, galvanized-steel, aluminum, or stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1½-inches in diameter.
  - a. Products:

- 1) AGM Industries, Inc.; RC-150.
  - 2) GEMCO; R-150.
  - 3) Midwest Fasteners, Inc.; WA-150.
  - 4) Nelson Stud Welding; Speed Clips.
- b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1½-inches in diameter.
- a. Manufacturers:
- 1) GEMCO.
  - 2) Midwest Fasteners, Inc.
- C. Staples: Outward-clinching insulation staples, nominal ¾-inch wide, stainless steel or Monel.
- D. Wire: 0.080-inch nickel-copper alloy, 0.062-inch soft-annealed, stainless steel, or 0.062-inch soft-annealed, galvanized steel.
1. Manufacturers:
- a. ACS Industries, Inc.
  - b. C & F Wire.
  - c. Childers Products.
  - d. PABCO Metals Corporation.
  - e. RPR Products, Inc.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
1. Verify that systems and equipment to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
  3. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.



- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
  - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
  - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 COMMON INSTALLATION REQUIREMENTS

- A. Install insulation products in strict accordance with manufacturer's installation instructions and the National Commercial and Industrial Insulation Standards.
- B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- E. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- F. Install multiple layers of insulation with longitudinal and end seams staggered.
- G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- H. Keep insulation materials dry during application and finishing.
- I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- J. Install insulation with least number of joints practical.
- K. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- M. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
  2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  3. Overlap jacket longitudinal seams at least 1½-inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at **[2 inches] [4 inches]** o.c.
    - a. For below ambient services, apply vapor-barrier mastic over staples.
  4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
  5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- N. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- Q. For above ambient services, do not install insulation to the following:
1. Vibration-control devices.
  2. Testing agency labels and stamps.
  3. Nameplates and data plates.
  4. Manholes.
  5. Handholes.
  6. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated):  
Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
  - 1. Firestopping and fire-resistive joint sealers are specified in other Divisions.
- C. Insulation Installation at Floor Penetrations:
  - 1. Pipe: Install insulation continuously through floor penetrations.
  - 2. Seal penetrations through fire-rated assemblies according to other Divisions.

### 3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this Article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
  - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
  - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
  3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
  4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
  5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.7 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  1. Sanitary Piping.
  2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.9 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
  1. NPS 1 and Smaller: Insulation shall be any of the following:
    - a. Pre-formed Fiber with ASJ Jacket: 1 inch thick.
    - b. Flexible Elastomeric: 1-inch thick.

END OF SECTION 220700

## SECTION 221116 - DOMESTIC WATER PIPING

### 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. This Section includes domestic water piping inside the building.
- B. Water meters will be furnished and installed by utility company.
- C. Related Sections include the following:
  - 1. Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and fittings.
  - 2. Division 22 Section "Facility Water Distribution Piping" for water-service piping outside the building from source to the point where water-service piping enters the building.
  - 3. Division 22 Section "Domestic Water Piping Specialties" for water distribution piping specialties.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing domestic water piping systems with 125 psig, unless otherwise indicated.

#### 1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
  - 1. Grooved joint products shall be shown on drawings and product submittals and shall be specifically identified with the applicable style.
- B. Water Samples: Specified in Part 3 "Cleaning" Article.
- C. Field quality-control test reports.

#### 1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1. All castings used for coupling housings, fittings, valve bodies, etc., shall be stamped for quality assurance and traceability.
  2. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- B. Comply with NSF 14, "Plastics Piping System Components and Related Materials," for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.
- C. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.
- D. Comply with NSF 372, "Drinking Water System Components – Lead Content".

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 PIPING MATERIALS

- A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

### 2.3 COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
  3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- B. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.



2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
4. Copper, Grooved-End Fittings: ASME B16.22 wrought-copper and ASTM B 75 copper tube or ASME B16.18 and ASTM B 584 bronze castings. Manufactured to copper-tube dimensions. (Flaring the adjoining tube or fitting ends to accommodate alternate sized couplings is not permitted.). Basis of design: Victaulic Copper-Connection.
  - a. Grooved-End-Tube Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections cast with offsetting, angle-pattern, bolt pads; gasket suitable for hot water, and ASTM A449 electroplated steel bolts and nuts. Installation ready, for direct stab installation without field disassembly. Basis of Design: Victaulic Style 607H.
  - b. System shall be UL classified in accordance with ANSI/NSF-61 for potable water service, and shall be certified to the low lead requirements of NSF-372.

## 2.4 VALVES

- A. Bronze and cast-iron, general-duty valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
- B. Balancing and drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

## PART 3 - EXECUTION

### 3.1 EXCAVATION

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

### 3.2 PIPE AND FITTING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Grooved joints may be used on aboveground grooved-end piping.
- D. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- E. Under-Building-Slab, Water-Service Piping on Service Side of Water Meter: Refer to Division 22 Section "Facility Water Distribution Piping."

- F. Domestic Water Piping on Service Side of Water Meter inside the Building: Use any of the following piping materials for each size range:
  - 1. NPS 4 to NPS 6: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
  - 2. NPS 4 to NPS 6: Hard copper tube, Type L with grooved ends; copper grooved-end fittings; grooved-end-tube couplings; and grooved joints.
- G. Under-Building-Slab, Domestic Water Piping on House Side of Water Meter, NPS 2 and Smaller:
  - 1. Soft copper tube, Type L; copper pressure fittings; and soldered joints.
- H. Aboveground Domestic Water Piping: Use any of the following piping materials for each size range:
  - 1. NPS 1 and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
  - 2. NPS 1 and Smaller: PEX distribution system, manifold, insert fittings, and crimped joints. (Not allowed in ceiling plenum return areas.)
- I. Non-Potable-Water Piping: Use any of the following piping materials for each size range:
  - 1. NPS 3-1/2 and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

### 3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 and smaller.
  - 2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller.
- B. Cast-iron, grooved-end valves may be used with grooved-end piping.
- C. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.
- D. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
  - 1. Install hose-end drain valves at low points in water mains, risers, and branches.
  - 2. Install stop-and-waste drain valves where indicated.
- E. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop

flow. Calibrated balancing valves are specified in Division 22 Section "Domestic Water Piping Specialties."

### 3.4 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Install under-building-slab copper tubing according to CDA's "Copper Tube Handbook."
- C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."
- D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 22 Section "Common Work Results for Plumbing."
- E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Pressure gages are specified in Division 22 Section "Meters and Gages for Plumbing Piping," and drain valves and strainers are specified in Division 22 Section "Domestic Water Piping Specialties."
- F. Install water-pressure regulators downstream from shutoff valves. Water-pressure regulators are specified in Division 22 Section "Domestic Water Piping Specialties."
- G. Install domestic water piping level and plumb.
- H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

### 3.5 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- C. Grooved Joints: Assemble joints with grooved-end-pipe or grooved-end-tube coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions. Pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to (and including) groove. Gasket shall be manufactured by the coupling manufacturer and verified as suitable for the intended service. A factory trained representative (direct employee) of the coupling manufacturer shall provide on-site training for the contractor's field personnel in the use of grooving tools, application of groove, and product installation. The representative shall periodically visit the job site and review installation to ensure best practices

in grooved joint installation are being followed. Contractor shall remove and replace any improperly installed products.

- D. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2104. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

### 3.6 HANGER AND SUPPORT INSTALLATION

- A. Pipe hanger and support devices are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet: MSS Type 49, spring cushion rolls, if indicated.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
  - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
- F. Install supports for vertical copper tubing every 10 feet.
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

- D. Connect domestic water piping to water-service piping with shutoff valve, and extend and connect to the following:
  - 1. Booster Pumps: Cold-water suction and discharge piping.
  - 2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Plumbing Fixtures."
  - 3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

### 3.8 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
  - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
  - 2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
    - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
  - 3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
  - 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test domestic water piping as follows:
  - 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
  - 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  - 3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - 4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
  - 5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
  - 6. Prepare reports for tests and required corrective action.

### 3.9 ADJUSTING

#### A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
  - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
  - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.10 CLEANING

#### A. Clean and disinfect potable and non-potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:
  - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
  - b. Fill and isolate system according to either of the following:
    - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
    - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
  - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
  - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

#### B. Prepare and submit reports of purging and disinfecting activities.

#### C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION 221116

## SECTION 221316 - SANITARY WASTE AND VENT PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes soil and waste, sanitary drainage and vent piping inside the building.

#### 1.2 SUBMITTALS

- A. Field quality-control test reports.

#### 1.3 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

### PART 2 - PRODUCTS

#### 2.1 PIPING MATERIALS

- A. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.
- B. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- C. Hub-and-Spigot Cast-iron Pipe and Fittings: ASTM A 74, Service class.
  - 1. Gaskets: ASTM C 564, rubber.
- D. Hubless Cast-Iron Pipe and Fittings: ASTM A 888 or CISPI 301.
  - 1. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.
    - a. Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.

- 1) NPS 1-1/2 to NPS 4: 3-inch-wide shield with 4 bands.
  - b. Heavy-Duty, Type 301, Stainless-Steel Couplings: ASTM A 666, Type 301, stainless-steel shield; stainless-steel bands; and sleeve.
    - 1) NPS 1-1/2 to NPS 4: 3-inch-wide shield with 4 bands.
  - c. Compact, Stainless-Steel Couplings: CISPI 310 with ASTM A 167, Type 301, or ASTM A 666, Type 301, stainless-steel corrugated shield; stainless-steel bands; and sleeve.
    - 1) NPS 1-1/2 to NPS 4: 2-1/8-inch-wide shield with 2 bands.
- E. Steel Pipe: ASTM A 53, Type E or S, Grade A or B, Schedule 40, galvanized. Include ends matching joining method.
1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.
  2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
  3. Cast-Iron, Threaded, Drainage Fittings: ASME B16.12, galvanized.
  4. Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern.
  5. Cast-Iron Flanges: ASME B16.1, Class 125.
  6. Cast-Iron, Flanged Fittings: ASME B16.1, Class 125, galvanized.
- F. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- G. Hard Copper Tube: ASTM B88, Types L and M, water tube, drawn temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end.
  3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- H. Grooved-Joint, Galvanized-Steel-Pipe Appurtenances:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Victaulic Company.
  2. Galvanized, Grooved-End Fittings for Galvanized-Steel Piping: ASTM A 536 ductile-iron castings, ASTM A 47/A 47M malleable-iron castings, ASTM A234/A 234M forged steel fittings, or ASTM A 106/A 106M steel pipes with dimensions matching ASTM A 53/A 53M steel pipe, and complying with AWWA C606 for grooved ends.



3. Grooved Mechanical Couplings for Galvanized-Steel Piping: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber gasket suitable for hot and cold water; and bolts and nuts.
  - I. ABS Pipe: ASTM D 2661, Schedule 40, solid wall.
  - J. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.
    1. ABS Special Fittings: ASTM F 409, drainage-pattern tube and tubular fittings with ends as required for application.
  - K. PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.
    1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste and vent patterns.
  - L. PVC Special Fittings: ASTM F 409, drainage-pattern tube and tubular fittings with ends as required for application.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.
- C. Aboveground, Soil, Waste, and Vent Piping: Use any of the following piping materials for each size range:
  1. NPS 1-1/4 and NPS 1-1/2: Use NPS 1-1/2 hubless, cast-iron soil piping and one of the following:
    - a. Couplings: Compact, stainless steel.
  2. NPS 1-1/4 and NPS 1-1/2: Steel pipe; cast-iron, threaded drainage fittings; and threaded joints.
  3. NPS 1-1/4 and NPS 1-1/2: Copper DWV tube, copper drainage fittings, and soldered joints.
  4. NPS 2 to NPS 4: Service class, cast-iron soil piping; gaskets; and gasketed joints.
  5. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:
    - a. Couplings: Heavy-duty, Type 304, stainless steel.
  6. NPS 2 to NPS 4: Copper DWV tube, copper drainage fittings, and soldered joints.
    - a. Option for Vent Piping: NPS 2-1/2 and NPS 3-1/2: Hard copper tube, Type M; copper pressure fittings; and soldered joints.

7. PVC and ABS Plastic not permitted above ground.
- D. Underground, Soil, Waste, and Vent Piping: Use any of the following piping materials for each size range:
  1. NPS 2 to NPS 4: Service class, cast-iron soil piping; gaskets; and gasketed joints.
  2. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:
    - a. Couplings: Heavy-duty, Type 304, stainless steel.
  3. NPS 2 to NPS 4: ABS pipe, ABS socket fittings, and solvent-cemented joints.
  4. NPS 2 to NPS 4: PVC pipe, PVC socket fittings, and solvent-cemented joints.
    - a. Couplings: Heavy-duty, Type 304, stainless steel.
- E. Aboveground, Sewage Force Mains (2- to 4-inch):
  1. Use hard copper tube Type L with pressure fittings and soldered joints.
  2. Victolic, Grooved-end, galvanized-steel pipe; grooved-joint, galvanized-steel-pipe appurtenances; and grooved joints.

### 3.2 PIPING INSTALLATION

- A. Refer to other Section for Project-site sanitary sewer piping.
- B. Refer to Division 22 Section "Common Work Results for Plumbing" for basic piping installation.
- C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- D. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- E. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- F. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

- G. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
  - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 2 and smaller; 1 percent downward in direction of flow for piping NPS 3 and larger.
  - 2. Horizontal Sanitary Drainage Piping: 1 percent downward in direction of flow.
  - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- H. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- I. Install underground ABS and PVC soil and waste drainage piping according to ASTM D 2321.
- J. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

### 3.3 JOINT CONSTRUCTION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.
- B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
  - 1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
  - 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

### 3.4 VALVE INSTALLATION

- A. Refer to Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty valves.
- B. Shutoff Valves: Install shutoff valve on each sewage pump discharge.
  - 1. Use gate or full-port ball valve for piping NPS 2 and smaller.
  - 2. Use gate valve for piping NPS 2-1/2 and larger.
- C. Check Valves: Install swing check valve, downstream from shutoff valve, on each sewage pump discharge.

### 3.5 HANGER AND SUPPORT INSTALLATION

- A. Refer to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:
  - a. MSS Type 1, adjustable, steel clevis hangers.
3. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
  2. NPS 3: 60 inches with 1/2-inch rod.
  3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
  4. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
  1. NPS 1-1/4: 84 inches with 3/8-inch rod.
  2. NPS 1-1/2: 108 inches with 3/8-inch rod.
  3. NPS 2: 10 feet with 3/8-inch rod.
  4. NPS 2-1/2: 11 feet with 1/2-inch rod.
  5. NPS 3: 12 feet with 1/2-inch rod.
  6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
- H. Install supports for vertical steel piping every 15 feet.
- I. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  1. NPS 1-1/4: 72 inches with 3/8-inch rod.
  2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
  3. NPS 2-1/2: 108 inches with 1/2-inch rod.
  4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
- J. Install supports for vertical copper tubing every 10 feet.
- K. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.6 CONNECTIONS

- A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- B. Connect drainage and vent piping to the following:
  - 1. Plumbing Fixtures: Connect drainage piping in sized indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Plumbing Fixtures."
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sized indicated, but not smaller than required by authorities having jurisdiction.
  - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Domestic Water Piping Specialties."
  - 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

### 3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.
  - 1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  - 2. Prepare reports for tests and required corrective action.

### 3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221316

## SECTION 22 1319 – SANITARY WASTE PIPING SPECIALTIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes plumbing specialties for the following:
  - 1. Soil, waste, and vent systems.

#### 1.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
  - 2. Force Main Piping: 100 psig.

#### 1.3 SUBMITTALS

- A. Product Data: For each plumbing specialty indicated. Include rated capacities of selected equipment and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products:
  - 1. Trap seal primer valves and systems.
  - 2. Trap seal protection devices.
  - 3. Cleanouts.
  - 4. Floor sinks
  - 5. Oil interceptors.
- B. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 1.

#### 1.4 QUALITY ASSURANCE

- A. Provide listing/approval stamp, label, or other marking on plumbing specialties made to specified standards.
- B. Listing and Labeling: Provide electrically operated plumbing specialties specified in this Section that are listed and labeled.
  - 1. Terms “Listed” and “Labeled”: As defined in National Electrical Code, Article 100.
  - 2. Listing and Labeling Agency Qualifications: “Nationally Recognized Testing Laboratory” as defined in OSHA Regulation 1910.7.

- C. Comply with ASME B31.9, “Building Services Piping,” for materials, products, and installation.
- D. Comply with NFPA 70, “National Electrical Code,” for electrical components.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Trap Seal Primer Valves:
    - a. Josam Co.
    - b. Smith: Jay R. Smith Mfg. Co.
    - c. Tyler Pipe; Wade Div.
    - d. Watts Industries, Inc.; Ancon Drain Div.
    - e. Watts Industries, Inc.; Water Products Div.
    - f. Zurn Industries, Inc.; Hydromechanics Div.
  - 2. Interceptors:
    - a. Josam.
    - b. Wade.
    - c. Zurn.

### 2.2 TRAP SEAL PRIMER VALVES

- A. Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:
  - 1. 125-psig minimum working pressure.
  - 2. Bronze body with atmospheric-vented drain chamber.
  - 3. Inlet and Outlet Connections: 1/2-inch NPS threaded, union, or solder joint.
  - 4. Gravity Drain Outlet Connection: 1/2-inch NPS threaded or solder joint.
  - 5. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

### 2.3 TRAP SEAL PROTECTION DEVICES

- A. Barrier Type Trap Seal Protection Devices:
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide SureSeal Manufacturing; Inline Floor Drain Trap Sealer, or a comparable product.
  - 2. Standard: ASSE 1072-2007.
  - 3. Body: ASB Plastic



4. Diaphragm & Sealing Gasket: Neoprene Rubber
5. Size: 3 inch.
6. Gravity Drain Outlet Connection: Compression fit sealing gasket 80 durometer.

#### 2.4 OIL INTERCEPTOR

- A. General: Factory fabricated oil interceptor with integral holding tank, sediment bucket with perforated inlet baffles deep seal trap, heavy duty steel lid, inlets, outlets, and vent openings.
- B. Construction: Minimum 10 gauge welded steel tank with powder epoxy coated inside and outside.
- C. Special Features: Stainless steel calibrated orifice plates, adjustable draw off assembly, double vent connection on each side, extensions, heavy-duty non-skid reinforced lid.
- D. Capacity: Flow and storage as scheduled on the drawings.

#### 2.5 CLEANOUTS

- A. Manufacturers:
  1. Josam Co.
  2. Jay R. Smith Co.
  3. Zurn Industries
  4. Wade, Division of Tyler Pipe.
- B. Cleanouts: ASME A112.36.2M, cast-iron body with straight threads and gasket seal or taper threads for plug, and a brass closure plug. Provide flashing flange and clamping ring for cleanouts in floors with membrane waterproofing.

#### 2.6 FLOOR SINKS

- A. Manufacturers:
  1. Josam Co.
  2. Jay R. Smith Co.
  3. Wade, Division of Tyler Pipe.
  4. Zurn Industries.
- B. Floor Sinks: ASME A112.2.1M, cast-iron body, with seepage flange. For floor drains for installation in floors having membrane waterproofing use seepage flange with clamping device

#### 2.7 FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4 lb/sq. ft. or 0.0625-inch thickness.
  2. Vent Pipe Flashing: 3 lb/sq. ft. or 0.0469-inch thickness.
  3. Burning: 6 lb/sq. ft. or 0.0937-inch thickness.
- B. Copper Sheet: ASTM B 152, of the following minimum weights and thicknesses, unless otherwise indicated:
1. General Applications: 12 oz./sq. ft.
  2. Vent Pipe Flashing: 8 oz./sq. ft.
- C. Zinc-Coated Steel Sheet: ASTM A 653, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.
- D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.
- E. Fasteners: Metal compatible with material and substrate being fastened.
- F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- G. Solder: ASTM B 32, lead-free alloy.
- H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

### PART 3 - EXECUTION

#### 3.1 PLUMBING SPECIALTY INSTALLATION

- A. General: Install plumbing specialty components, connections, and devices according to manufacturer's written instructions and all applicable codes.
- B. Comply with authorities having jurisdiction. Install air-gap fittings on units with atmospheric-vent connection and pipe relief outlet drain to nearest floor drain.
- C. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of one percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- D. Install backwater valves in building drain piping as indicated. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.
- E. Install cleanouts in aboveground piping and building drain piping as indicated, and where not indicated, according to the following:
1. Size same as drainage piping up to 4-inch NPS. Use 4-inch NPS for larger drainage piping unless larger cleanout is indicated.

2. Locate at each change in direction of piping greater than 45 degrees.
  3. Locate at minimum intervals of 50 feet for piping 4-inch NPS and smaller and 100 feet for larger piping.
  4. Locate at base of each vertical soil and waste stack.
- F. Install cleanout deck plates, of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.
- G. Install cleanout wall access covers, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
- H. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor. Size outlets as indicated.
- I. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
1. Radius, 30 Inches or Less: Equivalent to one percent slope, but not less than 1/4-inch total depression.
  2. Radius, 30 to 60 Inches: Equivalent to one percent slope.
  3. Radius, 60 Inches or Larger: Equivalent to one percent slope, but not greater than 1-inch total depression.
- J. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- K. Install interceptors, including trapping, and venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.
1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.
  2. Flush with Floor Installation: Set unit and extension if required, with cover flush with finished floor.
- L. Install oil interceptors, including trapping, and venting, according to authorities having jurisdiction and with clear space for servicing.
1. Install concrete ballast, cap, manhole cover, and access covers per manufacturer's installation instructions and as detailed on the drawings.
- M. Locate drainage piping as close as possible to bottom of floor slab supporting fixtures and drains.
- N. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to control protruding pipe fittings.
- O. Include wood-blocking reinforcement for recessed and wall-mounting plumbing specialties.

### 3.2 FLASHING INSTALLATION

- A. Fabricate flashing manufactured from single piece unless large pans, sumps, or other drainage shapes are required.
- B. Burn joints of lead sheets where required.
- C. Solder joints of copper sheets where required.
- D. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
  - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
  - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
- E. Set flashing on floors and roofs in solid coating of bituminous cement.
- F. Secure flashing into sleeve and specialty clamping ring or device.
- G. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings.
- H. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having caulking recess.
- I. Fabricate and install flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection if indicated.

### 3.3 COMMISSIONING

- A. Before operating systems, perform the following steps:
  - 1. Verify that drainage and vent piping are clear of obstructions. Flush with water until clear.
- B. Adjust operation and correct deficiencies discovered during commissioning.

### 3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

### 3.5 CLEANOUT SCHEDULE

- A. Wall Cleanouts: Cast iron tee with spigot inlet and outlet, threaded brass countersunk plug drilled and tapped for round stainless steel cover and screw. Reference products: Wade series 8560 with 8480R wall access cover.
- B. Floor Cleanouts (Finished Floor Areas): Threaded adjustable housing and flanged ferrule; light duty scoriated nickel bronze top; round top for concrete or terrazzo floors; round top with carpet flange for carpeted areas; round top for tile floors.
- C. Floor Cleanouts (Unfinished Floors and Mechanical Rooms): Threaded adjustable housing and flanged ferrule; heavy-duty round scoriated cast-iron top. Reference products: Wade series 6000.

### 3.6 FLOOR SINKS SCHEDULE

- A. General: Size outlets as indicated on drawings.
- B. Floor Sink (FS-1):
  - 1. Description: Cast-iron 12-inch square floor sink with 8-inch sump, A.P.E. interior, aluminum dome strainer and nickel bronzed hinged top, ½-inch plugged primer tap, 1/2 grate.
  - 2. Size: As indicated on plans.
  - 3. Product Reference: Wade #9140.
- C. Deep Seal Traps: Cast-iron or bronze, with inlet and outlet matching connecting piping, cleanout where indicated. Use seal traps for low use floor drains and where indicated.
  - 1. 2-inches Size: 4-inches minimum water seal.
  - 2. 2 ½ inches and Larger: 5-inches minimum water seal.

END OF SECTION 22 1319

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## SECTION 221429 - SUMP PUMPS

### 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. Submersible sump pumps.
- B. Related Requirements:
  - 1. Section 221329 "Sanitary Sewerage Pumps" for effluent and sewage pumps.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
  - 1. Include plans, elevations, sections, and details.
  - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include diagrams for power, signal, and control wiring.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.
- C. Comply with manufacturer's written instructions for handling.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

### 2.2 SUBMERSIBLE SUMP PUMPS

- A. Submersible, Fixed-Position, Single-Seal Sump Pumps:
  - 1. Description: Factory-assembled and -tested sump-pump unit.
  - 2. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sump pump as defined in HI 1.1-1.2 and HI 1.3.
  - 3. Pump Casing: Cast iron, with strainer inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
  - 4. Impeller: Statically and dynamically balanced, design for clear wastewater handling, and keyed and secured to shaft.
  - 5. Pump and Motor Shaft: Stainless steel with factory-sealed, grease-lubricated ball bearings.
  - 6. Seal: Mechanical.
  - 7. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
  - 8. Controls:
    - a. Enclosure: NEMA 250, Type 1; wall mounted.
    - b. Switch Type: Mechanical-float type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
    - c. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mechanical-float, switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
  - 9. Control-Interface Features:
    - a. Remote Alarm Contacts: For remote alarm interface.

### 2.3 MOTORS

- A. Motors for submersible pumps shall be hermetically sealed.



## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Excavation and filling are specified in Section 312000 "Earth Moving."

### 3.2 EXAMINATION

- A. Examine roughing-in for plumbing piping to verify actual locations of drainage piping connections before sump pump installation.

### 3.3 INSTALLATION

- A. Pump Installation Standards: Comply with HI 1.4 for installation of sump pumps.

### 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test, inspect, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections:
  - 1. Perform each visual and mechanical inspection.
  - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Pumps and controls will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

### 3.5 STARTUP SERVICE

- A. Perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.

### 3.6 ADJUSTING

- A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust control set points.

3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain controls and pumps.

END OF SECTION 221429

## SECTION 230500 – COMMON WORK RESULTS FOR HVAC

### 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. Piping materials and installation instructions common to most piping systems.
  - 2. Transition fittings.
  - 3. Dielectric fittings.
  - 4. Mechanical sleeve seals.
  - 5. Sleeves.
  - 6. Escutcheons.
  - 7. Grout.
  - 8. Equipment installation requirements common to equipment sections.
  - 9. Painting and finishing.
  - 10. Supports and anchorages.

#### 1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
  - 1. ABS: Acrylonitrile-butadiene-styrene plastic.

2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

#### 1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

C. Operation and Maintenance Data: At the end of the project the contractor shall submit two paper copies of the Operation and Maintenance Data to the owner in three ring binders with the project title and contractor's contact information.

D. Project Record Documents: Throughout the project the contractor shall keep a running record of as-builts showing deviations from the plans. At the end of the project the contractor shall submit one clean hand sketch set of documents to the owner.

#### 1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

D. Install all equipment, materials, and accessories per manufacturers written instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  2. AWWA C110, rubber, flat face, 1/8-inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining Plastic Piping:
1. ABS Piping: ASTM D 2235.
  2. CPVC Piping: ASTM F 493.
  3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
  4. PVC to ABS Piping Transition: ASTM D 3138.
- I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.
- 2.4 TRANSITION FITTINGS
- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
1. Manufacturers:
    - a. Cascade Waterworks Mfg. Co.
    - b. Dresser Industries, Inc.; DMD Div.
    - c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
    - d. JCM Industries.
    - e. Smith-Blair, Inc.
    - f. Viking Johnson.
  2. Underground Piping NPS 1½ and Smaller: Manufactured fitting or coupling.
  3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
  4. Aboveground Pressure Piping: Pipe fitting.

- B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
  - 1. Manufacturers:
    - a. Eslon Thermoplastics.
- C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
  - 1. Manufacturers:
    - a. Thompson Plastics, Inc.
- D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
  - 1. Manufacturers:
    - a. NIBCO INC.
    - b. NIBCO, Inc.; Chemtrol Div.
- E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve ends same size as piping to be joined, and corrosion-resistant metal band on each end.
  - 1. Manufacturers:
    - a. Cascade Waterworks Mfg. Co.
    - b. Fernco, Inc.
    - c. Mission Rubber Company.
    - d. Plastic Oddities, Inc.

## 2.5 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
  - 1. Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. Eclipse, Inc.
    - d. EpcO Sales, Inc.

- e. Hart Industries, International, Inc.
  - f. Watts Industries, Inc.; Water Products Div.
  - g. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300-psig minimum working pressure as required to suit system pressures.
- 1. Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. Epcos Sales, Inc.
    - d. Watts Industries, Inc.; Water Products Div.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
- 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Central Plastics Company.
    - d. Pipeline Seal and Insulator, Inc.
  - 2. Separate companion flanges and steel bolts and nuts shall have 150 or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- 1. Manufacturers:
    - a. Calpico, Inc.
    - b. Lochinvar Corp.
- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
- 1. Manufacturers:
    - a. Perfection Corp.
    - b. Precision Plumbing Products, Inc.
    - c. Sioux Chief Manufacturing Co., Inc.
    - d. Victaulic Co. of America.

## 2.6 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.



1. Manufacturers:
  - a. Advance Products & Systems, Inc.
  - b. Calpico, Inc.
  - c. Metraflex Co.
  - d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic, Carbon steel or Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## 2.7 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
  1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

## 2.8 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
  1. Finish: Polished chrome-plated and rough brass.

- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
  - 1. Finish: Polished chrome-plated and rough brass.
- E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With concealed or exposed-rivet hinge, set screw or spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## 2.9 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.

- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
  1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
    - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.
    - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated or rough-brass finish.
    - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed or exposed-rivet hinge and set screw or spring clips.
    - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
    - l. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
  2. Existing Piping: Use the following:
    - a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
    - b. Insulated Piping: Split-plate, stamped-steel type with concealed or exposed-rivet hinge and spring clips.
    - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and spring clips.
    - e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
    - f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and set screw.
    - g. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated or rough-brass finish.

- h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge and set screw or spring clips.
  - i. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
  - j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with set screw or spring clips.
  - k. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.
- M. Permanent sleeves are not required for holes formed by removable PE sleeves.
- N. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- O. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. PVC or Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
    - b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
      - 1) Seal space outside of sleeve fittings with grout.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
- P. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  - 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
  - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

- Q. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.
- S. Verify final equipment locations for roughing-in.
- T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
  - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
  - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
  - 1. Plain-End Pipe and Fittings: Use butt fusion.
  - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

### 3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  - 4. Wet Piping Systems: Install dielectric nipple fittings to connect piping materials of dissimilar metals.
    - a. For piping systems operating below ambient temperature, provide dielectric nipple and brass ball valve or dielectric coupling to separate interior and exterior dissimilar metals.

### 3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.
- E. Install equipment per the manufacturer's recommendations. If the manufacturer's recommendations are different than shown on the construction documents or as otherwise specified contact the engineer.
- F. Contractor shall provide all equipment and associated controls required to provide a complete and operable system.
- G. The scope of work for all Division 23 sections includes all miscellaneous work needed (whether or not specified or shown on the documents) to produce a complete and fully operational system.

### 3.5 PAINTING

- A. Painting of mechanical systems, equipment, and components is specified in Architectural Section.
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### 3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

### 3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

### 3.8 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

### 3.9 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

END OF SECTION 230500



## SECTION 230529 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes hangers and supports for mechanical system piping and equipment.

#### 1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

#### 1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

## 2.2 MANUFACTURED UNITS

### A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components.

#### 1. Manufacturers:

- a. AAA Technology and Specialties Co., Inc.
- b. B-Line Systems, Inc.
- c. Carpenter & Patterson, Inc.
- d. Empire Tool & Manufacturing Co., Inc.
- e. Globe Pipe Hanger Products, Inc.
- f. Grinnell Corp.
- g. GS Metals Corp.
- h. Michigan Hanger Co., Inc.
- i. National Pipe Hanger Corp.
- j. PHD Manufacturing, Inc.
- k. PHS Industries, Inc.
- l. Piping Technology & Products, Inc.

2. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.

3. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

### B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.

#### 1. Manufacturers:

- a. B-Line Systems, Inc.
- b. Grinnell Corp.
- c. GS Metals Corp.
- d. Michigan Hanger Co., Inc.
- e. National Pipe Hanger Corp.
- f. Thomas & Betts Corp.
- g. Unistrut Corp.
- h. Wesanco, Inc.

2. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

3. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

### C. Thermal-Hanger Shield Inserts: 100-psi minimum compressive-strength insulation, encased in sheet metal shield.

#### 1. Manufacturers:

- a. Carpenter & Patterson, Inc.
- b. Michigan Hanger Co., Inc.
- c. PHS Industries, Inc.
- d. Pipe Shields, Inc.

- e. Rilco Manufacturing Co., Inc.
  - f. Value Engineered Products, Inc.
2. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
  3. Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.
  4. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
  5. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.
  6. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

### 2.3 MISCELLANEOUS MATERIALS

- A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- B. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- C. Hanger Rods: Galvanized all-thread, ASTM A 36.
- D. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.
  1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
  2. Properties: Nonstaining, noncorrosive, and nongaseous.
  3. Design Mix: 5000-psi, 28-day compressive strength.

## PART 3 - EXECUTION

### 3.1 APPLICATIONS

- A. Specific hanger requirements are specified in Sections specifying equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.
- C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
  1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 .
  2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
  3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.

4. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
  5. U-Bolts (MSS Type 24): For support of heavy pipe, NPS 1/2 to NPS 30.
  6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
  7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
  8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
  2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
  2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
  3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb.
    - b. Medium (MSS Type 32): 1500 lb.
    - c. Heavy (MSS Type 33): 3000 lb.
  8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi minimum compressive-strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.
- H. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
  2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
  3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

### 3.2 INSTALLATION

- A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems. Field assemble and install according to manufacturer's written instructions.
- C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes. Support pipes of various sizes together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- E. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

- G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.
- J. Insulated Piping: Comply with the following:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits according to ASME B31.9.
  - 2. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
  - 3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
  - 4. Shield Dimensions for Pipe: Not less than the following:
    - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    - b. NPS 4: 12 inches long and 0.06 inch thick.
  - 5. Insert Material: Length at least as long as protective shield.
  - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor. Place grout under supports for equipment and make smooth bearing surface.

### 3.4 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations. Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.

4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

### 3.5 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

### 3.6 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils. See Division 9 Section "Painting" for paint materials and application requirements.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 230529

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## SECTION 230553 – IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

### 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 mechanical identification materials and their installation:
  - 1. Equipment nameplates.
  - 2. Equipment markers.
  - 3. Warning tags.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Valve numbering scheme.
- D. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals.

#### 1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

#### 1.5 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with location of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
  - 1. Data:
    - a. Manufacturer, product name, model number, and serial number.
    - b. Capacity, operating and power characteristics, and essential data.
    - c. Labels of tested compliances.
  - 2. Location: Accessible and visible.
  - 3. Fasteners: As required to mount on equipment.
- B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
  - 1. Terminology: Match schedules as closely as possible.
  - 2. Data:
    - a. Name and plan number.
  - 3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

### 2.2 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
  - 1. Colors: Comply with ASME A13.1, unless otherwise indicated.
  - 2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length
  - 3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
  - 4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
  - 5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.
- C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.

- D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.
- E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure-sensitive, permanent-type, self-adhesive back.
  - 1. Width for Markers on Pipes with OD, Including Insulation, and Less Than 6 Inches: 3/4 inch minimum.
  - 2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

### 2.3 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.
  - 1. Size: Approximately 4 by 7 inches
  - 2. Fasteners: Brass grommet and wire.
  - 3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
  - 4. Color: Yellow background with black lettering.

## PART 3 - EXECUTION

### 3.1 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 23 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

### 3.2 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
  - 1. Pumps, compressors, chillers, condensers, and similar motor-driven units.
  - 2. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
  - 3. Fans, blowers and air terminals.
  - 4. Air handling units.
- B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.

1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
2. Data: Distinguish among multiple units,
3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
  - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
  - b. Fire department hose valves and hose stations.
  - c. Pumps, compressors, chillers, condensers, and similar motor-driven units.
  - d. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
  - e. Air handling units, air terminals, and fan coil units.
  - f. Tanks and pressure vessels.
  - g. Humidifiers, water-treatment systems, and similar equipment.

C. Install access panel markers with screws on equipment access panels.

### 3.3 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
  1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pretensioned pipe markers. Use size to ensure a tight fit.
  2. Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, 1-1/2 inches wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.
  3. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.
  4. Pipes with OD, Including Insulation, 6 Inches and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends of pipe marker, and covering full circumference of pipe.
- B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:
  1. Near each valve and control device.
  2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
  4. At access doors, manholes, and similar access points that permit view of concealed piping.
  5. Near major equipment items and other points of origination and termination.
  6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

#### 3.4 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.
- B. Provide warning tags on equipment and with wording as directed by the Architect.

#### 3.5 ADJUSTING

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

#### 3.6 CLEANING

- A. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION 230553

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## SECTION 230700 - HVAC INSULATION

### 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 mechanical insulation for boiler breeching, duct, equipment, and pipe, including the following:
  - 1. Insulation Materials:
    - a. Flexible elastomeric.
  - 2. Insulating cements.
  - 3. Adhesives.
  - 4. Mastics.
  - 5. Lagging adhesives.
  - 6. Sealants.
  - 7. Factory-applied jackets.
  - 8. Field-applied fabric-reinforcing mesh.
  - 9. Field-applied jackets.
  - 10. Tapes.
- B. Related Sections include the following:
  - 1. Division 23 Section "Metal Ducts" for duct liners.

#### 1.3 DEFINITIONS

- A. ASJ: All-service jacket.
- B. FSK: Foil, scrim, kraft paper.
- C. FSP: Foil, scrim, polyethylene.
- D. PVDC: Polyvinylidene chloride.
- E. SSL: Self-sealing lap.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).
- B. Shop Drawings: Show details for the following:
  - 1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
  - 2. Insulation application at pipe expansion joints for each type of insulation.
  - 3. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
  - 4. Removable insulation at piping specialties, equipment connections, and access panels.
  - 5. Application of field-applied jackets.
  - 6. Field application for each equipment type.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- C. National Commercial and Industrial Insulation Standards: Comply with installation standards.
- D. ASHRAE Standard 90.1-2004: Comply with insulation values required by the Energy Standards.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

#### 1.7 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."



- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

## 1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 INSULATION MATERIALS

- A. Refer to Part 3 schedule articles for requirements about where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials. Paint flexible Elastomeric insulation exposed to sun light with Armaflex WB finish, white.

1. Products:
  - a. Aeroflex USA Inc.; Aerocel.
  - b. Armacell LLC; AP Armaflex.
  - c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

## 2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
  1. Products:
    - a. Aeroflex USA Inc.; Aeroseal.
    - b. Armacell LCC; 520 Adhesive.
    - c. Foster Products Corporation, H. B. Fuller Company; 85-75.
    - d. RBX Corporation; Rubatex Contact Adhesive.

## 2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
  1. Products:
    - a. Childers Products, Division of ITW; CP-35.
    - b. Foster Products Corporation, H. B. Fuller Company; 30-90.
    - c. ITW TACC, Division of Illinois Tool Works; CB-50.
    - d. Marathon Industries, Inc.; 590.
    - e. Mon-Eco Industries, Inc.; 55-40.
    - f. Vimasco Corporation; 749.
  2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
  3. Service Temperature Range: Minus 20 to plus 180 deg F.
  4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
  5. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.
  1. Products:
    - a. Childers Products, Division of ITW; CP-30.
    - b. Foster Products Corporation, H. B. Fuller Company; 30-35.

- c. ITW TACC, Division of Illinois Tool Works; CB-25.
    - d. Marathon Industries, Inc.; 501.
    - e. Mon-Eco Industries, Inc.; 55-10.
  2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
  3. Service Temperature Range: 0 to 180 deg F.
  4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
  5. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.
  1. Products:
    - a. Childers Products, Division of ITW; Encacel.
    - b. Foster Products Corporation, H. B. Fuller Company; 60-95/60-96.
    - c. Marathon Industries, Inc.; 570.
    - d. Mon-Eco Industries, Inc.; 55-70.
  2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
  3. Service Temperature Range: Minus 50 to plus 220 deg F.
  4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
  5. Color: White.
- E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
  1. Products:
    - a. Childers Products, Division of ITW; CP-10.
    - b. Foster Products Corporation, H. B. Fuller Company; 35-00.
    - c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
    - d. Marathon Industries, Inc.; 550.
    - e. Mon-Eco Industries, Inc.; 55-50.
    - f. Vimasco Corporation; WC-1/WC-5.
  2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
  3. Service Temperature Range: Minus 20 to plus 200 deg F.
  4. Solids Content: 63 percent by volume and 73 percent by weight.
  5. Color: White.

## 2.5 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
  1. Products:
    - a. Childers Products, Division of ITW; CP-52.
    - b. Foster Products Corporation, H. B. Fuller Company; 81-42.
    - c. Marathon Industries, Inc.; 130.
    - d. Mon-Eco Industries, Inc.; 11-30.

- e. Vimasco Corporation; 136.
2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
3. Service Temperature Range: Minus 50 to plus 180 deg F.
4. Color: White.

## 2.6 SEALANTS

### A. FSK and Metal Jacket Flashing Sealants:

1. Products:
  - a. Childers Products, Division of ITW; CP-76-8.
  - b. Foster Products Corporation, H. B. Fuller Company; 95-44.
  - c. Marathon Industries, Inc.; 405.
  - d. Mon-Eco Industries, Inc.; 44-05.
  - e. Vimasco Corporation; 750.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

### B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products:
  - a. Childers Products, Division of ITW; CP-76.
  - b. Materials shall be compatible with insulation materials, jackets, and substrates.
  - c. Fire- and water-resistant, flexible, elastomeric sealant.
  - d. Service Temperature Range: Minus 40 to plus 250 deg F.
  - e. Color: White.

## 2.7 FACTORY-APPLIED JACKETS

### A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. PVDC Jacket for Indoor Applications: 4-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and

with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

6. PVDC Jacket for Outdoor Applications: 6-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.
7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

a. Products:

- 1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.
8. Vinyl Jacket: UL-rated white vinyl with a permeance of 1.3 perms when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

## 2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. Metal Jacket:

1. Products:

- a. Childers Products, Division of ITW; Metal Jacketing Systems.
- b. PABCO Metals Corporation; Surefit.
- c. RPR Products, Inc.; Insul-Mate.
- d. Insert manufacturer's name; product name or designation.

2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.

- a. Sheet and roll stock ready for shop or field sizing Factory cut and rolled to size.
- b. Finish and thickness are indicated in field-applied jacket schedules.
- c. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
- d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
- e. Factory-Fabricated Fitting Covers:
  - 1) Same material, finish, and thickness as jacket.
  - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
  - 3) Tee covers.
  - 4) Flange and union covers.
  - 5) End caps.

- 6) Beveled collars.
- 7) Valve covers.
- 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

## 2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.

1. Products:

- a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
- b. Compac Corp.; 104 and 105.
- c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
- d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.

3. Thickness: 11.5 mils.

4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/ inch in width.

7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136 and UL listed.

1. Products:

- a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
- b. Compac Corp.; 110 and 111.
- c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
- d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.

3. Thickness: 6.5 mils.

4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/ inch in width.

7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products:

- a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
- b. Compac Corp.; 130.
- c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
- d. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/ inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/ inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.

1. Products:
  - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
  - b. Compac Corp.; 120.
  - c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
  - d. Venture Tape; 3520 CW.
2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/ inch in width.

E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products:
  - a. Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.
2. Width: 3 inches.
3. Film Thickness: 4 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/ inch in width.

F. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products:
  - a. Dow Chemical Company (The); Saran 560 Vapor Retarder Tape.
2. Width: 3 inches.
3. Film Thickness: 6 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/ inch in width.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
  - 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
  - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
  - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 COMMON INSTALLATION REQUIREMENTS

- A. Install insulation in strict accordance with the manufacturer's installation instructions and the National Commercial and Industrial Insulation Standards.
- B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.



- E. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- F. Install multiple layers of insulation with longitudinal and end seams staggered.
- G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- H. Keep insulation materials dry during application and finishing.
- I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- J. Install insulation with least number of joints practical.
- K. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- M. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at **[2 inches] [4 inches]** o.c.
    - a. For below ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- N. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

- P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- Q. For above ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.
  - 4. Manholes.
  - 5. Handholes.
  - 6. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Below-Grade Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Through-Penetration Firestop Systems."

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies according to Division 7 Section "Through-Penetration Firestop Systems."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this Article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
  3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
  4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
  5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1½-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.
- E. Where PVDC jackets are indicated, install as follows:
  - 1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
  - 2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1¼ circumferences of appropriate PVDC tape around overlapped butt joint.
  - 3. Continuous jacket can be spiral wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
  - 4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33½-inches or less. The 33½-inch-circumference limit allows for 2-inch-overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
  - 5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.
- F. Where rubberized bituminous resin jackets are installed comply with manufacturers installation instructions.

### 3.8 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  - 1. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.9 INDOOR PIPING INSULATION SCHEDULE

- A. Condensate Drain Piping:
  - 1. NPS 12 and Smaller: Insulation shall be the following:
    - a. Flexible Elastomeric: 1/2-inch thick.

3.10 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Refrigerant piping Suction and Liquid lines:
  - 1. All Pipe Sizes: Insulation shall be any of the following:
    - a. Flexible Elastomeric: 1-inches thick.

3.11 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Ductwork, piping and equipment, Exposed:
  - 1. PVC: 30 mils thick.
  - 2. Painted Aluminum, Stucco Embossed: 0.020 inch thick.
  - 3. Rubberized Bituminous self adhesion jacket.

END OF SECTION 230700

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## SECTION 232300 - REFRIGERANT PIPING

### 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. This Section includes refrigerant piping used for air-conditioning applications.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-134a:
  - 1. Suction Lines for Air-Conditioning Applications: 115 psig.
  - 2. Suction Lines for Heat-Pump Applications: 225 psig.
  - 3. Hot-Gas and Liquid Lines: 225 psig.
- B. Line Test Pressure for Refrigerant R-407C:
  - 1. Suction Lines for Air-Conditioning Applications: 230 psig.
  - 2. Suction Lines for Heat-Pump Applications: 380 psig.
  - 3. Hot-Gas and Liquid Lines: 380 psig.
- C. Line Test Pressure for Refrigerant R-410A:
  - 1. Suction Lines for Air-Conditioning Applications: 300 psig.
  - 2. Suction Lines for Heat-Pump Applications: 535 psig.
  - 3. Hot-Gas and Liquid Lines: 535 psig.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
  - 1. Thermostatic expansion valves.
  - 2. Solenoid valves.
  - 3. Hot-gas bypass valves.
  - 4. Filter dryers.
  - 5. Strainers.
  - 6. Pressure-regulating valves.

- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
  - 1. Shop Drawing Scale: 1/4 inch equals 1 foot.
  - 2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
  - 3. Equipment manufacturer's authorized representative shall review and approve refrigerant piping before installation.
- C. Welding certificates.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

#### 1.6 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

### PART 2 - PRODUCTS

#### 2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type K or L or ASTM B 280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

## 2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; Type, Grade, and wall thickness as selected in Part 3 piping applications articles.

B. Wrought-Steel Fittings: ASTM A 234/A 234M, for welded joints.

C. Steel Flanges and Flanged Fittings: ASME B16.5, steel, including bolts, nuts, and gaskets, bevel-welded end connection, and raised face.

D. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Flanged Unions:

1. Body: Forged-steel flanges for NPS 1 to NPS 1-1/2 and ductile iron for NPS 2 to NPS 3. Apply rust-resistant finish at factory.
2. Gasket: Fiber asbestos free.
3. Fasteners: Four plated-steel bolts, with silicon bronze nuts. Apply rust-resistant finish at factory.
4. End Connections: Brass tailpiece adapters for solder-end connections to copper tubing.
5. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
6. Pressure Rating: Factory test at minimum 400 psig.
7. Maximum Operating Temperature: 330 deg F.

F. Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, stainless-steel-wire-reinforced protective jacket
2. End Connections:
  - a. NPS 2 and Smaller: With threaded-end connections.
  - b. NPS 2-1/2 and Larger: With flanged-end connections.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.

5. Maximum Operating Temperature: 250 deg F.

## 2.3 VALVES AND SPECIALTIES

### A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

### B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

### C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

### D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

### E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.

2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
  3. Seat: Polytetrafluoroethylene.
  4. End Connections: Threaded.
  5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
  6. Working Pressure Rating: 400 psig.
  7. Maximum Operating Temperature: 240 deg F.
  8. Manual operator.
- F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
  2. Piston, Closing Spring, and Seat Insert: Stainless steel.
  3. Seat Disc: Polytetrafluoroethylene.
  4. End Connections: Threaded.
  5. Working Pressure Rating: 400 psig.
  6. Maximum Operating Temperature: 240 deg F.
- G. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
  2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
  3. Packing and Gaskets: Non-asbestos.
  4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
  5. Suction Temperature: 40 deg F.
  6. Superheat: Adjustable.
  7. Reverse-flow option (for heat-pump applications).
  8. End Connections: Socket, flare, or threaded union.
  9. Working Pressure Rating: 700 psig.
- H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
  2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
  3. Packing and Gaskets: Non-asbestos.
  4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
  5. Seat: Polytetrafluoroethylene.
  6. Equalizer: External.
  7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
  8. End Connections: Socket.
  9. Throttling Range: Maximum 5 psig.
  10. Working Pressure Rating: 500 psig.
  11. Maximum Operating Temperature: 240 deg F.
- I. Straight-Type Strainers:
1. Body: Welded steel with corrosion-resistant coating.
  2. Screen: 100-mesh stainless steel.

3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

J. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

K. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

L. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated charcoal.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F.

## 2.4 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. ASHRAE 34, R-22: Monochlorodifluoromethane.

- C. ASHRAE 34, R-134a: Tetrafluoroethane.
- D. ASHRAE 34, R-407C: Difluoromethane/Pentafluoroethane/1,1,1,2-Tetrafluoroethane.
- E. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

### PART 3 - EXECUTION

#### 3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.
- B. Suction Lines NPS 4 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR or L, drawn-temper tubing and wrought-copper fittings with soldered joints.
- C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR or L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

#### 3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install diaphragm packless or packed-angle valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install diaphragm packless or packed-angle valves on inlet and outlet side of filter dryers.
- E. Install a full-sized, three-valve bypass around filter dryers.
- F. Install thermostatic expansion valves as close as possible to distributors on evaporators.
  - 1. Install valve so diaphragm case is warmer than bulb.
  - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
  - 3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- G. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.
- H. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

- I. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:
  - 1. Solenoid valves.
  - 2. Thermostatic expansion valves.
  - 3. Hot-gas bypass valves.
  - 4. Compressor.
- J. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

### 3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operation" for solenoid valve controllers, control wiring, and sequence of operation.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in protective conduit where installed belowground.



- N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- O. Slope refrigerant piping as follows:
  - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
  - 2. Install horizontal suction lines with a uniform slope downward to compressor.
  - 3. Install traps and double risers to entrain oil in vertical runs.
  - 4. Liquid lines may be installed level.
- P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.
- R. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."
- S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.
- U. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.
- V. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

### 3.4 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.

2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.
- F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
  2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.
- H. Welded Joints: Construct joints according to AWS D10.12/D10.12M.
- I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

### 3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
1. Adjustable steel clevis hangers for individual horizontal runs less than 50 feet long.
  2. Roller hangers and spring hangers for individual horizontal runs 50 feet or longer for pipes 1½-inches or larger.
  3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
  4. Spring hangers to support vertical runs.
  5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
  2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
  3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
  4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
- D. Support multifloor vertical runs at least at each floor.

### 3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
  - a. Fill system with nitrogen to the required test pressure.
  - b. System shall maintain test pressure at the manifold gage throughout duration of test.
  - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
  - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

### 3.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
  1. Install core in filter dryers after leak test but before evacuation.
  2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
  3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
  4. Charge system with a new filter-dryer core in charging line.

### 3.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
  1. Open shutoff valves in condenser water circuit.
  2. Verify that compressor oil level is correct.
  3. Open compressor suction and discharge valves.
  4. Open refrigerant valves except bypass valves that are used for other purposes.
  5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

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## SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

### 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 split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied color finishes.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Warranty: Sample of special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE Compliance:
  - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
  - 2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-up."
- C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

## 1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period:
    - a. For Compressor: Five year(s) from date of Substantial Completion.
    - b. For Parts: One year(s) from date of Substantial Completion.
    - c. For Labor: One year(s) from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-approved equivalent:
  - 1. Carrier Corporation; Home Comfort and HVAC Building and Industrial Systems
  - 2. Fujitsu
  - 3. Hitachi
  - 4. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division

5. Mitsubishi Electric Sales Canada, Inc.
6. Mitsubishi Heavy Industries America, Inc.
7. Samsung
8. Trane; a business of American Standard companies
9. YORK; a Johnson Controls company

## 2.2 INDOOR UNITS (5 TONS OR LESS)

### A. Ceiling Cassette, Evaporator-Fan Components:

1. Cabinet: Enameled steel, ductless installation, vanes settings for direct/indirect airflow control, knockouts for outdoor air, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Fan: Direct-drive, centrifugal.
4. Fan Motors:
  - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
  - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
  - c. Enclosure Type: Totally enclosed, fan cooled.
  - d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
  - e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical sections.
  - f. Mount unit-mounted disconnect switches.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Condensate Drain Pans:
  - a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
    - 1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
    - 2) Depth: A minimum of 1 inch deep.
  - b. Single-wall, galvanized-steel sheet.
  - c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
    - 1) Minimum Connection Size: NPS 1.
  - d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
  - e. Built-in condensate lift mechanism.

7. Air Filtration Section:

a. General Requirements for Air Filtration Section:

- 1) Comply with NFPA 90A.
- 2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
- 3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
  - a. Compressor Type: Scroll.
  - b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
  - c. Refrigerant: R-410A.
  - d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.
3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to -5 deg F.
7. Mounting Base: Concrete pad.

2.4 ACCESSORIES

- A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.
- B. Automatic-reset timer to prevent rapid cycling of compressor.
- C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- D. Drain Hose: For condensate.



## 2.5 CAPACITIES AND CHARACTERISTICS

- A. Refer to schedule on drawings.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Equipment Mounting:
  - 1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s).
- D. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

#### 3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.

#### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

## SECTION 260010 - BASIC ELECTRICAL REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. Work includes all electrical items and systems shown on the contract drawings and specified herein.
- B. Unless specifically dimensioned, the work shown on the drawings is diagrammatic, and is intended only to show general arrangement.
- C. Include in the work all accessories and devices necessary for the intended operation of any system, whether or not specifically shown or specified.

#### 1.2 STANDARDS OF QUALITY

- A. The specifications establish the standard of quality required, either by description of by references to brand name, name of manufacturers or manufacturer's model number.
- B. Where one product only is specifically identified by name of manufacturer's model number, the Contractor shall base his bid on the use of the name product. Where multiple names are used, the Contractor shall base his bid on the use of any of those products named.
- C. The Contractor may submit with his bid, the names of products which are proposed as substitutions for products named in specifications. Each proposed substitution shall be accompanied by a written sum of money to be added or deducted from his bid. The Owner reserves the sole right to accept or reject said substitutions with or without cause.
- D. When equipment and/or materials are proposed to be purchased from a manufacturer other than those specified, the Contractor shall provide complete data adequate for the Engineer's evaluation of the proposed substitution.
- E. When the equipment other than that specified is used, the Contractor shall be responsible for any extra cost of required revisions such as structural steel, concrete, electrical, piping, etc. Such additional costs shall be identified at the time such substitutions are proposed.

#### 1.3 SUMMARY

- A. This Section includes general administrative and procedural requirements for electrical installations.
  - 1. Submittals
  - 2. Maintenance Manuals
  - 3. Rough-ins
  - 4. Electrical Installations

#### 1.4 SUBMITTALS

- A. The Contractor shall review, approve and submit shop drawings, with promptness so as to cause no delay in his work or in that of others. No submissions will be accepted by the Engineer without the signed review and approval of the Contractor.
- B. The Contractor shall check and verify pertinent field measurements, quantities of equipment and materials required.
- C. Submittals shall be identified by reference to project, the drawings, sections of specifications, or equipment symbols to which they relate.
- D. Shop drawings, when required, shall include:
  - 1. Verification of information given in Contract Documents such as performance, dimensions, weight, materials, construction, types, models, manufacturer, etc.
  - 2. Equipment layouts drawn to scale as may be required.
  - 3. Wiring diagrams and schematics for equipment.
  - 4. Any special construction conditions.
  - 5. Other information/data as may be requested.
- E. All submittals shall identify the specific details of the product or assembly. All optional features being proposed shall be so noted, or the submittal will be rejected.
- F. Review is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specification. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.
- G. For items being resubmitted, clearly identify changes made from the initial submittal requested by the Engineer. The Engineer will review only those changes requested and identified by the Contractor.

#### 1.5 MAINTENANCE MANUALS

- A. Prepare maintenance manuals including the following information for equipment items:
  - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
  - 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
  - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
  - 4. Servicing instructions and lubrication charts and schedules.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

1.7 PERMITS, FEES, AND CERTIFICATES OF APPROVAL

- A. Contractor shall acquire all permits and certificates.
- B. Contractor shall provide all labor and instruments required for tests and cleaning of systems.
- C. Whenever tests are required, three (3) copies of the test reports shall be submitted to the Engineer and (1) electronic copy.
- D. Tests may be observed by the Engineer or his representative. Notify the Engineer a minimum of three weeks in advance of the test dates.

1.8 COMPLIANCE WITH CODES, STANDARDS AND REGULATIONS

- A. In the absence of specific instruction in the technical specifications, equipment and installation shall conform to the following applicable codes, standards and regulations, latest editions:
  - 1. American Society for Testing Materials (ASTM).
  - 2. American National Standard Institute (ANSI).
  - 3. Underwriter's Laboratories, Inc. (UL).
  - 4. American Welding Society Code (AWSC).
  - 5. Local Building, Electrical, and Fire Codes.
  - 6. National Electrical Code (NEC).
  - 7. Service Rules and Regulations of Local Electrical Utility Company.
  - 8. National Electrical Manufacturer's Association (NEMA).
  - 9. U.S. Department of Health & Human Services "HRS-M-HF" 84-1.
  - 10. Occupational Safety and Health Act (OSHA).
  - 11. National Fire Protection Association (NFPA).
  - 12. Americans with Disabilities Act (ADA).

PART 2 - PRODUCTS - Not Used.

PART 3 - EXECUTION

3.1 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with requirements of the actual equipment to be connected.

3.2 ELECTRICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
11. Install access panel or doors where units are concealed behind finished surfaces.
12. Install systems, material, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
13. Coordinate all electrical requirements with other trades and their shop drawings prior to installing conduit, wire, switches and breakers. Notify engineer of any discrepancies between document and actual supplied equipment.

### 3.3 CUTTING AND PATCHING

A. General: Performing cutting and patching in accordance with the following requirements:

1. Perform cutting, fitting, and patching of electrical equipment and materials required to:
  - a. Uncover work to provide for installation of ill-timed work.
  - b. Remove and replace defective work.
  - c. Remove and replace work not conforming to requirements of the contract documents.
  - d. Remove samples of installed work as specified for testing.
  - e. Upon written instruction from the Engineer, uncover and restore work to provide for Engineer observation of concealed work.

END OF SECTION 260010

## SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. Electrical equipment coordination and installation.
  2. Common electrical installation requirements.

#### 1.2 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  3. To allow right of way for piping and conduit installed at required slope.
  4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.

### PART 2 - PRODUCTS – Not Used.

### PART 3 - EXECUTION

#### 3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

- E. Right of Way: Give to piping systems installed at a required slope.

END OF SECTION 260500



## SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Building wires and cables rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.

#### 1.2 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

### PART 2 - PRODUCTS

#### 2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2.

#### 2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

#### 2.3 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

### PART 3 - EXECUTION

#### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

- B. Branch Circuits: Copper. Stranded for No. 12 AWG and larger, except VFC cable, which shall be extra flexible stranded.

### 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-2-THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN-2-THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
  - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

### 3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

### 3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

### 3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

### 3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements.
    - a. Transfer switches.
    - b. All 100A and above feeders.
  - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
    - a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

- b. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
  
- B. Test and Inspection Reports: Prepare a written report to record the following:
  - 1. Procedures used.
  - 2. Results that comply with requirements.
  - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
  
- C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

## SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

#### 1.2 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
  - 1. Ground rods.
  - 2. Grounding arrangements and connections for separately derived systems.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
  - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NETA MTS.
      - 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
      - 2) Include recommended testing intervals.

#### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

### 2.2 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
  - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
  - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
  - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

### 2.3 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

### 2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type; 5/8 by 96 inches.

## PART 3 - EXECUTION

### 3.1 APPLICATIONS

- A. Conductors: Install stranded conductors for No. 8 AWG and larger unless otherwise indicated.
- B. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
  - 4. Connections to Structural Steel: Welded connectors.

### 3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

### 3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

### 3.4 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Three-phase motor and appliance branch circuits.
  - 6. Flexible raceway runs.
  - 7. Armored and metal-clad cable runs.
- C. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

### 3.5 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
  - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
  - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
  - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- D. Grounding and Bonding for Piping:
  - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
  - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

### 3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
  - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.



- a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
  - b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
  2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
  3. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
  4. Substations and Pad-Mounted Equipment: 5 ohms.
  5. Manhole Grounds: 10 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

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## SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Hangers and supports for electrical equipment and systems.

#### 1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

#### 1.3 QUALITY ASSURANCE

- A. Comply with NFPA 70.

#### 1.4 COORDINATION

- A. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

### PART 2 - PRODUCTS

#### 2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  - 4. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
  - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
  - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
  - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
  - 6. Toggle Bolts: All-steel springhead type.
  - 7. Hanger Rods: Threaded steel.

### PART 3 - EXECUTION

#### 3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

#### 3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
  2. To New Concrete: Bolt to concrete inserts.
  3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  4. To Existing Concrete: Expansion anchor fasteners.
  5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
  6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
  7. To Light Steel: Sheet metal screws.
  8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

### 3.3 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements.
- C. Anchor equipment to concrete base.
  1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

END OF SECTION 260529

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## SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. Metal conduits, tubing, and fittings.
  2. Nonmetal conduits, tubing, and fittings.
  3. Boxes, enclosures, and cabinets.
  4. Handholes and boxes for exterior underground cabling.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

### PART 2 - PRODUCTS

#### 2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. GRC: Comply with ANSI C80.1 and UL 6.
- C. IMC: Comply with ANSI C80.6 and UL 1242.
- D. EMT: Comply with ANSI C80.3 and UL 797.
- E. FMC: Comply with UL 1; zinc-coated steel.
- F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Fittings for EMT:
    - a. Material: Die cast.
    - b. Type: Setscrew.
- H. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- C. LFNC: Comply with UL 1660.
- D. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- E. Fittings for LFNC: Comply with UL 514B.
- F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.3 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- D. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- H. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- I. Gangable boxes are prohibited.
- J. Metal Floor Boxes:
  - 1. Material: Cast metal
  - 2. Type: Fully adjustable
  - 3. Shape: Rectangular
  - 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- K. Nonmetallic Floor Boxes: Nonadjustable



1. Listing and labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.4 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

### A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

### B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Armorcast Products Company.
  - b. Carson Industries LLC.
  - c. NewBasis.
  - d. Oldcastle Precast, Inc.
  - e. Quazite: Hubbell Power System, Inc.
  - f. Synertech Moulded Products.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "TELEPHONE."
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

## 2.5 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

### A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

### PART 3 - EXECUTION

#### 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
  2. Concealed Conduit, Aboveground: GRC.
  3. Underground Conduit: RNC, Type EPC-40-PVC.
  4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
  2. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  4. Damp or Wet Locations: GRC.
  5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  2. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.
  3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- G. Install surface raceways only where indicated on Drawings.
- H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

#### 3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
  - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
  - 5. Change from ENT to GRC before rising above floor.
- J. Stub-ups to Above Recessed Ceilings:
  - 1. Use EMT, IMC, or RMC for raceways.
  - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

- Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- S. Surface Raceways:
1. Install surface raceway with a minimum 2-inch radius control at bend points.
  2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where an underground service raceway enters a building or structure.
  3. Where otherwise required by NFPA 70.
- V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- W. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
  2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    - d. Attics: 135 deg F temperature change.
  3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.00078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
  4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  1. Use LFMC in damp or wet locations subject to severe physical damage.
  2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- AA. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.
- BB. Locate boxes so that cover or plate will not span different building finishes.
- CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

### 3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
  1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom for pipe less than 6 inches in nominal diameter.
  2. Install backfill.
  3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
  4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
  5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
    - a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.

- b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

### 3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes with bottom below frost line, 24 inches below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

### 3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

### 3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

### 3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

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## SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.

#### 1.2 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

#### 1.3 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

## PART 2 - PRODUCTS

### 2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage and system or service type.
- C. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- D. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

### 2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.
- B. Colors for Cables Carrying Circuits at 600 V and Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage and system or service type.
- C. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

### 2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.
- B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.
- D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

- E. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
  - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
- F. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

## 2.4 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- C. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
  - 1. Labels for Tags: Self-adhesive label, machine-printed with permanent, waterproof, black ink recommended by printer manufacturer, sized for attachment to tag.

## 2.5 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
  - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
  - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
  - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
  - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
- C. Description:
  - 1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
  - 2. Overall Thickness: 5 mils.
  - 3. Foil Core Thickness: 0.35 mil.
  - 4. Weight: 28 lb/1000 sq. ft.
  - 5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

## 2.6 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Warning label and sign shall include, but are not limited to, the following legends:
  - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
  - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

## 2.7 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
  - 1. Engraved legend with black letters on white face.
  - 2. Punched or drilled for mechanical fasteners.
  - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

## 2.8 EQUIPMENT IDENTIFICATION LABELS

- A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
- B. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
- C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.
- G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

### 3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 30-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
  - 1. Emergency Power.
  - 2. Power.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
  - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
    - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
    - b. Colors for 208/120-V Circuits:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
    - c. Colors for 480/277-V Circuits:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.

- d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.
- F. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive, self-laminating polyester labels with the conductor designation.
- G. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
  1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
  2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
  3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- I. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
  1. Limit use of underground-line warning tape to direct-buried cables.
  2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
  1. Comply with 29 CFR 1910.145.
  2. Identify system voltage with black letters on an orange background.
  3. Apply to exterior of door, cover, or other access.
  4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
    - a. Power transfer switches.
    - b. Controls with external control power connections.
- K. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- L. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.

- M. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
    - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
    - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label Stenciled legend 4 inches high.
    - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
  2. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. Access doors and panels for concealed electrical items.
    - d. Switchboards.
    - e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    - f. Emergency system boxes and enclosures.
    - g. Enclosed switches.
    - h. Enclosed circuit breakers.
    - i. Variable-speed controllers.
    - j. Power transfer equipment.
    - k. Power-generating units.
    - l. Light control panels.

END OF SECTION 260553

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## SECTION 262726 - WIRING DEVICES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. Receptacles, receptacles with integral GFCI, and associated device plates.
  2. Twist-locking receptacles.
  3. Weather-resistant receptacles.
  4. Snap switches and wall-box dimmers.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

### PART 2 - PRODUCTS

#### 2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

#### 2.2 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 5351 (single), CR5362 (duplex).
    - b. Hubbell; HBL5351 (single), HBL5352 (duplex).
    - c. Leviton; 5891 (single), 5352 (duplex).
    - d. Pass & Seymour; 5361 (single), 5362 (duplex).

## 2.3 GFCI RECEPTACLES

### A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

### B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Cooper; VGF20.
  - b. Hubbell; GFR5352L.
  - c. Pass & Seymour; 2095.
  - d. Leviton; 7590.

## 2.4 HAZARDOUS (CLASSIFIED) LOCATION RECEPTACLES

### A. Available Wiring Devices for Hazardous (Classified) Locations: Comply with NEMA FB 11 and UL 1010.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Cooper Crouse-Hinds.
  - b. EGS/Appleton Electric.
  - c. Killark; Division of Hubbell Inc.

## 2.5 TWIST-LOCKING RECEPTACLES

### A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Cooper; CWL520R.
  - b. Hubbell; HBL2310.
  - c. Leviton; 2310.
  - d. Pass & Seymour; L520-R.

## 2.6 TOGGLE SWITCHES

### A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

### B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
  - 1) Single Pole:

- a) Cooper; AH1221.
- b) Hubbell; HBL1221.
- c) Leviton; 1221-2.
- d) Pass & Seymour; CSB20AC1.

2) Two Pole:

- a) Cooper; AH1222.
- b) Hubbell; HBL1222.
- c) Leviton; 1222-2.
- d) Pass & Seymour; CSB20AC2.

3) Three Way:

- a) Cooper; AH1223.
- b) Hubbell; HBL1223.
- c) Leviton; 1223-2.
- d) Pass & Seymour; CSB20AC3.

4) Four Way:

- a) Cooper; AH1224.
- b) Hubbell; HBL1224.
- c) Leviton; 1224-2.
- d) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Cooper; AH1221PL for 120 and 277 V.
- b. Hubbell; HBL1201PL for 120 and 277 V.
- c. Leviton; 1221-LH1.
- d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

2.7 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.
- C. LED Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.8 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover and listed and labeled for use in wet and damp locations.

- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

## 2.9 FINISHES

- A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

- B. Wall Plate Color: For plastic covers, match device color.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

- B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

- C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
  - a. Cut back and pigtail or replace all damaged conductors.
  - b. Straighten conductors that remain and remove corrosion and foreign matter.
  - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

### 3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

### 3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

END OF SECTION 262726



## SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following individually mounted, enclosed switches and circuit breakers:
  - 1. Fusible switches.
  - 2. Nonfusible switches.
  - 3. Enclosures.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Current and voltage ratings.
  - 3. Short-circuit current rating.
  - 4. UL listing for series rating of installed devices.
  - 5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field quality-control test reports including the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
  - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
  - 2. Time-current curves, including selectable ranges for each type of circuit breaker.

#### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- B. Comply with NFPA 70.

#### 1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
  - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
  - 2. Altitude: Not exceeding 6600 feet.

#### 1.5 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

### PART 2 - PRODUCTS

#### 2.1 FUSIBLE AND NONFUSIBLE SWITCHES

- A. Available Manufacturers:
  - 1. Square D/Group Schneider.
- B. Fusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Nonfusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- D. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
  - 3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

#### 2.2 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
  - 1. Outdoor Locations: NEMA 250, Type 3R.
  - 2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
  - 3. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.



## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.
- B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

### 3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section "Identification for Electrical Systems."

### 3.4 FIELD QUALITY CONTROL

- A. Prepare for acceptance testing as follows:
  - 1. Inspect mechanical and electrical connections.
  - 2. Verify switch and relay type and labeling verification.
  - 3. Verify rating of installed fuses.
  - 4. Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.
- B. Perform the following field tests and inspections and prepare test reports:
  - 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 3. Infrared Scanning:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
    - b. Instruments, Equipment and Reports:

- 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- 2) Prepare a certified report that identifies enclosed switches and circuit breakers included and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.5 CLEANING

- A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.
- B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 262816

## SECTION 265100 - INTERIOR LIGHTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. Interior lighting fixtures, lamps, and ballasts.
  2. Emergency lighting units.
  3. Exit signs.
  4. Lighting fixture supports.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
1. Physical description of lighting fixture including dimensions.
  2. Emergency lighting units including battery and charger.
  3. Ballast, including BF.
  4. Energy-efficiency data.
  5. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
- B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.
1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  2. Wiring Diagrams: For power, signal, and control wiring.
- C. Installation instructions.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.
  2. Complete schedule at end of specification.

#### 1.4 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. Plastic Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
2. LED Modules: 1 for every 25 of each type and rating installed. Furnish at least one of each type.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

#### 1.6 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

#### 1.7 WARRANTY

- A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
  1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
  2. Warranty Period for Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.
- B. Special Warranty for LEDs and Drivers: Manufacturer's standard form, made out to Owner and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
  1. Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

#### 2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Metal Parts: Free of burrs and sharp corners and edges.

- C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Diffusers and Globes:
  - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
    - a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
    - b. UV stabilized.
  - 2. Glass: Annealed crystal glass unless otherwise indicated.
- F. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
  - 1. Label shall include the following lamp and ballast characteristics:
    - a. "USE ONLY" and include specific lamp type.
    - b. LED information, manufacturer, wattage.
    - c. CCT and CRI for all luminaires.

## 2.3 EMERGENCY LED POWER UNIT

- A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
  - 1. Emergency Connection: Operate LED continuously at an output of 1100 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
  - 2. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
    - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
  - 3. Battery: Sealed, maintenance-free, nickel-cadmium type.
  - 4. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
  - 5. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.

## 2.4 LED DRIVER

- A. High efficiency.
- B. If installed outside, shall be fully encased in potting for moisture resistance.

## 2.5 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
  - 1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
  - 2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
    - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
    - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
    - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

## 2.6 LEDs

- A. High-brightness LEDs mounted to a metal core circuit board.
- B. Provide color temperature as noted on drawings.
- C. Provide color accuracy (CRI) 80.

## 2.7 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

- F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Lighting fixtures:
  - 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
  - 2. Install lamps in each luminaire.
- B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.
- C. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.
  - 1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches from lighting fixture corners.
  - 2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
  - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
  - 4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- D. Suspended Lighting Fixture Support:
  - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
  - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
  - 4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.
- E. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.
- F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.2 IDENTIFICATION

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.4 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.

END OF SECTION 265100



## SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. RS-232 cabling.
  - 2. RS-485 cabling.
  - 3. Fire alarm wire and cable.
  - 4. Identification products.

#### 1.2 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. IDC: Insulation displacement connector.
- C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- D. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).
- E. RCDD: Registered Communications Distribution Designer.

#### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate layout and installation of electronic safety and security cabling with Owner's telecommunications and LAN equipment and service suppliers.
- B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Installation data for UTP and optical-fiber cables as specified in TIA 569-C-1.
  - 2. For coaxial cable, include the following installation data for each type used:
    - a. Nominal OD.
    - b. Minimum bending radius.
    - c. Maximum pulling tension.
- B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics, including the following:
  - a. Cross-connects.
  - b. Patch panels.
  - c. Patch cords.
5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
- B. Source quality-control reports.
- C. Field quality-control reports.

#### 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL.
  1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
  1. Test optical-fiber cable to determine the continuity of the strand, end to end. Use optical loss test set.
  2. Test optical-fiber cable on reels. Use an optical time domain reflectometer to verify the cable length, and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
  3. Test each pair of UTP cable for open and short circuits.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Flame-Spread Index: 25 or less.
  2. Smoke-Developed Index: 50 or less.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.2 RS-232 CABLE

- A. Standard Cable: NFPA 70, Type CM.

1. Three, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Polypropylene insulation.
3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
4. PVC jacket.
5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with UL 1581.

- B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Three, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PE insulation.
3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
4. Fluorinated ethylene propylene jacket.
5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

## 2.3 RS-485 CABLE

- A. Standard Cable: NFPA 70, Type CM or Type CMG.

1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

- B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

## 2.4 FIRE ALARM WIRE AND CABLE

- A. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

- B. Signaling Line Circuits: Twisted, shielded pair, not less than the size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.
- C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.
  1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
  2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.
  3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NRTL listed for fire alarm and cable tray installation, plenum rated.

## 2.5 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Section 260553 "Identification for Electrical Systems."

## 2.6 CABLE MANAGEMENT SYSTEM

- A. Description: Computer-based cable management system, with integrated database and graphic capabilities.
- B. Document physical characteristics by recording the network, TIA details, and connections between equipment and cable.
- C. Information shall be presented in database view, schematic plans, or technical drawings.
  1. Microsoft Visio Professional or AutoCAD drawing software shall be used as drawing and schematic plans software.
- D. System shall interface with the following testing and recording devices:
  1. Direct upload tests from circuit-testing instrument into the personal computer.
  2. Direct download circuit labeling into labeling printer.

## 2.7 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP and optical-fiber cables on reels according to TIA-568-C.1.
- C. Factory test UTP cables according to TIA-568-C.2.
- D. Factory test multimode optical fiber cables according to TIA-526.14-B and TIA-568-C.3.
- E. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage

whose frequency is varied through the specified frequency range and graphing the results. Structural Return Loss shall be less than 20 db.

- F. Cable will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for installation of supports for cables.

### 3.2 WIRING METHOD

- A. Install wiring in metal pathways and wireways.
  - 1. Minimum conduit size shall be 3/4 inch (21 mm). Control and data-transmission wiring shall not share conduits with other building wiring systems.
- B. Install cable, concealed in accessible ceilings, walls, and floors when possible.
- C. Wiring on Racks and within Enclosures:
  - 1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM's "Cabling Termination Practices" chapter. Cable ties shall not be excessively tightened such that the transmission characteristics of the cable are altered.
  - 2. Install lacing bars and distribution spools.
  - 3. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer.
  - 4. Install conductors parallel with or at right angles to sides and back of enclosure.
  - 5. Connect conductors associated with intrusion system that are terminated, spliced, or interrupted in any enclosure onto terminal blocks.
  - 6. Mark each terminal according to system's wiring diagrams.
  - 7. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1 and NFPA 70.
- B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.
- C. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.
- D. General Requirements for Cabling:

1. Comply with TIA-568-C.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels. Leave a minimum of 6 inches (150 mm) of slack at outlet terminations and coil loosely into box after termination on outlet fitting.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Maintain minimum cable bending radius during installation and termination of cables.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions. Do not exceed manufacturer's rated cable-pulling tension.
9. Riser Cable: Riser cable support intervals shall be in accordance with manufacturer's recommendations.
10. Comply with Section 280544 "Sleeves and Sleeve Seals for Electronic Safety and Security Pathways and Cabling."

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunication spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1525 mm) apart. Cable supports shall be fastened to structural members or floor slabs in accordance with Section 260529 "Hangers and Supports for Electrical Systems."
3. Cable shall not be run in contact with pipes, ducts, or other potentially damaging items. Cables shall not be run through structural members or use structural members, pipes, ducts, or equipment as a support.

F. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-C recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communication cables or cables in nonmetallic pathways and unshielded power conductors and electrical equipment shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).
3. Separation between communication cables in grounded metallic pathways and unshielded power lines or electrical equipment shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between cables in grounded metallic pathways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (75 mm).
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or hp and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

### 3.4 FIRE ALARM WIRING INSTALLATION

- A. Comply with NECA 1 and NFPA 72.
- B. Wiring Method: Install wiring in metal pathway according to Section 280528 "Pathways for Electronic Safety and Security."
  1. Install plenum cable in environmental air spaces, including plenum ceilings.
  2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated pathway system. This system shall not be used for any other wire or cable.
- C. Wiring Method:
  1. Cables and pathways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
  2. Fire-Rated Cables: Use of two-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is not permitted.
  3. Signaling Line Circuits: Power-limited fire alarm cables shall not be installed in the same cable or pathway as signaling line circuits.
- D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- F. Color Coding: Color code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and another for supervisory circuits. Color code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
- G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

- H. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

### 3.5 POWER AND CONTROL-CIRCUIT CONDUCTORS

- A. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
- B. Minimum Conductor Sizes:
  - 1. Class 1 remote-control and signal circuits, No. 14 AWG.
  - 2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
  - 3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

### 3.6 CONNECTIONS

- A. Comply with requirements in Section 283111 "Digital, Addressable Fire-Alarm System" for connecting, terminating, and identifying wires and cables.

### 3.7 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-C, "Firestopping" Annex A.
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

### 3.8 GROUNDING

- A. For communication wiring, comply with J-STD-607-A and with BICSI TDMM's "Grounding, Bonding, and Electrical Protection" chapter.
- B. For low-voltage wiring and cabling, comply with requirements in Section 280526 "Grounding and Bonding for Electronic Safety and Security."

### 3.9 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.



- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Visually inspect UTP and optical-fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
  - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
  - 3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.
    - a. Test instruments shall comply with or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- D. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 280513

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## SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. Fire-alarm control unit.
  2. Manual fire-alarm boxes.
  3. System smoke detectors.
  4. Heat detectors.
  5. Notification appliances.
  6. Device guards.
  7. Addressable interface device.
  8. Digital alarm communicator transmitter.
  9. Radio alarm transmitter.
  10. Network communications.

#### 1.2 DEFINITIONS

- A. FACP: Fire Alarm Control Panel.
- B. HLI: High Level Interface.
- C. NICET: National Institute for Certification in Engineering Technologies.
- D. PC: Personal computer.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including furnished options and accessories.
1. Include construction details, material descriptions, dimensions, profiles, and finishes.
  2. Include rated capacities, operating characteristics, and electrical characteristics.
- B. Shop Drawings: For fire-alarm system.
1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
  2. Include plans, elevations, sections, details, and attachments to other work.
  3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
  4. Detail assembly and support requirements.
  5. Include voltage drop calculations for notification-appliance circuits.
  6. Include battery-size calculations.
  7. Include input/output matrix.

8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Provide program report showing that air-sampling detector pipe layout balances pneumatically within the airflow range of the air-sampling detector.
12. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.
  - a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
  - b. Show field wiring required for HVAC unit shutdown on alarm.
  - c. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' control system.
  - d. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' smoke-evacuation system.
  - e. Locate detectors according to manufacturer's written recommendations.
  - f. Show air-sampling detector pipe routing.
13. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
14. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:
  - a. Trained and certified by manufacturer in fire-alarm system design.
  - b. NICET-certified, fire-alarm technician; Level III minimum.
  - c. Licensed or certified by authorities having jurisdiction.

D. Delegated-Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.
- 1.5 Sample Warranty: For special warranty.
- 1.6 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
1. In addition to items specified include the following and deliver copies to authorities having jurisdiction:
    - a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
    - b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
    - c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
    - d. Riser diagram.
    - e. Device addresses.
    - f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
    - g. Record copy of site-specific software.
    - h. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
      - 1) Equipment tested.
      - 2) Frequency of testing of installed components.
      - 3) Frequency of inspection of installed components.
      - 4) Requirements and recommendations related to results of maintenance.
      - 5) Manufacturer's user training manuals.
    - i. Manufacturer's required maintenance related to system warranty requirements.
    - j. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.
- B. Software and Firmware Operational Documentation:
1. Software operating and upgrade manuals.
  2. Program Software Backup: On magnetic media or compact disk, complete with data files.
  3. Device address list.
  4. Printout of software application and graphic screens.

#### 1.7 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. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
  - 2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
  - 3. Smoke Detectors and Heat Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
  - 4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
  - 5. Keys and Tools: One extra set for access to locked or tamperproofed components.
  - 6. Audible and Visual Notification Appliances: Three of each type installed.
  - 7. Fuses: Two of each type installed in the system. Provide in a box or cabinet with compartments marked with fuse types and sizes.
  - 8. Filters for Air-Sampling Detectors: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
  - 9. Air-Sampling Fan: Quantity equal to one for every five detectors, but no fewer than one unit of each type.

#### 1.8 QUALITY ASSURANCE

- A. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).
- B. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.
- C. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FM Global-approved alarm company.
- D. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.
- B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and voice/strobe evacuation.
- C. Automatic sensitivity control of certain smoke detectors.
- D. All components provided shall be listed for use with the selected system.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

### 2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and existing systems:
  - 1. Manual stations.
  - 2. Heat detectors.
  - 3. Smoke detectors.
  - 4. Duct smoke detectors.
  - 5. Carbon monoxide detectors.
  - 6. Existing automatic sprinkler system water flow.
  - 7. Existing preaction system.
  - 8. Existing fire standpipe system.
  - 9. Existing dry system pressure flow switch.
  - 10. Existing fire pump running.
- B. Fire-alarm signal shall initiate the following actions:
  - 1. Continuously operate alarm notification appliances, including voice evacuation notices.
  - 2. Identify alarm and specific initiating device at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
  - 3. Transmit an alarm signal to the remote alarm receiving station.
  - 4. Unlock electric door locks in designated egress paths.
  - 5. Release fire and smoke doors held open by magnetic door holders.
  - 6. Activate voice/alarm communication system.
  - 7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
  - 8. Activate smoke-control system (smoke management) at firefighters' smoke-control system panel.
  - 9. Activate stairwell and elevator-shaft pressurization systems.
  - 10. Close smoke dampers in air ducts of designated air-conditioning duct systems.
  - 11. Activate preaction system.
  - 12. Recall elevators to primary or alternate recall floors.
  - 13. Activate elevator power shunt trip.
  - 14. Activate emergency lighting control.

15. Activate emergency shutoffs for gas and fuel supplies.
16. Record events in the system memory.
17. Record events by the system printer.
18. Indicate device in alarm on the graphic annunciator.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. High- or low-air-pressure switch of a dry-pipe or preaction sprinkler system.
3. Alert and Action signals of air-sampling detector system.
4. Elevator shunt-trip supervision.
5. Fire pump running.
6. Fire-pump loss of power.
7. Fire-pump power phase reversal.
8. Independent fire-detection and -suppression systems.
9. User disabling of zones or individual devices.
10. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.
10. Voice signal amplifier failure.
11. Hose cabinet door open.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
3. Record the event on system printer.
4. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
5. Transmit system status to building management system.
6. Display system status on graphic annunciator.

## 2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."



2.4 FIRE-ALARM CONTROL UNIT

A. Shall be manufactured by one of the following:

1. Honeywell (Basis of Design XLS1000)
2. Siemens
3. EST
4. National Time and Signal
5. Simplex

B. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
  - a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
  - b. Include a real-time clock for time annotation of events on the event recorder and printer.
  - c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
  - d. The FACP shall be listed for connection to a central-station signaling system service.
  - e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.
2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, three line(s) of 80 characters, minimum.

2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.
- E. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:
1. Pathway Class Designations: NFPA 72, Class B
  2. Pathway Survivability: Level 0.
  3. Install no more than 80% of addressable devices on each signaling-line circuit.
  4. Serial Interfaces:
    - a. One dedicated RS 485 port for central-station operation using point ID DACT.
    - b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
    - c. One USB or RS 232 port for PC configuration.
    - d. One RS 232 port for VESDA HLI connection.
    - e. One RS 232 port for voice evacuation interface.
- F. Smoke-Alarm Verification:
1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
  2. Activate an approved "alarm-verification" sequence at fire-alarm control unit and detector.
  3. Record events by the system printer.
  4. Sound general alarm if the alarm is verified.
  5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.
- G. Notification-Appliance Circuit:
1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
  2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
  3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.
- H. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls shall be connected to fire-alarm system.
- I. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.
- J. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
- K. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided in a separate cabinet located in the fire command center.

1. Indicate number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711.
  - a. Allow the application of, and evacuation signal to, indicated number of zones and, at the same time, allow voice paging to the other zones selectively or in any combination.
  - b. Programmable tone and message sequence selection. Provide the following:
    - 1) Ready To Page
    - 2) All Call
    - 3) Page to Evacuation
    - 4) Page to Alert
    - 5) All call Minus
    - 6) Page By Phone.
    - 7) SOM Downtown (coordinate with Owner)
    - 8) SOM Downtown (coordinate with Owner)
    - 9) SOM Downtown (coordinate with Owner)
    - 10) SOM Downtown (coordinate with Owner)
    - 11) Spare
    - 12) Spare
    - 13) Spare
    - 14) Spare
  - c. Standard digitally recorded messages for "Evacuation" and "All Clear."
  - d. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification-appliance circuits of fire-alarm control unit.
2. Status Annunciator: Indicate the status of various voice/alarm speaker zones.
3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.
- L. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.
- M. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals supervisory and digital alarm communicator transmitters and digital alarm radio transmitters shall be powered by 24-V dc source.
  1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
- N. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
  1. Batteries: Sealed lead calcium.
- O. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate

response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

## 2.5 MANUAL FIRE-ALARM BOXES

A. Shall be manufactured by one of the following:

1. Honeywell
2. Siemens
3. EST
4. National Time and Signal
5. Simplex

B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral or attached addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.
3. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
4. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

## 2.6 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
  - a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.

- b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
- c. Multiple levels of detection sensitivity for each sensor.
- d. Sensitivity levels based on time of day.

B. Photoelectric Smoke Detectors:

- 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
- 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

- 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
- 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).
- 3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
- 4. Each sensor shall have multiple levels of detection sensitivity.
- 5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
- 6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.
- 7. Provide remote test switch when required.

2.7 MULTICRITERIA DETECTORS

- A. Mounting: Twist-lock base interchangeable with smoke-detector bases.
- B. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- C. Automatically adjusts its sensitivity by means of drift compensation and smoothing algorithms. The detector shall send trouble alarm if it is incapable of compensating for existing conditions.
- D. Test button tests all sensors in the detector.

- E. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - 1. Primary status.
  - 2. Device type.
  - 3. Present sensitivity selected.
  - 4. Sensor range (normal, dirty, etc.).
  
- F. Sensors: The detector shall be comprised of four sensing elements including a smoke sensor, a carbon monoxide sensor, an infrared sensor, and a heat sensor.
  - 1. Smoke sensor shall be photoelectric type as described in "System Smoke Detectors" Article.
  - 2. Carbon monoxide sensor shall be as described in "Carbon Monoxide Detectors" Article.
  - 3. Heat sensor shall be as described in "Heat Detectors" Article.
  - 4. Each sensor shall be separately listed according to requirements for its detector type.

## 2.8 HEAT DETECTORS

- A. Shall be manufactured by one of the following:
  - 1. Simplex
  - 2. Siemens Branch
  - 3. EST
  - 4. National Time and Signal
  
- B. General Requirements for Heat Detectors: Comply with UL 521.
  - 1. Temperature sensors shall test for and communicate the sensitivity range of the device.
  
- C. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
  - 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
  - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
  
- D. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.
  - 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
  - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
  
- E. Continuous Linear Heat-Detector System:
  - 1. Detector Cable: Rated detection temperature 155 deg F. Listed for "regular" service and a standard environment. Cable includes two steel actuator wires twisted together with spring pressure, wrapped with protective tape, and finished with PVC outer sheath. Each actuator wire is insulated with heat-sensitive material that reacts with heat to allow the cable twist pressure to short circuit wires at the location of elevated temperature.
  - 2. Control Unit: Two-zone or multizone unit as indicated. Provide same system power supply, supervision, and alarm features as specified for fire-alarm control unit.

3. Signals to Fire-Alarm Control Unit: Any type of local system trouble shall be reported to fire-alarm control unit as a composite "trouble" signal. Alarms on each detection zone shall be individually reported to central fire-alarm control unit as separately identified zones.
4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

## 2.9 NOTIFICATION APPLIANCES

- A. Shall be manufactured by one of the following:
  1. Honeywell
  2. Siemens
  3. EST
  4. National Time and Signal
  5. Simplex
- B. General Requirements for Notification Appliances: Individually addressed, connected to a signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.
- C. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
  1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.
- D. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.
- E. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.
  1. Rated Light Output:
    - a. 15/30/75/95/110 cd, selectable in the field.
  2. Mounting: Wall mounted unless otherwise indicated.
  3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
  4. Flashing shall be in a temporal pattern, synchronized with other units.
  5. Strobe Leads: Factory connected to screw terminals.
  6. Mounting Faceplate: Factory finished, white.
- F. Voice/Tone Notification Appliances:
  1. Comply with UL 1480.

2. Speakers for Voice Notification: Locate speakers for voice notification to provide the intelligibility requirements of the "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
3. High-Range Units: Rated 2 to 15 W.
4. Low-Range Units: Rated 1 to 2 W.
5. Mounting: Flush, semi-recessed or surface mounted and bidirectional.
6. Matching Transformers: Tap range matched to acoustical environment of speaker location.
7. All speakers shall be tap at 2 W unless noted otherwise on the drawings.

## 2.10 ADDRESSABLE INTERFACE DEVICE

### A. General:

1. Include address-setting means on the module.
2. Store an internal identifying code for control panel use to identify the module type.
3. Listed for controlling HVAC fan motor controllers.

### B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

### C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall or to circuit-breaker shunt trip for power shutdown.

1. Allow the control panel to switch the relay contacts on command.
2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

### D. Control Module:

1. Operate notification devices.
2. Operate solenoids for use in sprinkler service.
3. Operate fire smoke and smoke dampers.
4. Operate any other non-fire alarm equipment that requires interfacing with fire alarm system.

## 2.11 DIGITAL ALARM COMMUNICATOR TRANSMITTER

### A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

### B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

### C. Local functions and display at the digital alarm communicator transmitter shall include the following:



1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply.
5. Loss of power.
6. Low battery.
7. Abnormal test signal.
8. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

## 2.12 NETWORK COMMUNICATIONS

- A. Provide network communications for fire-alarm system according to fire-alarm manufacturer's written requirements.
- B. Provide network communications pathway per manufacturer's written requirements and requirements in NFPA 72 and NFPA 70.
- C. Provide integration gateway using BACnet for connection to building automation system.

## 2.13 DEVICE GUARDS

- A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
  1. Factory fabricated and furnished by device manufacturer.
  2. Finish: Paint of color to match the protected device.

## PART 3 - EXECUTION

### 3.1 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.

- D. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Visual Inspection: Conduct visual inspection prior to testing.
    - a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
    - b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
  - 2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
  - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
  - 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
  - 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
  - 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.
- H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

### 3.2 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
  - 1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
  - 2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

### 3.3 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.
- C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
  1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

### 3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111

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